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Chapter 6

Existing Conditions, Impacts, and Mitigation – Route Permit

6.1 INTRODUCTION

This chapter assesses potential construction and operations impacts for the Applicant's preferred route and each of the route alternatives identified in Section 4.3. As discussed in Section 4.3, the Minnesota Public Utilities Commission (Commission) must determine the route of the Line 3 Project (Project) if they grant a Certificate of Need (CN) for the Project. The objectives of the analysis in this chapter are to (1) provide relevant information for a comparison of the Applicant's preferred route and each route alternative; and (2) determine whether any of the alternative routes may offer significant benefits through lower impacts to inform the Commission's decision.

The Applicant's preferred route begins near Neche, North Dakota, and terminates at Superior, Wisconsin. However, because the Commission has routing authority only over the portion of the route in Minnesota the route permit analysis is concerned only with the portion of the Project located in Minnesota. All route alternatives in Minnesota are variants on the segment of the Applicant's preferred route between Clearbrook and Carlton; the North Dakota border-to-Clearbrook segment and the Carlton-to-Wisconsin border segments are virtually identical for all route alternatives (Table 6.1-1). This chapter describes the existing conditions and assesses potential impacts for the Applicant's preferred route through Minnesota. In addition, the impact assessment highlights the potential impacts for the Applicant's preferred route and each route alternative where they diverge from a common alignment along the Clearbrook-to-Carlton segment.

In accordance with criteria for pipeline route selection in Minnesota Administrative Rules § 7852.1900, the environmental review in this chapter is structured to assess the impacts of the Applicant's preferred route and route alternatives associated with the following:

- Human settlement, existence and density of populated areas, existing and planned future land uses, and management plans;
- The natural environment, public and designated lands, including but not limited to natural area, wildlife habitats, water, and recreational lands;
- Lands of historical, archaeological, and cultural significance;
- Economies within the route, including agricultural, commercial or industrial, forestry, recreational, and mining operations;
- Pipeline cost and accessibility;
- Use of existing rights-of-way and right-of-way sharing or paralleling;
- Natural resources and features;

- The extent to which human or environmental effects are subject to mitigation by regulatory control;
- Cumulative potential effects of related or anticipated future pipeline construction; and
- Relevant applicable policies, rules, and regulations of other state and federal agencies and local governmental land use laws.

Table 6.1-1. Length of the Applicant's Preferred Route and Route Alternatives across Minnesota (miles)

Segment	Applicant's Preferred Route	Route Alternative RA-03-AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
North Dakota border to Clearbrook terminal[a]	109.1	110.2	110.2	110.2	110.2
Clearbrook terminal to Carlton	220.9	275.1	196.8	167.7	164.8
Carlton to Wisconsin border	9.6	9.6	9.6	9.6	9.6
TOTAL	**339.7**	**394.9**	**316.6**	**287.5**	**284.6**

[a] Differences in length are due to assumptions for where the route options enter the Clearbrook terminal.

The impact assessment in this chapter covers each of the criteria listed above that the Commission is required to consider in determining a route for the proposed Project. This chapter evaluates potential impacts on various resources, focusing on issues of concern for each resource identified based on:

- Relevant regulatory requirements;
- Input during scoping from the public, agencies, non-governmental organizations, and tribal representatives;
- Consultation with knowledgeable resource management agencies and tribal resource representatives; and
- Professional judgment, in part based on other impact assessments in recent energy infrastructure environmental impact statements (EISs) and agency guidance (DOS 2009; FERC 2013a, 2013b; DOE 2015; Wisconsin DNR 2016).

The following sub-sections are presented for each resource:

- Regulatory Context and Methodology
- Existing Conditions
- Impact Assessment
- Summary and Mitigation

The general contents of each of the sub-sections in this chapter are described below. The analysis of route segment alternatives is described in Chapter 7. The analysis of potential impacts associated with crude oil releases is presented in Chapter 10. Cumulative potential effects are discussed in Chapter 12.

6.1.1 Regulatory Context and Methodology

The regulatory context describes the framework of laws, regulations, ordinances, and policies intended to protect and manage an affected resource with regard to impacts associated with the Applicant's preferred route and route alternatives. As described in Chapter 3, these regulations are implemented by a variety of federal, state, and local jurisdictions.

For each affected resource, the impact assessment methodology is described. This includes identifying the region of interest (ROI) for the resource (the geographic scope), the specific datasets acquired and analyzed, the analytical methods and assumptions used, and the quantitative or qualitative metrics for assessing impacts relative to each issue of concern. The ROI incorporates the geographic extent of the Applicant's preferred route in Minnesota as presented in Chapter 2, and the Applicant's preferred route and the route alternatives in the Clearbrook-to-Carlton segment as described in Chapter 2 and Section 4.3. The extent of the ROI beyond the physical footprint of each route option varies among resources according to the characteristics of the resource and the Project-related effects that could occur (e.g., potential effects on vegetation would be localized while effects on air quality may be localized and regional).

6.1.2 Existing Conditions

The existing conditions within the ROI for each affected resource are described for the Applicant's preferred route and each route alternative. Sources of data used to characterize existing conditions were identified based on a review of publically available geospatial datasets; federal, state, and local government reports, assessments, and planning documents; and input during the scoping process, including input from the public, tribes, agencies, and non-governmental organizations. In addition, data available as part of Enbridge's application, Enbridge's 2016 Environmental Assessment Worksheet (EAW), and responses to data requests from the Minnesota Department of Commerce Energy, Environmental Review and Analysis (DOC-EERA) were considered. **Descriptions of existing conditions reflect the current state of the environment. Where past projects have impacted or altered the environment, these impacts or alterations are captured in the description of the existing environment. For example, where forest has been cleared, or habitat has been fragmented by the existing mainline, this is part of the discussion in the relevant "existing conditions" section.**

Literature addressing the potential impacts of Project construction and operations was reviewed. Information was evaluated for its relevancy in assessing Project-related impacts based on the data collection methods used and the geographic extent, study duration and age, detail, and usefulness of the data in characterizing existing conditions. Project-specific mileposts included in Chapter 6 resource sections and figures are based on the Applicant's preferred route and all route alternatives starting at milepost (MP) 0.0 near Neche, North Dakota, and extending to Superior, Wisconsin. Maps depicting a range of existing resource conditions and data associated with land ownership and physical features are provided in Appendix A.

6.1.3 Impact Assessment

Resource-specific impact assessment methods are described in each resource section of this chapter. The impact assessments focus on direct impacts from construction and operation of the Project, describe the nature of the impacts, and provide quantifiable estimates of those direct impacts where feasible and meaningful. **The impact assessment describes the incremental impact that construction and operation of the Project (or alternatives to the Project) will have on the existing environment (as described in the "Existing Conditions" portion of each section). Even in areas where existing conditions reflect impacts from previous projects, the proposed project (and alternatives) will still have incremental impacts on the environment, and these are the impacts represented in this EIS. The discussion in the impacts section identifies that there are some resources for which the incremental impacts of constructing and operating a pipeline in a new corridor are greater than the incremental impacts of constructing and operating a pipeline in an existing corridor. Habitat fragmentation, land use, and aesthetics are all good examples of cases where the incremental impact in a new corridor is greater than the incremental impact in an existing corridor.**

Examples of direct impacts include habitat fragmentation due to permanent loss of woody vegetation within the permanent right-of-way and contributions to climate change from greenhouse gas (GHG) emitted as a result of fossil fuel combustion in construction equipment. Indirect impacts, which may result from or be influenced by the Project later in time or further removed from direct Project activities, are described where appropriate. Examples of indirect impacts include economic growth, reduced productivity in wildlife due to stress, and direct impacts on aesthetics from vegetation removal indirectly affecting recreational use.

Within each resource section, the nature of impacts are discussed and the impacts are characterized in terms of their duration and magnitude or severity. Impacts are discussed for resources located within the ROI, specified for each resource. Impact duration was characterized as *temporary, short term, long term,* or *permanent*. Impact duration was considered temporary if the impact would occur only during and immediately following construction activity (e.g., turbidity due to instream construction). Impacts were considered short term if the resource recovery would last up to 3 years following construction (e.g., vegetation clearing in pastures). Impacts were considered long term if resource recovery would require more than 3 years but would occur during the life of the Project (e.g., clearing of trees in temporary construction work areas). Impacts were considered permanent if they would last for the life of the Project (e.g., clearing of trees within the permanent right-of-way). See Table 6.1-2.

Table 6.1-2. Definitions of Impact Duration

Term	Definition
Temporary	Impacts that would occur during and immediately following construction
Short term	Impacts that would continue for up to 3 years after construction
Long term	Impacts that would last more than 3 years but would recover during the life of the proposed Project or alternative
Permanent	Impacts that would last for at least the duration of the proposed Project or alternative

Categories of impact magnitude or severity for the purposes of this EIS include *negligible*, *minor*, and *major*. Impacts were considered negligible if they have the potential to occur but would not generally be measurable or noticeable. They were considered minor if they were expected to be evident but below resource-specific standards or metrics, such as those used in other recent linear infrastructure EISs in the region (e.g., Great Northern Transmission Line, Alberta Clipper, Wisconsin Sandpiper/Line 3 Replacement) and requirements by the Federal Energy Regulatory Commission for interstate natural gas pipelines crossing wetlands, waterbodies, or uplands (DOS 2009; FERC 2013a, 2013b; DOE 2015; Wisconsin DNR 2016). Impacts were considered major if they were expected to potentially exceed the resource-specific standards or metrics, with consideration of the geographic extent and duration. See Table 6.1-3.

Table 6.1-3. Definition of Impact Magnitude

Term	Definition
Negligible	Impacts could potentially occur, but not expected to be measureable or noticeable
Minor	Impacts are evident, but expected to be below resource-specific standards or metrics
Major	Impacts are evident and expected to exceed resource-specific standards or metrics

In each resource area, available datasets and metrics were reviewed to identify “factors” that provide an indication of how a given resource could be affected. For example, presence of different vegetation types, noxious weeds, native plants, and old growth forest were all identified as factors that could be examined to understand how vegetation resources as a whole could be affected.

In most cases, no single “factor” provides a perfect indication of impacts to a resource. Therefore, for each resource, a collection of factors was analyzed that together provide a reasonably comprehensive indication of the potential impacts. For example, impacts to wetlands are a function of the number and acreage of wetlands crossed, wetland type and quality, and a number of other factors. There is no readily available composite dataset that effectively combines all of these individual factors, so the “wetlands” section of the EIS instead evaluates a suite of factors, including acreage of forested and scrub/shrub wetlands, acres of emergent wetlands, acres of Public Waters Inventory wetlands, acres of calcareous fen, acres of wetland reserve program wetland, and acreage of wetland mitigation bank easement within the project footprint. Taken together, all of these factors provide a fairly complete picture of wetland impacts for a given alternative and provide the information necessary for a valid comparison of impacts across alternatives.

In most cases impacts were assessed by mapping available data for each of the relevant factors and overlaying information on the construction and operations footprints for the Applicant’s preferred route and route alternatives. These overlays were reviewed in order to identify the location, type, and condition of resources within and adjacent to the construction/operational features. In addition, methods of construction and operations, including Applicant-proposed measures to minimize impacts, were reviewed. Together, the spatial analysis and review of construction and operation methods were used to determine the nature, duration, and magnitude of impacts for the Applicant’s preferred route and each route alternative.

The footprint of the Applicant’s preferred route was defined based on the Project applications and additional information provided by Enbridge. This information is summarized in Chapter 2, which includes the Applicant-proposed measures to limit or avoid impacts during construction and operations. The impact analysis for each resource assumes that the Applicant-proposed measures would be implemented regardless of the route (e.g., construction activities along the RA-06 route would adhere to Enbridge's Environmental Protection Plan [Appendix E]).

As described in Chapter 2, Enbridge provided the location and land requirements of the Applicant's preferred route during construction and operation including the construction work area along the pipeline route, additional temporary workspaces (ATWS), temporary and permanent access roads, temporary contractor and material/pipe storage yards (yards), and aboveground facilities in Minnesota. Enbridge provided DOC-EERA with geo-referenced geographic information system (GIS) shapefiles of these features. Over 80 percent of the 5,604 acres that would be disturbed during construction of the entire Project would be associated with the construction work area along the pipeline (typically 120 feet wide). The remaining land disturbance primarily would be associated with temporary construction, including ATWS (9 percent), access roads (5 percent), and yards (4 percent). During operation, 62 percent of the land disturbed during construction of the entire Project (3,480 acres) would return to preconstruction uses, and the majority of the permanent operations-related land disturbance would be associated with maintenance of the permanent right-of-way (97 percent, or 2,057 acres). The remaining 3 percent would be associated with aboveground facilities, including access (67 acres). Each resource section in this chapter discusses the impacts of construction and operations for the Applicant's preferred route based on this detailed geo-referenced information.

As discussed in Section 4.3, each route alternative would follow the same centerline as the Applicant's preferred route from Neche, North Dakota, to Clearbrook, Minnesota; and from Carlton, Minnesota, to Superior, Wisconsin (Table 6.1-1). The only segment where the route alternatives would materially vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. As the impacts for the route alternatives are already being described for the alignment that they share with the Applicant's preferred route (i.e., the impact analysis for the Applicant's preferred route in Chapter 5 and in this chapter), the environmental analysis of the route alternatives in this chapter is limited to the pipeline segment where the route alternatives would vary from the Applicant's preferred route (i.e., the Clearbrook-to-Carlton segment). For some socioeconomic resources, the impact analysis was based on county-level data (e.g., income, tax revenue); for those impact analyses, the ROIs for the route alternatives extend across Carlton County to the Wisconsin border (less than 10 miles from where the routes would re-converge with the Applicant's preferred route in Carlton County).

The available data for the route alternatives are not as extensive or complete as those for the Applicant's preferred route—in part, because no one has designed or engineered those alternatives. For route alternatives, a quantitative analysis for each route alternative was conducted using the digital centerline identified during scoping; no corresponding geo-referenced information was provided on aboveground facilities, ATWS, access roads, or yards. Along the centerline for each route alternative, a standard construction work area was applied to assess the impacts associated with pipeline construction. For three of the four route alternatives (RA-03AM, RA-06, and RA-08), the standard construction work area was 120 feet wide. For RA-07, a 205-foot-wide construction work area was used to quantify the extent of the acreage affected along existing Line 3 between Clearbrook and Carlton in order to allow removal of the existing Line 3 and installation of the new pipeline in the same trench, as described in Section 4.3.4. Using these standard construction work areas allowed quantification of construction and operations impacts on land cover, habitat, and resources along the route alternatives based on publically available information on existing conditions. Using the relative proportion of land requirements for the Applicant's preferred route, the 120-foot-wide construction footprint equates to approximately 80 percent of the overall construction acreage that would be required to construct the route alternatives, and a 205-foot-wide construction work area would compose over 85 percent of the overall construction footprint (besides the construction work area along the centerline, acreage affected during construction would be associated with unidentified ATWS, access roads, yards, and aboveground facilities). The 50-foot-wide permanent right-of-way along each route alternative would account for 97 percent of the operations footprint of the route (based on the relative proportion of the land requirements for the Applicant's preferred route). Without knowing the precise locations of aboveground facilities and secondary construction features (e.g., ATWS, yards, and temporary access roads) potential impacts were qualitatively assessed by applying the assumptions used in the evaluation of the Applicant's preferred route. For example, although the exact locations for pump stations are not known for any of the route alternatives, they average about 8 acres each and would be expected to be located in open upland areas where feasible—although specific locations or land cover types are not known. If a route alternative is approved, field surveys, landowner and agency coordination, and site-specific engineering along the approved route would be conducted to refine routing; develop specialized construction methods; and locate aboveground facilities, access roads, and yards.

6.1.4 Summary and Mitigation

Each resource discussion in this chapter concludes with a general summary of the anticipated impacts on the resource for the Applicant's preferred route and the route alternatives between Clearbrook and Carlton based on the nature, extent, duration, and magnitude of potential impacts.

As discussed in Section 6.1.3, the quantitative results for the route alternative impact analysis include only standard construction work areas along the alternative centerlines (120 feet or 205 feet wide) and the 50-foot-wide permanent right-of-way, underestimating the overall construction footprint by up to 20 percent because no specific location or design information is available for secondary facilities (aboveground facilities, access roads, ATWS, and yards). To allow for a more direct comparison between the Applicant's preferred route and the route alternatives, impacts for all routes (Applicant's preferred and route alternatives) are presented in the summary sub-section are based on Enbridge's refined construction work area (typically 120 feet wide, or 205 feet in the case of RA-07) and 50-foot-wide permanent right-of-way. By not including aboveground facilities, access roads, ATWS, and yards, impacts for all routes are underestimated by approximately 3 percent (operations) to 20 percent (construction). It is expected that the majority of the acreage of aboveground facilities, access roads, ATWS, and yards would be located in upland open lands. From an overall acreage perspective, the 3- to 20-percent underestimate does not substantially alter the general relationship between the relative impacts among the route options.

The primary shortcoming of the above approach for the environmental analysis is associated with Enbridge's proposal to reduce the width of the construction work area for the Applicant's preferred route in some wetlands and waterbodies (from 120 feet to 95 feet, or 21 percent) based on site-specific field investigations and engineering. No design engineering has been conducted for the route alternatives. For context, theoretically reducing the construction width in wetlands from 120 to 95 feet for route alternatives would result in the Applicant's preferred route and RA-03AM affecting virtually the same total wetland acreage during construction, and the remaining route alternatives affecting substantially greater acreage than either of those two (over 40 percent more for RA-06, RA-07, and RA-08). For the analysis of surface water, the issue is recognized but is less integral, as the impact assessment for surface waters is not driven by the acreage of waterbody crossings as much as identifying and minimizing the impacts of in-water disturbance on water quality, aquatic habitat, and fisheries (see Section 6.3.1.2). As noted above, if a route alternative is approved, it is expected that field surveys and engineering would result in refinements to the route, the width of the construction footprint, and construction methods to further avoid and minimize impacts on wetlands and waterbodies.

The summary sub-section for each resource includes a summary table to highlight impacts on the resources among route options. **The individual rows of these tables summarize information for the various factors evaluated in the impact assessment. As discussed above, no single factor provides a comprehensive picture of impacts; instead, the whole suite of factors for each resource are meant to be considered all together. For the summary tables, this means that the individual rows are not meant to stand alone, but together all the rows provide a reasonably comprehensive summary of the potential impacts. Additionally, the quantitative information in the tables should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in each section. Tables provide quantitative information and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts is contained in the text of each section.**

The summary sub-section also identifies potential mitigation, as appropriate, to further avoid and minimize impacts. Mitigation may include expanding best management practices (BMPs), initiating agency/landowner coordination, and identifying possible permit conditions (Section 3.6 summarizes the permits and approval processes for the Project).

6.1.5 References

Federal Energy Regulatory Commission (FERC). 2013a. Upland erosion control, revegetation, and maintenance plan. May. Washington, DC.

_____. 2013b. Wetland and Waterbody Construction and Mitigation Procedures. May. Washington, DC.

U.S. Department of Energy (DOE). 2015. Great Northern Transmission Line Final Environmental Impact Statement. (DOE/EIS0499.) Prepared by the U.S Department of Energy, Office of Electricity Delivery and Energy Reliability and the Minnesota Department of Commerce, Energy Environmental Review and Analysis. October. Washington, DC.

U.S. Department of State (DOS). 2009. Final Environmental Impact Statement for the Alberta Clipper Pipeline Project. U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs. June. Washington, DC.

Wisconsin Department of Natural Resources (Wisconsin DNR). 2016. Final Environmental Impact Statement Enbridge Sandpiper and Line 3 Replacement Projects. August.

6.2 HUMAN SETTLEMENT

6.2.1 Planning and Zoning

Land use planning and zoning regulations are used by county and local jurisdictions to regulate the pattern of development to ensure that adjacent land uses are compatible with one another. They also ensure that the pattern of development allows for efficient incorporation of publicly provided infrastructure, including roads, utility systems, and public services. Land use planning and zoning regulations also minimize potential impacts on the public from floods, unstable slopes (landslides), and other natural events that may cause loss of life and property, in addition to protecting important natural resources. Where projects fail to conform with local land use plans and zoning ordinances, where established, they can disrupt orderly community development.

The following analysis evaluates compatibility with land use planning and zoning to identify where the pipeline construction and operation may disrupt orderly community development. The analysis considers land uses adjacent to each of the potential routes, based on a review of county and local comprehensive plans and zoning ordinances, floodplain and shoreland overlay districts, existing land use (for jurisdictions without planning and zoning ordinances),[1] and a general review of watershed district goals.

The analysis of impacts on planning and zoning from construction and operation of the Applicant's preferred route and the route alternatives considers the following issues:

- Compatibility with county and local comprehensive plans and zoning ordinances;
- Compatibility with floodplain and shoreland overlay district regulations;
- Compatibility with existing land use for jurisdictions without planning and zoning ordinances; and
- Compatibility with watershed district goals.

This section first describes the different types of existing or planned land use (per existing plans and zoning requirements) along the Applicant's preferred route and each of the route alternatives that could be affected by construction and operation of an oil pipeline. Potential Project-related impacts of construction and operation are then discussed and compared across each of the routing options.

6.2.1.1 Regulatory Context and Methodology

6.2.1.1.1 Regulatory Context

Planning and zoning regulations are authorized by Minnesota Statutes, Chapter 394. Under these statutes, counties and municipalities may develop comprehensive land use plans and establish zoning permit authorities. In county land use plans and zoning ordinances, specific areas within a jurisdiction are designated for one of a number of "allowable" uses. These designations include the type and

1 For counties or local jurisdictions that have not established comprehensive land use plans or zoning ordinances, existing land use patterns have been reviewed. This review covers all land crossed by construction and operation of the Applicant's preferred route and the route alternatives, but is meant to supplement the review of comprehensive plans and zoning ordinances, especially for areas with no zoning information.

intensity of allowable use. Most, but not all, of the counties that are crossed by the pipeline routes have established land use plans or zoning ordinances. Local governments can further regulate the types of development or activity that can occur in special use areas called overlay districts, for example shoreland and floodplain[2] overlay districts that restrict development in floodways and near waterbodies. Minnesota also has 46 watershed districts,[3] which are local special-purpose units of government that manage water drainage and flow in the watershed in partnership with the state, counties, cities, and soil and water conservation districts.

A route permit from the Commission would supersede local government approvals including land use and zoning approvals (Minn. Stat. § 216G.02, Subd. 4); however, the Commission must consider the Project's compliance with local laws, plans, and ordinances when making a decision for the route permit (Minn. Stat. § 216G.02, Subd. 3[b][4]).

6.2.1.1.2 Methodology

The degree of compatibility with local land use plans and zoning ordinances, overlay districts, existing land use, and water resource management plans was evaluated by:

- Inventorying and reviewing existing comprehensive plans and zoning ordinances, including shoreland and floodplain ordinances and existing land uses for the counties crossed by the Applicant's preferred route and each of the route alternatives;
- Overlaying the Applicant's preferred route and route alternatives on zoning maps provided by counties and on existing land uses from the National Land Cover Database (NLCD) to measure:
  - Miles of each zone crossed by the route centerline, and
  - Acreage of each land use type within the construction work area and within the permanent right-of-way;
- Reviewing water resource management plans in watershed districts crossed by the Applicant's preferred route and route alternatives;
- Identifying the number of miles of each watershed district crossed by the each route's centerline; and
- Identifying those areas where the Applicant's preferred route or route alternatives were not consistent with or did not meet the requirements of existing local plans and zoning ordinances, overlay districts, or watershed districts.

No single one of the data sources considered above provides a complete indication of all relevant impacts to planning and zoning, but together the different data sources provide a reasonably comprehensive indication of the potential impacts. For example, while data on zoning designations can aid in a general assessment of compatibility, planning documents, including watershed district

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2 Floodplain maps produced by the Federal Emergency Management Agency (FEMA), known as Flood Insurance Rate Maps, are used to identify floodplain areas. Any development or activity proposed to occur within a floodplain must meet FEMA guidelines (structures flood-proofed to some level), and some activities are prohibited.

3 Watershed Districts were authorized by the Minnesota Legislature in 1955 when it passed the Watershed Act, Minnesota Statute 103D

plans, can provide additional information about management that is needed in order to understand the long-term potential for impacts.

Furthermore, the quantitative information from these data sources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, of miles and acres of land use and zoning types crossed by the Project; however, a full understanding of the qualitative nature of impacts that could occur to different land use and zoning types is contained in the text of this section.

The ROI is comprised of counties and watershed districts that are crossed by the Applicant's preferred route and route alternatives. The ROI included four watershed districts and 21 counties, 19 of which have a comprehensive land use plan or other relevant land use ordinance, and 12 have a comprehensive plan and a specific development code or ordinance outlining land use and zoning. The specific assessment of compatibility of the pipeline with land use plans and zoning ordinances, overlay districts, and watershed district goals is focused on the land crossed by the centerline of the Applicant's preferred route or the route alternatives. The assessment of compatibility of the pipeline with current land use plans is focused on the land disturbed for construction and the land within the permanent right-of-way for each alternative.

Data for the analysis was obtained from county land use zoning GIS layers, county websites, Federal Emergency Management Agency (FEMA) flood maps, watershed district websites, the NLCD, and GIS data for the construction and operational footprint of the Applicant's preferred route and the route centerlines for the route alternatives supplied by the Applicant.

Land use and zoning designations and the miles of each zone or land type crossed were determined by overlaying each route's centerline on zoning information. Because the potential routes cross counties that have a wide variety of zoning designations, zoning designations were reviewed and grouped into standardized "land use zone" categories to allow for comparison. The potential routes will also cross Indian Reservations with their own codified zoning regulations. For example, RA-08 passes through the Fond du Lac Reservation in Carlton and St. Louis counties in Minnesota. Fond du Lac Ordinance #02-07 establishes a land use committee and designated zoning districts for their lands (Fond du Lac Reservation Business Committee 2007).

"Shoreland" areas were identified based on overlay districts provided by counties.[4] Where no zoning data were available "the open water land use" category from the NLCD was used to estimate shoreland areas. Floodplain areas were determined based on 100-year floodplain, as outlined in the FEMA flood maps. Impacts on floodplains are discussed in detail in Section 6.3.1.4. Existing land use and the acreage of each land use crossed were determined by overlaying each route's construction and operation footprint on spatial land use data (NLCD).

The analysis of the Applicant's preferred route includes the entire route: (1) the segment from the North Dakota-Minnesota border to Clearbrook, Minnesota; (2) the segment from Clearbrook to Carlton, Minnesota; and (3) the segment from Carlton to the Wisconsin border. Because the first and last segments are the same for each of the routes, the analysis for the alternatives to the Applicant's

[4] Shoreland designated as land located within 1,000 feet of the high water level of a lake, pond, or flowage, and land located within 300 feet of a river or stream or the landward extent of the floodplain, whichever is greater per Minn. Stat. § 103F.205, Subd. 4.

preferred route is focused on the segment from Clearbrook to Carlton, Minnesota, where the route alternatives diverge from the Applicant's preferred route.

6.2.1.2 Existing Conditions

6.2.1.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the land use and planning ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Table 6.2.1-1 lists the land use zones crossed by the Applicant's preferred route in each county where land use designations exist. The most common land use zone crossed by the Applicant's preferred route is agricultural land, followed by public/municipal land. A total of approximately 8 miles of shoreland would be crossed by Applicant's preferred route, all east of Clearbrook.

Table 6.2.1-2 lists the acreages of each land use type located within the construction (con) and operation (op) footprint of the Applicant's preferred route. The most common land use type present is agricultural.

Table 6.2.1-1. Land Use Zoning Categories Crossed by the Applicant's Preferred Route (miles)

Segment/County	Agriculture/ Forestry	Residential	Commercial	Industrial	Public/ Municipal	Conservation/ Recreation	Shoreland	Other
North Dakota Border to Clearbrook								
Kittson County[a]	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marshall County	NA	NA	NA	NA	NA	NA	NA	NA
Pennington County	NA	NA	NA	NA	NA	NA	NA	NA
Red Lake County	NA	NA	NA	NA	NA	NA	NA	NA
Polk County	NA	NA	NA	NA	NA	NA	NA	NA
Clearwater County	NA	NA	NA	NA	NA	NA	NA	NA
Subtotal	***15.4***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
Clearbrook to Carlton								
Clearwater County	NA	NA	NA	NA	NA	NA	NA	NA
Hubbard County	NA	NA	NA	NA	NA	NA	NA	NA
Wadena County	7.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Cass County	11.8	7.2	0.0	0.0	28.5	0.0	0.0	0.0
Crow Wing County[b]	0.0	1.9	0.0	0.0	2.6	0.0	0.4	0.0
Aitkin County	16.0	0.0	0.5	0.0	10.3	18.0	6.7	0.0
Carlton County	31.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	***66.2***	***9.1***	***0.5***	***0.0***	***41.4***	***18.0***	***7.4***	***0.0***

Table 6.2.1-1. Land Use Zoning Categories Crossed by the Applicant's Preferred Route (miles)

Segment/County	Agriculture/ Forestry	Residential	Commercial	Industrial	Public/ Municipal	Conservation/ Recreation	Shoreland	Other
Carlton to Wisconsin Border								
Carlton County	8.8	0.0	0.0	0.5	0.0	0.0	0.3	0.0
Subtotal	***8.8***	***0.0***	***0.0***	***0.5***	***0.0***	***0.0***	***0.3***	***0.0***
TOTAL	**90.5**	**9.1**	**0.5**	**0.5**	**41.4**	**18.0**	**7.7**	**0.0**

Sources: GIS zoning layers from Aitkin, Carlton, Cass, and Wadena counties.

[a] Estimates for Kittson County are not based on a GIS layer but on a review of the Land Use Ordinance.

[b] Estimates for Crow Wing County are not based on a GIS layer but on a review using the online GIS tool for Crow Wing County.

Notes:

Each county has a different zoning ordinance, and zones differ between the counties. Zoning categories in this table are an approximation of similar zones. The specific zones for each county that makes up each category are listed below:

Agriculture/Forestry = Wadena, General Agriculture, Transitional Agriculture, and Mixed Ag and Forestry; Cass, Agricultural/Forestry; Carlton, Agricultural/Forest Management and Agriculture/Rural Residential; Aitkin, Farm Residential.

Residential = Cass, Rural Residential 2.5 and Rural Residential 5; Crow Wing, Rural Residential – 10 and Rural Residential – 20; Wadena, Residential.

Commercial = Wadena, Highway Service Business District; Cass, Commercial.

Industrial = Carlton, Limited Industrial.

Public/Municipal = Cass, Public Land or within City Limits; Crow Wing, Public Lands; Aitkin, Public.

Conservation/Recreation = Aitkin, Open; Carlton, Commercial Recreation.

Shoreland = Wadena, shoreland overlay district; Crow Wing, shoreland District; Aitkin, shoreland; Carlton, shoreland.

Other = Cass, Unknown.

NA = Zoning data not available for this county.

Table 6.2.1-2. Land Use Types Crossed by the Applicant's Preferred Route (acres)

Segment/ Facility	Agricultural[a]		Developed[b]		Forested[c]		Open Land[d]		Open Water[e]		Wetlands[f]		Total	
	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Pipeline Segment														
North Dakota border to Clearbrook	1,285.5	552.9	63.3	28.8	57.0	26.6	34.1	15.8	3.7	2.3	68.8	35.2	1,512.5	661.7
Clearbrook to Carlton	561.6	251.6	94.0	45.5	1,446.5	631.0	307.7	151.0	6.4	3.8	490.6	254.2	2,906.8	1,337.1
Carlton to Wisconsin border	65.7	28.8	7.5	3.4	39.7	14.9	17.3	8.5	0.0	0.0	5.8	2.7	136.0	58.2
Subtotal	***1,912.8***	***833.3***	***164.8***	***77.7***	***1,543.2***	***672.5***	***359.1***	***175.4***	***10.2***	***6.1***	***565.2***	***292.0***	***4,555.2***	***2,057.0***
Other Facilities														
Additional temporary workspaces and pipe yards	447.6	0.0	45.4	0.0	116.4	0.0	55.7	0.0	2.5	0.0	36.6	0.0	704.2	0.0
Access roads	67.7	67.7	44.8	44.8	123.5	123.5	22.5	22.5	0.6	0.6	20.1	20.1	279.2	279.2
Mainline valves and pump stations	38.9	38.9	10.2	10.2	5.5	5.5	5.8	5.8	0.0	0.0	6.6	6.6	67.0	67.0
Subtotal	***554.2***	***106.6***	***100.4***	***55.0***	***245.4***	***129.0***	***83.9***	***28.2***	***3.1***	***0.6***	***63.3***	***26.7***	***1,050.4***	***346.2***
TOTAL	**2,466.9**	**939.9**	**265.3**	**132.7**	**1,788.6**	**801.5**	**443.1**	**203.6**	**13.2**	**6.7**	**628.5**	**318.7**	**5,605.6**	**2,403.2**

[a] Agricultural Land = NLCD land use types: Cultivated and Hay/Pasture.

[b] Developed Land = NLCD land use types: Developed, High Intensity; Developed, Med Intensity; Developed, Low Intensity; and Developed, Open Space.

[c] Forested Land = NLCD land use types: Deciduous Forest, Evergreen Forest, and Mixed Forest.

[d] Open Land = NLCD land use types: Barren Land, Herbaceous, and Scrub/Shrub.

[e] Open Water = NLCD land use types: Open Water.

[f] Wetlands = NLCD land use types: Woody Wetlands and Emergent Herbaceous Wetlands.

Enbridge-provided footprints: Con = construction work area, Op = permanent right-of-way.

The Applicant's preferred route would cross four watershed districts for a total of approximately 134 miles: the Middle-Snake-Tamarac Rivers, Red Lake, Two Rivers, and Wild Rice watershed districts (Table 6.2.1-3). These watershed districts are all located in northwestern/western Minnesota. Red Lake Watershed District is the primary watershed district crossed, including approximately 76 miles of the route.

6.2.1.2.2 Route Alternatives

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the land use and planning ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Table 6.2.1-4 lists the land use zones crossed by RA-03-AM, between Clearbrook and Carlton, in each county where land use designations exist. The most common land use zone crossed by RA-03AM is agriculture/forestry. A total of approximately 4 miles of shoreland would be crossed by RA-03AM.

Table 6.2.1-5 lists the acreages of each land use type located within the construction (con) and operation (op) footprint of RA-03-AM. The most common land type present is agricultural.

Table 6.2.1-6 lists the miles of each watershed district crossed by RA-03AM. The route alternative would cross through approximately 19 miles of the Red Lake Watershed District and approximately 5 miles of the Wild Rice Watershed District.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the land use and planning ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Table 6.2.1-7 lists the land use zones crossed by RA-06, between Clearbrook and Carlton, in each county where land use designations exist. The most common land use zone crossed by RA-06 is public/municipal land, followed closely by agriculture/forestry land. RA-06 would cross approximately 1 mile of shoreland.

Table 6.2.1-8 lists the acreages of the land use types located within the construction (con) and operation (op) footprint of RA-06. The most common land type present is forest. Additionally, RA-06 would cross 52 miles of the Red Lake Watershed District.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the land use and planning ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing

Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

RA-07 involves removal of the existing Line 3 and replacement in the existing trench, which is located entirely in the Enbridge Mainline corridor right-of-way. Enbridge has easements for the land in this corridor, and past, current, and foreseeable future land use in this corridor is pipeline right-of-way.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the land use and planning ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

The most common zone type crossed by RA-08 is public/municipal land (Table 6.2.1-9). The next most common zone type is agriculture/forestry land. RA-08 would cross 0.6 mile of shoreland.

Table 6.2.1-10 lists the acreages of the land use types located within the construction (con) and operation (op) footprint of RA-08. The most common land use type crossed is wetlands. Additionally, RA-08 would cross through 13 miles of the Red Lake Watershed District.

Table 6.2.1-3. Watershed Districts Crossed by the Applicant's Preferred Route (miles)

Segment	Middle-Snake-Tamarac Rivers Watershed District	Red Lake Watershed District	Two Rivers Watershed District	Wild Rice Watershed District	Total
North Dakota border to Clearbrook	36.6	56.4	16.1	0.0	109.1
Clearbrook to Carlton	0.0	19.6	0.0	5.4	25.0
Carlton to Wisconsin border	0.0	0.0	0.0	0.0	0.0
TOTAL	**36.6**	**76.0**	**16.1**	**5.4**	**134.1**

Table 6.2.1-4. Land Use Zoning Categories Crossed by Route Alternative RA-03AM (miles)

County	Agriculture/ Forestry	Residential	Commercial	Industrial	Public/ Municipal	Conservation/ Recreation	Shoreland	Other
Clearwater County	NA	NA	NA	NA	NA	NA	NA	NA
Hubbard County	NA	NA	NA	NA	NA	NA	NA	NA
Wadena County	33.9	0.1	0.5	0.0	0.0	0.0	1.3	0.0
Todd County	10.3	1.6	0.3	0.0	0.0	0.0	0.5	0.0
Morrison County	43.7	0.5	0.0	0.3	0.0	0.4	1.8	0.0
Benton County	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mille Lacs County	13.5	0.0	0.0	0.0	0.9	1.2	0.0	0.0
Kanabec County	NA	NA	NA	NA	NA	NA	NA	NA
Pine County	NA	NA	NA	NA	NA	NA	NA	NA
Carlton County	23.9	0.0	0.4	0.1	0.0	0.1	0.0	0.0
TOTAL	**130.8**	**2.2**	**1.2**	**0.4**	**0.9**	**1.7**	**3.7**	**0.0**

Sources: GIS Zoning layers from Benton, Carlton, Mille Lacs, Morrison, Todd, and Wadena counties.

Notes:

Each county has a different zoning ordinance, and zones differ between the counties. Zoning categories in this table are an approximation of similar zones. The specific zones for each county that make up each category are listed below:

Agriculture/Forestry = Wadena, General Agriculture, Transitional Agriculture, and Mixed Ag and Forestry; Carlton, Agricultural/Forest Management and Agriculture/Rural Residential; Todd, Agriculture/Forestry – 1 and Agriculture/Forestry – 2; Morrison, Agriculture; Mille Lacs, Agricultural Residential.

Residential = Wadena, Residential; Todd, Residential – 2 and Residential – 10; Morrison, Residential and Rural Residential; Benton, Rural Service District.

Commercial = Wadena, Highway Service Business District; Todd, Commercial.

Industrial = Carlton, Limited Industrial; Morrison, Manufacturing – Industrial.

Public/Municipal = Mille Lacs, Bock and Milaca.

Conservation/Recreation = Morrison, Mississippi Headwaters; Mille Lacs, Wild and Scenic River District – Recreational and West Branch of Rum River – Transition District; Carlton, Commercial Recreation.

Shoreland = Wadena, shoreland overlay district; Carlton, shoreland; Todd, shoreland; Morrison, shoreland.

NA = Zoning data are not available for this county.

Table 6.2.1-5. Land Use Types Crossed by Route Alternative RA-03AM (Clearbrook to Carlton) (acres)

Land Use Type	Construction	Operations
Agricultural[a]	1,611.1	676.8
Developed[b]	385.8	157.8
Forested[c]	1,137.7	470.5
Open Land[d]	339.6	143.5
Open Water[e]	17.0	7.1
Wetlands[f]	509.1	211.2
TOTAL	**4,000.4**	**1,666.9**

Notes:

[a] Agricultural Land = NLCD land use types: Cultivated and Hay/Pasture.

[b] Developed Land = NLCD land use types: Developed, High Intensity; Developed, Med Intensity; Developed, Low Intensity; and Developed, Open Space.

[c] Forested Land = NLCD land use types: Deciduous Forest, Evergreen Forest, and Mixed Forest.

[d] Open Land = NLCD land use types: Barren Land, Herbaceous, and Scrub/Shrub.

[e] Open Water = NLCD land use types: Open Water.

[f] Wetlands = NLCD land use types: Woody Wetlands and Emergent Herbaceous Wetlands.

Construction = 120-foot-wide construction footprint, Operations = 50-foot-wide permanent right-of-way.

Table 6.2.1-6. Watershed Districts Crossed by Route Alternative RA-03AM (miles)

Route Segment	Middle-Snake-Tamarac Rivers Watershed District	Red Lake Watershed District	Two Rivers Watershed District	Wild Rice Watershed District	TOTAL
Clearbrook to Carlton	0.0	19.4	0.0	5.4	24.8

Table 6.2.1-7. Land Use Zoning Categories Crossed by Route Alternative RA-06 (miles)

County	Agriculture/ Forestry	Residential	Commercial	Industrial	Public/ Municipal	Conservation/ Recreation	Shoreland	Other
Clearwater County	NA	NA	NA	NA	NA	NA	NA	NA
Beltrami County	NA	NA	NA	NA	NA	NA	NA	NA
Itasca County	31.1	0.2	0.0	10.0	63.3	0.0	0.0	3.4
Aitkin County	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
St. Louis County	18.0	0.0	0.0	0.0	0.0	0.0	0.7	6.0
Carlton County	14.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
TOTAL	**63.1**	**0.2**	**0.0**	**10.0**	**63.3**	**0.8**	**1.3**	**9.4**

Sources: GIS Zoning layers from Aitkin, Carlton, St. Louis, and Itasca counties.

Notes:

Each county has a different zoning ordinance, and zones differ between the counties. Zoning categories in this table are an approximation of similar zones. The specific zones for each county that make up each category are listed below:

Agriculture/Forestry = Carlton, Agricultural/Forest Management and Agriculture/Rural Residential; Aitkin, Farm Residential; Itasca, Farm Residential; St. Louis, Forest Agriculture Management.

Residential = Beltrami, Rural, Moderate Density Residential, Multiple Family, Suburban Residential (Sewered), and Suburban Residential (Unsewered).

Commercial = Beltrami, Low Density Commercial.

Industrial = Carlton, Limited Industrial; Itasca, Light Industrial/Commercial and Industrial.

Public/Municipal = Aitkin, Public; Itasca, Municipal and Public.

Conservation/Recreation = Aitkin, Open; Carlton, Commercial Recreation; Beltrami, Conservation.

Shoreland = Aitkin, Shoreland; Carlton, Shoreland; St. Louis, Shoreland Mixed Use.

Other = Itasca (blank); St. Louis, Multiple Use Non-Shoreland and Non-Jurisdiction Area.

NA = Zoning data not available for this county.

Table 6.2.1-8. Land Use Types Crossed by Route Alternative RA-06 (Clearbrook to Carlton) (acres)

Land Use Type	Construction	Operations
Agricultural[a]	256.7	107.4
Developed[b]	65.4	26.4
Forested[c]	1,107.3	460.9
Open Land[d]	354.2	148.6
Open Water[e]	81.8	33.7
Wetlands[f]	996.3	415.3
TOTAL	2,861.8	1,192.4

[a] Agricultural Land = NLCD land use types: Cultivated and Hay/Pasture.

[b] Developed Land = NLCD land use types: Developed, High Intensity; Developed, Med Intensity; Developed, Low Intensity; and Developed, Open Space.

[c] Forested Land = NLCD land use types: Deciduous Forest, Evergreen Forest, and Mixed Forest.

[d] Open Land = NLCD land use types: Barren Land, Herbaceous, and Scrub/Shrub.

[e] Open Water = NLCD land use types: Open Water.

[f] Wetlands = NLCD land use types: Woody Wetlands and Emergent Herbaceous Wetlands.

Construction = 120-foot-wide construction footprint, Operations = 50-foot-wide permanent right-of-way.

Table 6.2.1-9. Land Use Zoning Categories Crossed by Route Alternative RA-08 (miles)

County	Agriculture/ Forestry	Residential	Commercial	Industrial	Public / Municipal	Conservation/ Recreation	Shoreland	Other
Clearwater County	NA	NA	NA	NA	NA	NA	NA	NA
Beltrami County	0.0	4.6	0.6	0.0	0.0	0.3	0.0	0.0
Hubbard County	NA	NA	NA	NA	NA	NA	NA	NA
Cass County	2.1	1.9	0.0	0.0	30.3	0.0	0.0	0.0
Itasca County	20.4	0.5	0.0	0.5	23.6	0.0	0.0	1.1
Aitkin County	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.0
St. Louis County	16.9	0.0	0.0	0.0	0.0	0.0	0.0	5.8
Carlton County	13.3	0.0	0.0	0.4	0.0	0.0	0.6	0.0
TOTAL	**52.7**	**7.0**	**0.6**	**1.0**	**58.5**	**0.3**	**0.6**	**6.8**

Sources: GIS Zoning layers from Aitkin, Beltrami, Carlton, Cass, Itasca, and St. Louis counties.

Notes:

Beltrami County zoning data cover only the Greater Bemidji Area.

Each county has a different zoning ordinance, and zones differ between the counties. Zoning categories in this table are an approximation of similar zones. The specific zones for each county that make up each category are listed below:

Agriculture/Forestry = Cass, Agricultural/Forestry; Carlton, Agricultural/Forest Management and Agriculture/Rural Residential; Aitkin, Farm Residential; Itasca, Farm Residential; St. Louis, Forest Agriculture Management.

Residential = Cass, Rural Residential 2.5 and Rural Residential 5; Itasca, Rural Residential; Beltrami, Rural, Moderate Density Residential, Multiple Family, Suburban Residential (Sewered), and Suburban Residential (Unsewered).

Commercial = Beltrami, Low Density Commercial; Cass, Commercial.

Industrial = Carlton, Limited Industrial; Itasca, Light Industrial/Commercial and Industrial.

Public/Municipal = Cass, Public Land or within City Limits; Aitkin, Public; Itasca, Municipal and Public.

Conservation/Recreation = Aitkin, Open; Carlton, Commercial Recreation; Beltrami, Conservation.

Shoreland = Aitkin, Shoreland; Carlton, Shoreland; St. Louis, Shoreland Mixed Use.

Other = Itasca (blank); St. Louis, Multiple Use Non-Shoreland and Non-Jurisdiction Area; Cass, Unknown.

NA = Zoning data not available for this county.

Table 6.2.1-10. Land Use Types Crossed by Route Alternative RA-08 (Clearbrook to Carlton) (acres)

Land Use Type	Construction	Operation
Agricultural[a]	335.6	141.4
Developed[b]	86.3	35.2
Forested[c]	772.8	319.8
Open land[d]	207.9	87.4
Open water[e]	25.3	10.3
Wetlands[f]	969.7	404.9
TOTAL	**2,397.6**	**999.0**

[a] Agricultural Land = NLCD land use types: Cultivated and Hay/Pasture.

[b] Developed Land = NLCD land use types: Developed, High Intensity; Developed, Med Intensity; Developed, Low Intensity; and Developed, Open Space.

[c] Forested Land = NLCD land use types: Deciduous Forest, Evergreen Forest, and Mixed Forest.

[d] Open Land = NLCD land use types: Barren Land, Herbaceous, and Scrub/Shrub.

[e] Open Water = NLCD land use types: Open Water.

[f] Wetlands = NLCD land use types: Woody Wetlands and Emergent Herbaceous Wetlands.

Construction = 120-foot-wide construction footprint, Operation = 50-foot-wide permanent right-of-way.

6.2.1.3 Impact Assessment

6.2.1.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the land use and planning ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Compatibility with Comprehensive Plans and Zoning Ordinances

Review of the relevant comprehensive plans and zoning ordinances found that pipelines are not listed as an allowed use for any of the zones that would be crossed by the Applicant's preferred route or the route alternatives.

Agriculture/Forestry

The Applicant's preferred route crosses approximately 91 miles of land zoned as agriculture/forestry in Kittson, Wadena, Cass, Aitkin, and Carlton counties (Table 6.2.1-1). A typical goal associated with this zone is to preserve the resource, whether farmland or forested land. Preserving farmland in its designated use prevents encroachment of development that could remove the farmland from production. Preserving forestry land could fulfill many goals including timber production, recreation, habitat protection, and even water quality. Usually only limited residential development is permitted in these zones. Construction of an oil pipeline would be incompatible with some of these goals, either temporarily or long-term.

Impacts on agricultural land would be temporary; a growing season in the construction footprint would be lost, after which the land would revert to agricultural use, resulting in minor temporary impacts. For forested land, however, impacts would be greater; trees cleared from construction work areas would take a long time (up to many decades in some cases) to regenerate to preexisting conditions. Impacts on forested land uses would be minor to major and long-term for land zoned as forestry in the temporary construction areas and major and permanent for land in the permanent right-of-way. Impacts on agricultural and forestry land are also discussed in Sections 6.3.3 and 6.5.1.

Residential

A total of approximately 9 miles of land zoned as residential would be crossed by the Applicant's preferred route in Cass and Crow Wing counties (Table 6.2.1-1). Two primary goals are associated with residential land: to provide an appropriate place to live and to prevent incompatible/nuisance development. Variations in land zoned as residential may dictate the minimum lot size and dwelling types allowed, which aid planners to regulate population density. Specific zones the Applicant's preferred route would cross are Rural Residential 2.5 and Rural Residential 5 in Cass County, and Rural Residential 10 and Rural Residential 20 in Crow Wing County. (The numbers in the zone name represent the minimum lot size in acres; so the lot sizes for a single residence would be 2.5 acres, 5 acres, 10 acres, or 20 acres, respectively.) Impacts on land zoned as residential would be temporary for areas outside the permanent right-of-way, because construction work areas would be restricted from development for a short period of time since construction moves through an area relatively quickly, after which these areas would be restored, and no further restrictions on development would be in place. Areas within the permanent right-of-way would be permanently restricted from development, and this would subtract from the land available for residential use. The large lot sizes would likely have adequate areas that could still be developed for residential use, resulting in minor and permanent impacts on land zoned as residential.

Commercial

The Applicant's preferred route crosses 0.5 mile of land zoned for commercial use in Aitkin County. The goal of commercial land is to provide areas for stores and businesses. Construction near stores and businesses could temporarily interrupt this use by restricting access to businesses or parking areas and creating extra traffic in the area. Noise and dust also could be a nuisance to businesses. The Applicant would cross all paved roads without disturbing the surface, which would help to maintain access and traffic flows (see Section 6.2.5). The Applicant also would use dust and noise suppression when possible (see Sections 6.3.7 and 6.2.2, respectively). With implementation of the Applicant-proposed measures, the impacts on commercial-zoned land from construction would be minor and temporary. Land in the permanent right-of-way would be permanently restricted from commercial development and would reduce the overall amount of commercial-zoned land available. Impacts would be minor because of the small amount of commercial land to be crossed and the reduction of impacts from the Applicant-proposed measures. Impacts would be permanent because after construction, the land within the permanent right-of-way would be restricted from development for the life of the Project.

Industrial

The Applicant's preferred route crosses 0.5 mile of industrial land in Carlton County. An industrial zone is intended for manufacturing or other production facilities and these areas typically require major transportation routes and/or appropriate access to handle the inflow of materials and the outflow of products. Construction of a pipeline in industrial areas could lead to traffic interruptions which could affect the facilities in this zone. However, the Applicant's proposal to bore underneath or use horizontal directional drilling (HDD) to drill underneath paved roads would prevent traffic and associated industrial disruptions (see Section 6.2.5). With implementation of the Applicant-proposed measures, impacts on industrial land outside the permanent right-of-way would be negligible to minor and temporary. Impacts would be negligible to minor because of the small amount of industrial land to be crossed and the reduction of impacts from the Applicant-proposed measures. Impacts would be temporary, because after construction areas outside the permanent right-of-way would not be restricted from development. Areas within the permanent right-of-way would be restricted from any development. This would be a minor impact, because of the small amount of land affected, but it would be permanent because no development in the right-of-way would be permitted for the life of the Project.

Public/Municipal

Public and municipal land can have many different goals, depending on the specific land type, but typically this land is to be used for public benefit. Development on land zoned as public/municipal typically requires additional approvals outside of a zoning permit. These additional approvals and the specific goals of public lands are further discussed in Section 6.3.6.

The Applicant's preferred route crosses approximately 41 miles of public/municipal land in Cass, Crow Wing, and Aitkin counties. Most of this land is state forest land administered by Minnesota Department of Natural Resources (Minnesota DNR). Construction in public or municipal land would disrupt uses in this zone. The impact would be minor to major and temporary to permanent depending on the specific land type and ownership. Goals and impacts would vary across the different public land types and these are discussed further in Section 6.3.6.

Conservation/Recreation

The Applicant's preferred route would cross 18 miles of land zoned as conservation/recreation in Aitkin County. The specific zone name in Aitkin County is "open land;" this land use is applied to areas of floodplains, swamp lands, and other areas unsuitable or unsafe for development. The use of the area as open land would be temporarily affected by construction activities, such as clearing vegetation, grading the land, and trenching for placement of the pipe. These impacts would be minor and temporary. Following construction and restoration, impacts would remain minor because the pipeline would be buried and would not affect surface use.

Shoreland

The Applicant's preferred route would cross approximately 8 miles of land zoned as shoreland in Wadena, Crow Wing, Aitkin, and Carlton counties. The Shoreland zone is based on a special overlay district designed to limit and regulate development near waterbodies. The goals and impacts of overlay districts are further discussed in the overlay districts section below. Construction in the Shoreland zone would not meet the goal of limiting development near waterways, and removal of vegetation from the construction areas would be a minor temporary impact.

<u>Compatibility with Overlay Districts</u>

The goals of the shoreland overlay districts are to "provide guidance for the wise development of shorelands of public waters and, thus, preserve and enhance the quality of surface waters; preserve the economic and natural environmental values of shorelands; and provide for the wise use of water and related land resources" (Minn. Stat. § 103F.201). Conditions that are placed on construction in shoreland areas may include maintenance of a buffer of vegetation between construction and the edge of waterbodies, or other requirements to preserve vegetation and trees where possible. In areas where the Applicant's preferred route would cross waterways, pipeline construction may require clearing trees and vegetation from the edge of the water. A total of 192 surface waters would be crossed by the Applicant's preferred route (see Section 6.3.1.2).

As discussed further in Section 6.3.1.2, impacts on some waterbodies would be reduced through the use of bore crossings and HDD crossings where vegetation buffers and streambanks could be left intact. Generally, construction in the shoreland area and across streambanks is not compatible with the goals of shoreland overlay districts and would be a minor permanent impact. Overall, the impacts in shoreland areas would be minor because of the small amount of land along waterbodies that would be affected and although trees would not be allowed, other vegetation would be planted. The impacts would be permanent because trees and woody vegetation would not be allowed to regrow in the permanent right-of-way. Impacts in shoreland areas are further discussed in Sections 6.3.1.2, 6.3.1.3, and 6.3.1.4.

Floodplain overlay districts are designated to reduce the quantity of development in floodplains and restrict the type of development to reduce losses from flooding and keep floodways clear for the movement of flood waters. Pipelines are generally a conditional use permitted in floodplain overlay districts, although not all floodplain ordinances specifically list them as a conditional use. The conditions for construction may include protecting spoil piles from erosion and storing materials and equipment outside the floodplain if it could not be moved in the time available after a flood warning. Construction activities would temporarily alter floodplain topography, resulting in minor alterations to water flows in the event of a flood in the area, but are unlikely to block or restrict flows, reduce the area within a floodplain that carries floodwaters, or increase flood elevations upstream (see Section 6.3.1.4 for further information). Thus, the uses of floodplains in the floodplain overlay districts would not likely change due to pipeline construction, resulting in minor and temporary impacts. Floodplains are further discussed in Section 6.3.1.4.

<u>Compatibility with Existing Land Use</u>

Construction of the Applicant's preferred route would affect a little over 5,600 acres of land in Minnesota. Approximately 2,467 acres of the total affected acreage would be agricultural land, and approximately 1,789 acres would be forested land. Developed land, open land, wetlands, and open water would account for approximately 1,350 acres of impacts.

Agricultural

Compatibility with agricultural land is discussed for the agriculture/forestry zone above. The temporary removal of land from agricultural production during construction would be a minor, temporary impact because agricultural land would lose a growing season in the construction footprint, after which the land would be returned to agricultural land use.

Developed Land

As mentioned in the discussions above for residential, commercial, and industrial zones, construction activities in developed lands may be incompatible with existing uses in developed land. With implementation of the Applicant-proposed measures described for those zones, impacts from construction in developed areas would be temporary and minor, because of the limited area that would be affected by construction and the short construction period. However, land in the permanent right-of-way would be restricted from future development, which would be a minor permanent impact.

Forested Land

Compatibility of the Applicant's preferred route with forested land is discussed above for the agriculture/forestry zone. Forested land also may fall under the public/municipal zone, especially for areas of state or national forests. Construction of the Applicant's preferred route is generally not compatible with forested land, because of the requirement to remove trees from construction work areas and the permanent right-of-way. The 1,789 acres of forested land affected would be a major long-term impact for areas in the temporary construction areas and would be major and permanent for areas within the permanent right-of-way.

Open Land

Open land may correspond most closely with the conservation/recreation zone type. Construction activities in open land would be incompatible temporarily with goals of preserving undeveloped natural areas or scenic resources and enhancing recreation opportunities. Construction of the pipeline would temporarily disturb approximately 359 acres of open land until restoration is complete. This would be a minor, temporary impact because of the small change to the land area that would be affected; after construction, open lands would be restored, and the buried pipeline would not affect surface use.

Open Water

Typically, the open water land use category is not a planned zone. From a planning and zoning perspective, pipeline construction in these areas would be compatible with the open water land use category. During construction in waterways, minor temporary impacts could occur to surface waters from sedimentation and potential spills of small quantities of hazardous materials used during construction, as discussed in Section 6.3.1.2. However, Applicant-proposed measures would be implemented to reduce such impacts, which would be temporary until construction is complete and the waterbody revegetated.

Wetlands

Wetlands most closely correspond with the Shoreland zone in local comprehensive plans. During construction of the Applicant's preferred route, construction activities in wetlands would not be compatible with preservation goals and would be a minor to major impact, which may be a temporary to long-term impact. After construction, the wetlands in some cases would revert to their original state; however, some wetlands, such as forested and scrub/shrub wetlands would be cleared of woody vegetation and would remain altered. Wetlands are discussed further in Section 6.3.1.3.

Compatibility with Watershed District Goals

The goals of watershed districts are broad and far reaching, involving all aspects of water within their districts, including but not limited to improving water quality, managing drainage systems, providing flood protection, enhancing recreational opportunities, and providing for wildlife habitat. The compatibility of construction of the Applicant's preferred route with these goals is largely related to the potential impacts of construction on water resources in the watershed. During construction of a pipeline, removal of vegetation in construction work areas and working in and around wetlands and waterbodies may result in impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water. Removal of vegetation in and around waterbodies could eliminate or reduce some of these benefits (and associated watershed district goals), and it may reduce the scenic integrity of shoreland areas. The Applicant has proposed measures to limit impacts on water resources as described in the Environmental Protection Plan (Appendix E), including temporary erosion control measures and BMPs for waterbody crossings as described in Section 6.3.1.2. The Applicant-proposed measures would reduce construction impacts on water resources, which would help to meet the watershed districts' goals of conserving watershed functions and limiting impacts on water quality from development. With implementation of Applicant-proposed measures, pipeline construction would result in minor, temporary impacts on waterbodies and watershed district goals.

Operations Impacts

<u>Compatibility with Comprehensive Plans and Zoning Ordinances</u>

County and local comprehensive plans generally have long-term goals. While short-term impacts from construction may temporarily interrupt desired land uses, long-term effects of pipeline operation may represent greater impacts, as detailed below.

Agriculture/Forestry

Operation of the Applicant's preferred route would be compatible with the goal of preserving agricultural land because farming would be permitted in the right-of-way after construction, resulting in no compatibility impacts on land zoned as agricultural during operations. However, the goal of preserving forested land would not be compatible with operation of the Applicant's preferred route because no trees would be allowed within the permanent right-of-way, resulting in a loss of forested land and an impact that would be major and permanent.

Residential

The presence of a buried oil pipeline in residential areas would partially limit development of residential land during operation, as no structures would be permitted over the permanent right-of-way. However, these residential areas are zoned for development on large land parcels (2.5- to 10-acre plots), and land outside the permanent right-of-way would be available for such development. The loss of a 50-foot-wide permanent right-of-way corridor to residential development would represent a minor, permanent impact on residential land use.

Commercial

The presence of a buried oil pipeline would limit development of commercial land within the permanent right-of-way during operation, because no structures would be permitted for development in this area. However, only a small amount of land that is zoned as commercial (0.5 mile) is crossed by the permanent right-of-way, and land outside the permanent right-of-way would be available for commercial development. The loss of a 50-foot-wide permanent right-of-way corridor to commercial development would represent a minor, permanent impact on commercial use.

Industrial

The presence of a buried oil pipeline would partially limit development of industrial land within the permanent right-of-way during operation, because no structures would be permitted for development in this area. However, only a small amount of land that is zoned as industrial (0.5 mile) is crossed by the permanent right-of-way, and land outside the permanent right-of-way would be available for industrial development. The loss of a 50-foot-wide permanent right-of-way corridor to industrial development would represent a minor, permanent impact on commercial use.

Public/Municipal

The majority of land zoned for public/municipal use crossed by the Applicant's preferred route is state forest land, as described above. This land does not fall under local planning and zoning authority, as it is controlled by Minnesota State. The loss of forest from clearing trees would be a major permanent impact within the permanent right-of-way, which would be maintained free of trees and woody vegetation. For purposes of local government planning and zoning, the land would remain public; however, goals and impacts would vary across the different public land types, and these are discussed further in Section 6.3.6. Other public uses may be permitted to resume after construction is complete.

Conservation/Recreation

Operation of the Applicant's preferred route in areas zoned for conservation/recreation would be compatible with recreation in that the permanent right-of-way would be revegetated and would revert to its original use. The only conservation/recreation-zoned land that would be crossed by the Applicant's preferred route would be in Aitkin County. The specific zone in Aitkin County is the open land zone and pipeline construction in open land is generally compatible because the pipeline would be buried and out of sight. Land in this land use zone used for conservation purposes, however, would be periodically disturbed by maintenance mowing in the permanent right-of-way, which would result in minor, permanent impacts.

Shoreland

During operations, the Applicant's preferred route would largely be compatible with shoreland goals, since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions, with the exception of the permanent right-of-way at the water's edge, where trees would not be allowed to grow along the banks. The goal of preserving vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation that would preserve other goals of water quality and bank stability. Operation of the Applicant's preferred route in shoreland areas would be a minor permanent impact on shoreland goals.

Compatibility with Overlay Districts

The Applicant's preferred route would largely be compatible with shoreland overlay district goals since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions. Where the pipeline crosses waterbodies, the permanent right-of-way abutting the water's edge would be maintained clear of trees and large woody vegetation, and the goal of preserving buffers and shade trees along waterbodies would be partially prevented. However, the permanent right-of-way would be planted with other vegetation that would preserve other goals of maintaining water quality and bank stability. Impacts and mitigation associated with water resources are further discussed in Section 6.3.1. Operation of the Applicant's preferred route in shoreland overlay districts would be a minor, permanent impact on overlay district goals.

Because the pipeline would be buried underground, and the ground cover conditions would be restored, the Applicant's preferred route would be compatible with floodplain overlay district requirements during operation. The buried pipeline would not be an obstruction in the floodplain and would not affect the water channel or flood levels.

Compatibility with Existing Land Use

During operation, the permanent footprint of the Applicant's preferred route would cover approximately 940 acres of agricultural land, 802 acres of forested land, 319 acres of wetlands, 204 acres of open land, 133 acres of developed land, and 7 acres of open water. This analysis reviews the compatibility of the Applicant's preferred route in Minnesota with these adjacent land uses during operation. The reason for this analysis is to supplement the review of compliance with zoning regulations. For areas without zoning information, however, the analysis covers all of the land crossed by the Applicant's preferred route, including land with zoning information.

Agricultural

Operation of the Applicant's preferred route would be compatible with the use of agricultural land because farming would occur in the right-of-way after construction, resulting in no compatibility impacts on land used for agriculture during operations.

Developed Land

The presence of a buried oil pipeline in developed areas would partially limit residential, commercial, and industrial development in these areas during operation, as no structures would be permitted over the permanent right-of-way. However, only a small amount of land is designated as developed (approximately 133 acres) within the permanent right-of-way, and land outside the permanent right-of-way would be available for development. The loss of a 50-foot-wide permanent right-of-way corridor to residential, commercial, and industrial development would represent a minor, permanent impact on developed land use.

Forested Land

Forested land also may fall under the public/municipal zone, especially for areas of state or national forests. Operation of the Applicant's preferred route would be least compatible with preservation of forested land, because trees would not be permitted in the permanent right-of-way. The loss of approximately 802 acres of forest land from clearing trees would be a major, permanent impact within the permanent right-of-way, which would be maintained free of trees and woody vegetation.

Open Land

Open land may correspond most closely with the conservation/recreation zone type. Maintenance vegetation mowing in the permanent right-of-way would be incompatible with goals of preserving undeveloped natural areas, but would be consistent with goals of providing public use of open areas. For this analysis, the approximately 204 acres of open land that would be maintained during operations is considered to be a minor permanent impact, as these areas could continue to be used as open space after restoration is complete.

Open Water

Typically, the open water land use category is not a planned zone. From a planning and zoning perspective, pipeline operation in open water areas would be compatible with the open water land use category, because open waters crossed by the Applicant's preferred route would remain in their current use, and there would be no impacts.

Wetlands

Wetlands would most closely correspond with the Shoreland zone in local comprehensive plans. Because the pipeline would be buried beneath waterbodies, operations of the Applicant's preferred route would generally not affect wetland functions, with the exception of the permanent right-of-way where trees and large woody vegetation would not be allowed to grow. Preservation of wetland vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation that would preserve other wetland functions, such as water quality and bank stability. Operation of the Applicant's preferred route in wetland areas would be minor and long-term, as wetlands would generally return to functionality. Wetlands are further discussed in Section 6.3.1.3.

Compatibility with Watershed District Goals

During operation of the Applicant's preferred route, the pipeline would be compatible with watershed district goals, such as improving water quality, managing drainage systems, providing flood protection, enhancing recreational opportunities, and providing for wildlife habitat. During operation of a pipeline, maintenance of vegetation in the permanent right-of-way in and around wetlands and waterbodies may result in minor impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water. Removal of large woody vegetation in and around waterbodies could reduce some of these benefits (and associated watershed district goals) and may reduce the scenic integrity of shoreland areas, although other vegetation would be retained which would provide many of these benefits. Generally, operation of an oil pipeline in wetland areas would be consistent with wetland land uses, resulting in minor, temporary impacts.

6.2.1.3.2 Route Alternatives (from Clearbrook to Carlton)

Table 6.2.1-11 presents the amount and categories of land zoned for specific uses for the Applicant's preferred route and route alternatives from Clearbrook to Carlton.

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the land use and planning ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Compatibility with Comprehensive Plans and Zoning Ordinances

The types of land use impacts and the compatibility of pipeline construction within land use zones for RA-03AM would be the same as those discussed above for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1-11.

Agriculture/Forestry. Impacts on agricultural land would consist of prevention of crops on agricultural land for one growing season in the construction work areas, after which the land would revert to agricultural use, resulting in minor temporary impacts. For forested land, impacts would be greater, as trees would be cleared from construction work areas and would take a long period of time (up to many decades in some cases) to regenerate to preexisting conditions, resulting in minor to major and long-term impacts on forestry land in construction workspace areas and major permanent impacts in the permanent right-of-way.

Residential. Impacts on approximately 2 miles of land zoned as residential would be temporary for areas outside the permanent right-of-way, because construction work areas would be restricted from development for a short period of time since construction moves through an area relatively quickly, after which these areas would be restored, and no further restrictions on development would be in place. Areas within the permanent right-of-way would be permanently restricted from development; this would subtract from the land available for residential use, resulting in minor and permanent impacts on land zoned as residential.

Table 6.2.1-11. Amount and Types of Land Zoning and Uses for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Impact	Applicant's Preferred Route	Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
Construction Impacts					
Comprehensive Plans and Zoning Ordinances (miles of zoned land in construction work areas)					
Agriculture/forestry	66.2	**130.8**	63.1	58.4	52.7
Residential	9.1	2.2	0.2	**9.3**	7.0
Commercial	0.5	**1.2**	0.0	0.7	0.6
Industrial	0.0	0.3	**10.0**	1.0	0.9
Public/municipal	41.4	0.9	**63.3**	52.7	58.5
Conservation/recreation	**18.0**	1.7	0.8	1.1	0.3
Shoreland	**7.4**	3.7	1.3	1.3	0.6
Other	0.0	0.0	**9.4**	6.8	6.8
Watershed Districts Crossed (miles of land in construction work areas)					
Watershed districts crossed	25.0	24.8	**52.4**	15.6	13.3
Existing Land Uses (acres of land in construction work spaces)					
Agricultural	561.6	**1,611.1**	256.7	401.8	335.6
Developed	94.0	**385.8**	65.4	272.9	86.3
Forested	**1,446.5**	1,137.7	1,107.3	1,146.4	772.8
Open land	307.7	339.6	354.2	**692.0**	207.9
Open water	6.4	17.0	**81.8**	34.5	25.3
Wetlands	490.6	509.1	996.3	**1,592.0**	969.7

Table 6.2.1-11. Amount and Types of Land Zoning and Uses for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Impact	Applicant's Preferred Route	Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
Operations Impacts					
Existing Land Uses (acres of land in permanent right-of-way)					
Agricultural	251.6	**676.8**	107.4	111.5	141.4
Developed	45.5	**157.8**	26.4	69.5	35.2
Forested	**631.0**	470.5	460.9	242.0	319.8
Open land	151.0	143.5	148.6	**193.6**	87.4
Open water	3.8	7.1	**33.7**	9.6	10.3
Wetlands	254.2	211.2	**415.3**	390.3	404.9

Note:

Bold font indicates the route option with the greatest amount of acres or miles for the zone or land area crossed.

Commercial. Construction near stores and businesses could temporarily interrupt commercial land uses by restricting access to businesses or parking areas, creating extra traffic in the area and creating noise and dust nuisances. However, with implementation of the Applicant-proposed measures, as described for the Applicant's preferred route, the impacts on commercial-zoned land from construction would be minor and temporary. Land in the permanent right-of-way would be permanently restricted from commercial development and would reduce the overall amount of commercial-zoned land available. Impacts would be minor because of the small amount of commercial land to be crossed (approximately 1 mile) and reduction of impacts from the Applicant-proposed measures. Impacts would be permanent, because after construction, the land within the permanent right-of-way would be restricted from development for the life of the Project.

Industrial. Construction of a pipeline in industrial areas could lead to traffic interruptions that could disrupt access to the inflow of materials and the outflow of products for facilities in this zone. With implementation of the Applicant-proposed measures, as described for the Applicant's preferred route, impacts on industrial land outside the permanent right-of-way would be negligible to minor and temporary. Impacts would be negligible to minor because of the small amount of industrial land to be crossed (0.3 mile) and the reduction of impacts from the Applicant-proposed measures. Impacts would be temporary because after construction, areas outside the permanent right-of-way would not be restricted from development. Areas within the permanent right-of-way would be restricted from any development. This would be a minor impact because of the small amount of land affected, but it would be permanent, as no development in the right-of-way would be permitted for the life of the Project.

Public/Municipal. Typically, this land is to be used for public benefit, and construction in land zoned for public or municipal use would temporarily minor to major disruptions of such uses. In RA-03 AM, the public/municipal land is 0.9 mile of municipal land in Mille Lacs County. For purposes of local government planning and zoning, the land would remain public; however, goals and impacts would vary, and no development would be permitted in the permanent right-of-way. This would be a minor impact because of the small amount of land, but it would be permanent, as no development would be allowed in the right-of-way for the life of the Project.

Conservation/Recreation. Conservation/recreation-zoned land crossed by RA-03AM consists of 0.4 mile of Mississippi Headwaters land in Morrison County, approximately 1 mile of Wild and Scenic River District zone along the Rum River in Mille Lacs County, and 0.1 mile of commercial recreation-zoned land in Carlton County. The use of these land use types would be temporarily affected by construction activities, such as clearing vegetation, grading the land, and trenching for placement of the pipe. These impacts would vary depending on the specific land type. Impacts in Mississippi Headwaters and the Wild and Scenic Rivers District would see similar impacts as those described for Shoreland zones of the Applicant's preferred route and in Section 6.3.1. Specific waterbody crossing methods have not been identified for RA-03AM, but mitigation measures along the route would be similar to those being proposed for the Applicant's preferred route and may include steps to avoid or reduce impacts on sensitive areas such as using guided bore or HDD waterbody crossing methods. Without specific plans for crossings in these areas, we assume that impacts would be similar to those in the Applicant's preferred route for Shoreland zones and the shoreland overlay district and would be minor and permanent. The small amount of land affected and the likelihood of Applicant-proposed mitigation measures would make the impact minor. However, trees and other woody vegetation would not be allowed to regrow in the permanent right-of-way, which would be a permanent impact.

Shoreland. Construction in Shoreland zones would not meet the goal of limiting development near waterways. RA-03AM would cross approximately 4 miles of Shoreland zones. Removal of vegetation from the construction areas would be a minor temporary impact, as all disturbed areas would be revegetated, but trees and woody vegetation would not be allowed to regrow within the permanent right-of-way.

Compatibility with Overlay Districts

Conditions that are placed on construction in shoreland areas may include maintenance of a vegetation buffer between construction and the edge of waterbodies, or other requirements to preserve vegetation and trees where possible. In areas where the pipeline would cross waterways, construction may require clearing trees and vegetation from the edge of the water, which is generally not compatible with the goals of shoreland overlay districts. Impacts would be minor because of the small amount of land along waterbodies that would be affected, and although trees would not be allowed, other vegetation would be planted. The impacts would be permanent because trees and woody vegetation would not be allowed to regrow in the right-of-way.

Floodplain overlay districts are designated to reduce the quantity of development in floodplains and restrict the type of development to reduce losses from flooding and retain adequate area within a floodplain to carry floodwaters. Construction activities would temporarily alter floodplain topography, but the uses of floodplains in the floodplain overlay districts would not likely change as a result of pipeline construction, resulting in minor and temporary impacts. Floodplains are further discussed in Section 6.3.1.4.

Compatibility with Existing Land Use

The types of land use impacts and the compatibility of pipeline construction within land use zones for RA-03AM would be the same as those discussed above for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1-11.

Agricultural. Compatibility with agricultural land is discussed for the agriculture/forestry zone above. The temporary removal of approximately 1,611 acres of land from agricultural production during construction would be a minor temporary impact because agricultural land would lose a growing season in the construction footprint, after which the land would be returned to agricultural land use.

Developed Land. As mentioned in the discussions above for residential, commercial, and industrial zones, construction activities in developed lands may be incompatible with existing uses in developed land. With implementation of the Applicant-proposed measures described for those zones, impacts from construction in developed areas would be temporary and minor because of the limited area that would be affected by construction (approximately 386 acres) and the short construction period; however, land in the permanent right-of-way would be restricted from future development, which would be a minor permanent impact.

Forested Land. Compatibility of the Applicant's preferred route with forested land is discussed above for the agriculture/forestry zone. Forested land also may fall under the public/municipal zone, especially for areas of state or national forests. Construction of RA-03AM is generally not compatible with forested land because of the requirement to remove trees from construction work areas. The approximately 1,138 acres of forested land affected would be a major long-term impact for areas in the temporary construction areas and a major permanent impact for areas within the permanent right-of-way where trees would not be permitted to regrow.

Open Land. Open land may correspond most closely with the conservation/recreation zone type. Construction activities in open land would temporarily be incompatible with goals of preserving undeveloped natural areas or scenic resources and enhancing recreation opportunities. Construction of a pipeline in open land would temporarily disturb approximately 340 acres of open land until restoration is complete. This would be a minor temporary impact because of the small area that would be affected and after construction, open lands would be restored.

Open Water. Pipeline construction in open water areas would be compatible with this land use category. During construction in waterways, minor temporary impacts could occur to surface waters from sedimentation and potential spills of small quantities of hazardous materials used during construction as discussed in Section 6.3.1.2. However, Applicant-proposed measures would be implemented to reduce such impacts which, would be temporary until construction is complete and the waterbody revegetated.

Wetlands. During construction of RA-03AM, construction activities in wetlands would not be compatible with preservation goals and impact would be minor to major, which may be temporary to long-term. After construction, the wetlands in some cases would revert to their original state; however, some wetlands, such as forested and scrub/shrub wetlands would be cleared of woody vegetation and would remain altered. Wetlands are discussed further in Section 6.3.1.3.

Compatibility with Watershed District Goals

During construction of a pipeline, removal of vegetation in construction work areas and working in and around wetlands and waterbodies may result in impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water.

Removal of vegetation in and around waterbodies during construction could result in impacts on water resources in watersheds. This could affect watershed district goals of retaining good water quality by keeping banks stabilized and preventing erosion and may reduce the scenic integrity of shoreland areas. Applicant-proposed measures, including temporary erosion control measures and BMPs for waterbody crossings, would reduce construction impacts on water resources. These measures would help to meet the watershed districts' goals of conserving watershed functions and limiting impacts on water quality from development. With implementation of Applicant-proposed measures, pipeline construction would result in minor temporary impacts on waterbodies and watershed district goals.

Operations Impacts

The types of land use impacts and the compatibility of pipeline operations within land use zones for RA-03AM would be the same as those discussed above for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1-11.

Compatibility with Comprehensive Plans and Zoning Ordinances

County and local comprehensive plans generally have long-term goals. While short-term impacts from construction may temporarily interrupt desired land uses, long-term effects of operation of the pipeline may represent greater impacts, as detailed below.

Agriculture/Forestry. Operation of an oil pipeline would be compatible with the goal of preserving agricultural land because farming would be permitted in the right-of-way after construction, resulting in no compatibility impacts on land zoned as agricultural during operations. The goal of preserving forested land would not be compatible with operation of the proposed Project; however, because no trees would be allowed within the permanent right-of-way, this would result in a loss of forested land and an impact that would be major and permanent.

Residential. The presence of a buried oil pipeline in residential areas would partially limit development of residential land during operation, as no structures would be permitted over the permanent right-of-way. However, land outside the permanent right-of-way would be available for such development. The loss of a 50-foot-wide permanent right-of-way corridor to residential development would represent a minor permanent impact on residential land use.

Commercial. The presence of a buried oil pipeline would limit development of commercial land within the permanent right-of-way during operation, because no structures would be permitted for development in this area. However, only a small amount of land is zoned as commercial within the permanent right-of-way, and land outside the permanent right-of-way would be available for commercial development. The loss of a 50-foot-wide permanent right-of-way corridor to commercial development would represent a minor permanent impact on commercial use.

Industrial. The presence of a buried oil pipeline would partially limit development of industrial land within the permanent right-of-way during operation because no structures would be permitted for development in this area. However, only a small amount of land is zoned as industrial within the permanent right-of-way, and land outside the permanent right-of-way would be available for industrial development. The loss of a 50-foot-wide permanent right-of-way corridor to industrial development would represent a minor permanent impact on commercial use.

Public/Municipal. RA-03AM crosses approximately 1 mile of public/municipal land. The land zoned for public/municipal use crossed by RA-03AM is municipal land. For purposes of local government planning and zoning, the land would remain public; however, goals and impacts would vary across the different public land types, which is discussed further in Section 6.3.6. Other public uses may be permitted to resume after construction is complete; however, no development would be permitted in the permanent right-of-way. Because of the small amount of land affected, this would be a minor impact, but it would last throughout the lifetime of the Project, so it would be permanent.

Conservation/Recreation. Operation of RA-03AM in areas zoned conservation within Mississippi Headwaters and the Wild and Scenic River District would generally be compatible with the Project, because the pipeline would be buried and vegetation would be replanted in any disturbed areas. Trees and woody vegetation would not be allowed to revegetate in the permanent right-of-way, which could affect the viewshed of the scenic river area. Crossing methods have not been determined; but in special interest areas, less impactful crossing methods, such as boring and HDD would be considered. The elimination of trees from the permanent right-of-way may conflict with goals of conservation in these zones and would be a minor permanent impact. Impacts in land zoned as conservation/recreation would be similar to impacts in commercial land and would result in the loss of the ability to develop land within the permanent right-of-way. The small amount of land affected (1.7 miles) would make this a minor but permanent impact.

Shoreland. During operations, RA-03AM would largely be compatible with shoreland goals, since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions, with the exception of the permanent right-of-way at the water's edge, where trees would not be allowed to grow along the banks. The goal of preserving vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation, which would preserve other goals of water quality and bank stability. Operation of RA-03AM in shoreland areas would be a minor permanent impact on shoreland goals.

Compatibility with Overlay Districts

RA-03AM would largely be compatible with shoreland goals, since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions. Where the pipeline crosses waterbodies, the permanent right-of-way abutting the water's edge would be maintained clear of trees and large woody vegetation, and the goal of preserving buffers and shade trees along waterbodies would be partially prevented. However, the permanent right-of-way would be planted with other vegetation, which would preserve other goals of maintaining water quality and bank stability. Impacts and mitigation associated with water resources are further discussed in Section 6.3.1. Operation of RA-03AM in shoreland overlay districts would be a minor permanent impact on overlay district goals.

Because the pipeline would be buried underground and the groundcover conditions would be restored, the Project would be compatible with floodplain overlay requirements during operation. The buried pipeline would not be an obstruction in the floodplain and would not affect the water channel or flood levels.

Compatibility with Existing Land Use

During operation, the permanent footprint of RA-03AM would cover approximately 677 acres of agricultural land, 471 acres of forested land, 211 acres of wetlands, 144 acres of open land, 158 acres of developed land, and 7 acres of open water. This analysis reviewed the compatibility of RA-03AM with these adjacent land uses to supplement the zoning compatibility analyses of areas without zoning information, but the study included all areas crossed by RA-03AM.

Agricultural. Operation of RA-03AM would be compatible with the use of agricultural land because farming would occur in the right-of-way after construction, resulting in no compatibility impacts on land used for agriculture during operations.

Developed Land. The presence of buried oil pipeline in developed areas would partially limit residential, commercial, and industrial development in these areas during operation, because no structures would be permitted over the permanent right-of-way. However, only a small amount of land is zoned as developed (approximately 158 acres) within the permanent right-of-way, and land outside the permanent right-of-way would be available for development. The loss of a 50-foot-wide permanent right-of-way corridor to residential, commercial, and industrial development would represent a minor permanent impact on developed land use.

Forested Land. Forested land may also fall under the public/municipal zone, especially for areas of state or national forests. Operation of RA-03AM would be least compatible with preservation of forested land, because trees would not be permitted in the permanent right-of-way. The loss of approximately 471 acres of forest land from clearing trees would be a major permanent impact within the permanent right-of-way, which would be maintained free of trees and woody vegetation.

Open Land. Open land may correspond most closely with the conservation/recreation zone type. Maintenance mowing of vegetation in the permanent right-of-way would be incompatible with goals of preserving undeveloped natural areas, but would be consistent with goals of providing public use of open areas. For this analysis, the approximately 144 acres of open land that would be maintained during operations is considered to be a minor, permanent impact, as these areas could continue to be used as open space after restoration is complete.

Open Water. Typically, the open water land use category is not a planned zone. From a planning and zoning perspective, pipeline operation in open water areas would be compatible with the open water land use category, because open waters crossed by RA-03AM would remain in their current use, and there would be no impacts.

Wetlands. Wetlands would most closely correspond with the Shoreland zone in local comprehensive plans. During operations, because the pipeline would be buried beneath waterbodies and would generally not affect wetland functions, with the exception of the permanent right-of-way where trees and large woody vegetation would not be allowed to grow. Preservation of wetland vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation that would preserve other wetland functions, such as water quality and bank stability. Operation of RA-03AM in wetland areas would be minor and long-term, as wetlands would generally return to functionality. Wetlands are further discussed in Section 6.3.1.3.

Compatibility with Watershed District Goals

During operation of RA-03AM, the pipeline would be compatible with watershed district goals, including erosion control and water quality. During operation of a pipeline, maintenance of vegetation in the permanent right-of-way in and around wetlands and waterbodies may result in minor impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water. Removal of large woody vegetation in and around waterbodies could reduce some of these benefits (and associated watershed district goals) and may reduce the scenic integrity of shoreland areas, although other vegetation would be retained that would provide many of these benefits. Generally, operation of an oil pipeline in wetland areas would be consistent with wetland land uses, resulting in minor temporary impacts.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the land use and planning ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

The types of land use impacts and the compatibility of pipeline construction within land use zones for RA-06 would be the same as those discussed above for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1-11.

Compatibility with Comprehensive Plans and Zoning Ordinances

Agriculture/Forestry. Impacts on agricultural land would consist of prevention of crops on agricultural land for one growing season in the construction work areas, after which the land would revert to agricultural use, resulting in minor, temporary impacts. For forested land, impacts would be greater as trees cleared from construction work areas would take a long period of time (up to many decades in some cases) to regenerate to preexisting conditions, resulting in minor to major and long-term impacts on forestry land in construction workspace areas and major permanent impacts in the permanent right-of-way.

Residential. Impacts on 0.2 mile of land zoned as residential would be temporary for areas outside the permanent right-of-way, because construction work areas would be restricted from development for a short period of time as construction moves through an area relatively quickly, after which these areas would be restored, and no further restrictions on development would be in place. Areas within the permanent right-of-way would be permanently restricted from development, and this would subtract from the land available for residential use. The small amount of residential land crossed would leave adequate areas that could still be developed for residential use, resulting in minor and permanent impacts on land zoned as residential.

Industrial. Construction of a pipeline in industrial areas could lead to traffic interruptions that could disrupt access to the inflow of materials and the outflow of products for facilities in this zone. With implementation of the Applicant-proposed measures, as described for the Applicant's preferred route, impacts on land zoned for industrial use would be minor, because of the amount of industrial land to be crossed (10 miles) and temporary, because after construction, areas outside the permanent right-of-way would not be restricted from development. Areas within the permanent right-of-way would be restricted from any development. This would be a minor impact because of the small amount of land affected, but it would be permanent, as no development in the right-of-way would be permitted for the life of the Project.

Public/Municipal. Typically, this land is to be used for public benefit, and construction in land zoned for public or municipal use would temporarily cause minor to major disruptions of such uses. Public/municipal land is the largest zoning category crossed by RA-06 with approximately 63 miles crossed. For purposes of local government planning and zoning, the land would remain public; however, goals and impacts would vary across the different public land types, and no development would be permitted in the permanent right-of-way. Impacts on specific public land types are discussed further in Section 6.3.6.

Conservation/Recreation. RA-06 would cross 0.8 mile of conservation/recreation-type zoning (see Table 6.2.1-11). The specific land is zoned open land in Aitkin County and is designated for areas of floodplains, swamp lands, and other areas unsuitable or unsafe for development. The use of the area as open land would be temporarily affected by construction activities, such as clearing vegetation, grading the land, and trenching for placement of the pipe. These impacts would be minor and temporary. However, following construction and restoration, impacts would be negligible because the pipeline would be buried and would not affect surface use.

Shoreland. Construction in Shoreland zones would not meet the goal of limiting development near waterways, and RA-06 would cross approximately 1 mile of Shoreland zones in St. Louis and Carlton counties. Construction in the Shoreland zone would not meet the goal of limiting development near waterways, and removal of vegetation from the construction areas would be a minor, temporary impact. Impacts on overlay districts are discussed further below.

Compatibility with Overlay Districts

Conditions that are placed on construction in shoreland areas may include maintenance of a buffer of vegetation between construction and the edge of waterbodies or other requirements to preserve vegetation and trees, where possible. In areas where the pipeline would cross waterways, construction may require clearing trees and vegetation from the edge of the water, which is generally not compatible with the goals of shoreland overlay districts. A total of 137 surface waters would be crossed by RA-06 (see Section 6.3.1.2). As discussed further in Section 6.3.1.2, impacts on some waterbodies would be reduced through the use of bore crossings and HDD crossings where vegetation buffers and streambanks could be left intact, as well as other Applicant-proposed measures. Generally construction in the shoreland area and across streambanks is not compatible with the goals of shoreland overlay districts and would be a minor permanent impact. Overall, the impacts in shoreland areas would be minor because of the small amount of land along waterbodies that would be affected and although trees would not be allowed, other vegetation would be planted. The impacts would be permanent because trees and woody vegetation would not be allowed to regrow in the right-of-way. Impacts in shoreland areas are further discussed in Sections 6.3.1.2, 6.3.1.3, and 6.3.1.4.

Floodplain overlay districts are designated to reduce the quantity of development in floodplains and restrict the type of development in order to reduce losses from flooding and retain adequate area within a floodplain to carry floodwaters. Construction activities would temporarily alter floodplain topography but the uses of floodplains in floodplain overlay districts would not likely change as a result of pipeline construction, resulting in minor and temporary impacts. Floodplains are further discussed in Section 6.3.1.4.

Compatibility with Existing Land Use

Agricultural. Compatibility with agricultural land is discussed for the agriculture/forestry zone above. The temporary removal of approximately 257 acres of land from agricultural production during construction would be a minor temporary impact, because agricultural land would lose one growing season in the construction footprint, after which the land would be returned to agricultural land use.

Developed Land. As mentioned in the discussions for residential, commercial, and industrial zones, construction activities in developed lands may be incompatible with existing uses in developed land. With implementation of the Applicant-proposed measures described for those zones, impacts from construction in developed areas would be temporary and minor, because of the limited area that would be affected by construction (approximately 65 acres) and the short construction period; however, land in the permanent right-of-way would be restricted from future development, which would be a minor permanent impact.

Forested Land. Compatibility of RA-06 with forested land is discussed for the agriculture/forestry zone. Forested land also may fall under the public/municipal zone type, especially for areas of state or national forests. Construction of RA-06 is generally not compatible with forested land because of the requirement to remove trees from construction work areas. The approximately 1,107 acres of forested land affected would be a major long-term impact for areas in the temporary construction areas and a major permanent impact for areas within the permanent right-of-way where trees would not be permitted to regrow.

Open Land. Open land may correspond most closely with the conservation/recreation zone type. Construction activities in open land would temporarily be incompatible with goals of preserving undeveloped natural areas or scenic resources and enhancing recreation opportunities. Construction of

RA-06 in open land would temporarily disturb approximately 354 acres of open land until restoration is complete. This would be a minor temporary impact because of the small area that would be affected and after construction, open lands would be restored.

Open Water. Pipeline construction in open water areas would be compatible with this land use category. RA-06 would cross approximately 82 acres of open water during construction. During construction in waterways, minor temporary impacts could occur to surface waters from sedimentation and potential spills of small quantities of hazardous materials used during construction, as discussed in Section 6.3.1.2. However, Applicant-proposed measures would be implemented to reduce such impacts, which would be temporary until construction is complete and the waterbody revegetated.

Wetlands. During construction of RA-06, construction activities in wetlands would not be compatible with preservation goals and would be a minor to major impact, which may be temporary or long-term. A total of approximately 996 acres of wetlands would be crossed during construction. After construction, wetlands in some cases would revert to their original state; however, some wetlands, such as forested and scrub/shrub wetlands, would be cleared of woody vegetation and would remain altered. Wetlands are discussed further in Section 6.3.1.3.

Compatibility with Watershed District Goals

During construction of a pipeline, removal of vegetation in construction work areas and working in and around wetlands and waterbodies may result in impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water.

Removal of vegetation in and around waterbodies during construction could result in impacts on water resources in watersheds that could affect watershed district goals of retaining good water quality by keeping banks stabilized and preventing erosion, and may reduce the scenic integrity of shoreland areas. The Applicant-proposed measures, including temporary erosion control measures and BMPs for waterbody crossings, would reduce construction impacts on water resources and help to meet the watershed districts' goals of conserving watershed functions and limiting impacts on water quality from development. With implementation of Applicant-proposed measures, pipeline construction would result in minor temporary impacts on waterbodies and watershed district goals.

Operations Impacts

The types of land use impacts and the compatibility of pipeline operations within land use zones for RA-06 would be the same as those discussed above for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1-11.

Compatibility with Comprehensive Plans and Zoning Ordinances

County and local comprehensive plans generally have long-term goals. While short-term impacts from construction may temporarily interrupt desired land uses, long-term effects of operation of the pipeline may represent greater impacts, as detailed below.

Agriculture/Forestry. Operation of an oil pipeline would be compatible with the goal of preserving agricultural land because farming would be permitted in the right-of-way after construction, resulting in no compatibility impacts on land zoned as agricultural during operations. The goal of preserving forested land would not be compatible with operation of the proposed Project; however, because no trees would be allowed within the permanent right-of-way, resulting in a loss of forested land and an impact that would be major and permanent.

Residential. The presence of a buried oil pipeline in residential areas would partially limit development of residential land during operation as no structures would be permitted over the permanent right-of-way. However, land outside the permanent right-of-way would be available for such development. The loss of a 50-foot-wide, 0.2-mile-long, permanent right-of-way corridor to residential development would represent a minor permanent impact on residential land use from RA-06.

Industrial. The presence of buried oil pipeline would partially limit development of industrial land within the permanent right-of-way during operation because no structures would be permitted for development in this area. However, only a small amount of land is zoned as industrial (10 miles) within the permanent right-of-way, and land outside the permanent right-of-way would be available for industrial development. The loss of a 50-foot-wide permanent right-of-way corridor to industrial development would represent a minor permanent impact on industrial use.

Public/Municipal. RA-06 crosses approximately 63 miles of public/municipal land, all in Itasca County. The majority of land zoned for public/municipal use crossed by RA-06 is state forest land as discussed further in Section 6.3.6. The loss of forest from clearing trees would be a major permanent impact along the permanent right-of-way, which would be maintained free of trees and woody vegetation. For purposes of local government planning and zoning, the land would remain public. However, goals and impacts would vary across the different public land types; these are discussed further in Section 6.3.6. Other public uses may be permitted to resume after construction is complete.

Conservation/Recreation. Operation of RA-06 in areas zoned for conservation/recreation would be compatible with recreation in that the permanent right-of-way would be revegetated and would revert to its original use. The only conservation/recreation-zoned land that would be crossed by RA-06 would be in Aitkin County. The specific zone crossed in Aitkin County is the open land zone, and pipeline construction in open land is generally compatible as the pipeline would be buried. Additionally, because of the small amount of land that would be affected (0.8 mile), RA-06 would lead to negligible impacts.

Shoreland. During operations, RA-06 would largely be compatible with shoreland goals, since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions, with the exception of the permanent right-of-way at the water's edge where trees would not be allowed to grow along the banks. The goal of preserving vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation, which would preserve other goals of water quality and bank stability, for example. Operation of RA-06 in shoreland areas would be a minor permanent impact on shoreland goals.

Compatibility with Overlay Districts

RA-06 would largely be compatible with shoreland goals during operation, since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions. Where the pipeline crosses waterbodies, the permanent right-of-way abutting the water's edge would be maintained clear of trees and large woody vegetation, and the goal of preserving buffers and shade trees along waterbodies would be partially prevented. However, the permanent right-of-way would be planted with other vegetation, which would preserve other goals of maintaining water quality and bank stability. Impacts and mitigation associated with water resources are further discussed in Section 6.3.1. Operation of RA-06 in shoreland overlay districts would be a minor permanent impact on overlay district goals.

Because the pipeline would be buried underground and the ground cover conditions would be restored, the Project would be compatible with floodplain overlay requirements during operation. The buried pipeline would not be an obstruction in the floodplain and would not affect the water channel or flood levels.

Compatibility with Existing Land Use

During operation, the permanent footprint of RA-06 would cover approximately 107 acres of agricultural land, 461 acres of forested land, 415 acres of wetlands, 149 acres of open land, 26 acres of developed land, and 34 acres of open water. This analysis reviews the compatibility of the Project with these adjacent land uses during operation.

Agricultural. Operation of RA-06 would be compatible with the use of agricultural land because farming would occur in the right-of-way after construction, resulting in no compatibility impacts on land used for agriculture during operations.

Developed Land. The presence of buried oil pipeline in developed areas would partially limit residential, commercial, and industrial development in these areas during operation as no structures would be permitted over the permanent right-of-way. However, only a small amount of land is zoned as developed (approximately 26 acres) within the permanent right-of-way, and land outside the permanent right-of-way would be available for development. The loss of a 50-foot-wide permanent right-of-way corridor to residential, commercial, and industrial development would represent a minor permanent impact on developed land use.

Forested Land. Forested land also may fall under the Public/Municipal zone, especially for areas of state or national forests. Operation of RA-06 would be least compatible with preservation of forested land because trees would not be permitted in the permanent right-of-way. The loss of approximately 461 acres of forest land from clearing trees would be a major permanent impact along the permanent right-of-way, which would be maintained free of trees and woody vegetation.

Open Land. Open land may correspond most closely with the Conservation/Recreation zone type. Maintenance vegetation mowing in the permanent right-of-way would be incompatible with goals of preserving undeveloped natural areas, but would be consistent with goals of providing public use of open areas. For this analysis, the approximately 149 acres of open land that would be maintained during operations is considered to be a minor permanent impact, as these areas could continue to be used as open space after restoration is complete.

Open Water. Typically the Open Water land use category is not a planned zone. From a planning and zoning perspective, pipeline operation in open water areas would be compatible with the open water land use category because open waters crossed by RA-06 would remain in their current use, and there would be no impacts.

Wetlands. Wetlands would most closely correspond with the Shoreland zone in local comprehensive plans. During operations, because the pipeline would be buried beneath waterbodies and would generally not affect wetland functions, with the exception of the permanent right-of-way where trees and large woody vegetation would not be allowed to grow. Preservation of wetland vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation that would preserve other wetland functions such as water quality and bank stability. Operation of RA-06 in wetland areas would be minor and long-term, as wetlands would generally return to functionality. Wetlands are further discussed in Section 6.3.1.3.

Compatibility with Watershed District Goals

During operation of RA-06, the pipeline would be compatible with watershed district goals, including erosion control and water quality. During operation of a pipeline, maintenance of vegetation in the permanent right-of-way in and around wetlands and waterbodies may result in minor impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water. Removal of large woody vegetation in and around waterbodies could reduce some of these benefits (and associated watershed district goals) and may reduce the scenic integrity of shoreland areas, although other vegetation would be retained, which would provide many of these benefits. Generally, operation of an oil pipeline in wetland areas would be consistent with wetland land uses, resulting in minor, temporary impacts.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the land use and planning ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

As noted above, RA-07 involves removal of the existing Line 3 and replacement in the existing trench, which is located entirely within the Enbridge Mainline corridor right-of-way. Enbridge has easements for the land in this corridor, and past, current, and foreseeable future land use in this corridor is pipeline right-of-way. The 205-foot anticipated construction work area for this alternative would extend somewhat beyond the existing Mainline corridor, but impacts on land use/planning and zoning are expected to be temporary negligible, as this construction activity would occur on the margin of the existing Mainline corridor.

Operations Impacts

RA-07 involves removal of the existing Line 3 and replacement in the existing trench, which is located entirely in the Enbridge Mainline corridor right-of-way. Enbridge has easements for the land in this corridor, and past, current, and foreseeable future land use in this corridor is pipeline right-of-way. Continued use of this corridor would leave existing land-use in the corridor unchanged.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the land use and planning ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been

altered by previous projects, this Project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

The types of land use impacts and the compatibility of pipeline construction within land use zones for RA-08 would be the same as those discussed for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1-11.

Compatibility with Comprehensive Plans and Zoning Ordinances

Agriculture/Forestry. Impacts on agricultural land would consist of prevention of crops on agricultural land for one growing season in the construction work areas, after which the land would revert to agricultural use, resulting in minor temporary impacts. For forested land, impacts would be greater as trees would be cleared from construction work areas that would take a long period of time (up to many decades in some cases) to regenerate to preexisting conditions, resulting in minor to major and long-term impacts on forestry land in construction workspace areas and major permanent impacts in the permanent right-of-way.

Residential. Impacts on 7 miles of land zoned as residential would be temporary for areas outside the permanent right-of-way, because construction work areas would be restricted from development for a short period of time, as construction moves through an area relatively quickly, after which these areas would be restored, and no further restrictions on development would be in place. Areas within the permanent right-of-way would be permanently restricted from development, and this would subtract from the land available for residential use. The small amount of residential land crossed would leave adequate areas that could still be developed for residential use, resulting in minor and permanent impacts on land zoned as residential.

Commercial. Construction near stores and businesses could temporarily interrupt commercial land uses by restricting access to businesses or parking areas, creating extra traffic in the area, and creating noise and dust nuisances. However, with implementation of the Applicant-proposed measures as described for the Applicant's preferred route, the impacts on commercial-zoned land from construction would be minor and temporary. Land in the permanent right-of-way would be permanently restricted from commercial development and would reduce the overall amount of commercial-zoned land available. Impacts would be minor because of the small amount of commercial land to be crossed (0.6 mile) and the reduction of impacts from the Applicant-proposed measures. Impacts would be permanent because after construction the land within the permanent right-of-way would be restricted from development for the life of the Project.

Industrial. Construction of a pipeline in industrial areas could lead to traffic interruptions, which could disrupt access to the inflow of materials and the outflow of products for facilities in this zone. With implementation of the Applicant-proposed measures as described for the Applicant's preferred route, impacts on land zoned for industrial use would be negligible to minor because of the small amount of industrial land to be crossed (1 mile) and temporary, because after construction areas outside the permanent right-of-way would not be restricted from development. Areas within the permanent right-of-way would be restricted from any development. This would be a minor impact because of the small amount of land affected, but it would be permanent as no development in the right-of-way would be permitted for the life of the Project.

Public/Municipal. This land is to be used for public benefit, and construction in land zoned for public or municipal use would temporarily minor to major disruptions of such uses. RA-08 would cross approximately 59 miles of Public/Municipal land in Cass and Itasca counties. For purposes of local government planning and zoning, the land would remain public; however, no development would be allowed in the permanent right-of-way and goals and impacts would vary across the different public land types. The various public land types crossed are discussed further in Section 6.3.6.

Conservation/Recreation. The use of this land use type would be temporarily affected by construction activities, such as clearing vegetation, grading the land, and trenching for placement of the pipe. RA-08 would cross 0.3 mile of conservation/recreation-type zoning (see Table 6.2.1-11). The specific land is zoned "Conservation" in Beltrami County. The goals of conservation would not generally be compatible with a pipeline; however, the small amount of land that would be affected would make this a minor impact. Following construction and restoration impacts would be negligible, because the pipeline would be buried and would not affect surface use.

Shoreland. Construction in Shoreland zones would not meet the goal of limiting development near waterways, and RA-08 would cross approximately 0.6 mile of Shoreland zones in Carlton County. Construction in the Shoreland zone would not meet the goal of limiting development near waterways, and removal of vegetation from the construction areas would be a minor temporary impact. Impacts on overlay districts are discussed further below.

Compatibility with Overlay Districts

Conditions that are placed on construction in shoreland areas may include maintenance of a buffer of vegetation between construction and the edge of waterbodies, or other requirements to preserve vegetation and trees where possible. In areas where the pipeline would cross waterways, construction may require clearing trees and vegetation from the edge of the water, which is generally not compatible with the goals of shoreland overlay districts. A total of 106 surface waters would be crossed by RA-08 (see Section 6.3.1.2). As discussed further in Section 6.3.1.2, impacts on some waterbodies would be reduced through the use of bore crossings and HDD crossings where vegetation buffers and streambanks could be left intact, as well as other Applicant-proposed measures. Generally, construction in the shoreland area and across streambanks is not compatible with the goals of shoreland overlay districts and would be a minor permanent impact. Overall, the impacts in shoreland areas would be minor because of the small amount of land along waterbodies that would be affected and although trees would not be allowed, other vegetation would be planted. The impacts would be permanent because trees and woody vegetation would not be allowed to regrow in the right-of-way. Impacts in shoreland areas are further discussed in Sections 6.3.1.2, 6.3.1.3, and 6.3.1.4.

Floodplain overlay districts are designated to reduce the quantity of development in floodplains and restrict the type of development in order to reduce losses from flooding and retain adequate area within a floodplain to carry floodwaters. Construction activities would temporarily alter floodplain topography but the uses of floodplains in the floodplain overlay districts would not likely change as a result of pipeline construction, resulting in minor and temporary impacts. Floodplains are further discussed in Section 6.3.1.4.

Compatibility with Existing Land Use

Agricultural. Compatibility with agricultural land is discussed for the Agriculture/Forestry zone above. The temporary removal of approximately 336 acres of land from agricultural production during construction would be a minor, temporary impact because agricultural land would lose a growing season in the construction footprint, after which the land would be returned to agricultural land use.

Developed Land. As mentioned in the discussions above for Residential, Commercial, and Industrial zones, construction activities in developed lands may be incompatible with existing uses in developed land. With implementation of the Applicant-proposed measures described for those zones, impacts from construction in developed areas would be temporary and minor, because of the limited area that would be affected by construction (approximately 86 acres) and the short construction period; however, land in the permanent right-of-way would be restricted from future development, which would be a minor permanent impact.

Forested Land. Compatibility of RA-08 with forested land is discussed above for the Agriculture/ Forestry zone. Forested land also may fall under the Public/Municipal zone, especially for areas of state or national forests. Construction of RA-08 is generally not compatible with forested land, because of the requirement to remove trees from construction work areas. The approximately 773 acres of forested land affected would be a major long-term impact for areas in the temporary construction areas and a major permanent impact for areas within the permanent right-of-way where trees would not be permitted to regrow.

Open Land. Open land may correspond most closely with the Conservation/Recreation zone type. Construction activities in open land would temporarily be incompatible with goals of preserving undeveloped natural areas or scenic resources and enhancing recreation opportunities. Construction of a pipeline in open land would temporarily disturb approximately 208 acres of open land until restoration is complete. This would be a minor, temporary impact because of the small area that would be affected and after construction, open lands would be restored.

Open Water. Pipeline construction in open water areas would be compatible with this land use category. During construction in waterways, minor temporary impacts could occur to surface waters from sedimentation and potential spills of small quantities of hazardous materials used during construction, as discussed in Section 6.3.1.2. However, Applicant-proposed measures would be implemented to reduce such impacts, which would be temporary, until construction is complete and the waterbody revegetated.

Wetlands. During construction of RA-08, construction activities in wetlands would not be compatible with preservation goals and would be a minor to major impact, which may be a temporary to long-term impact. After construction, the wetlands in some cases would revert to their original state; however some wetlands, such as forested and scrub/shrub wetlands would be cleared of woody vegetation and would remain altered. Wetlands are discussed further in Section 6.3.1.3.

Compatibility with Watershed District Goals

During construction of a pipeline, removal of vegetation in construction work areas and working in and around wetlands and waterbodies may result in impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water.

Removal of vegetation in and around waterbodies during construction could result in impacts on water resources in watersheds, which could affect watershed district goals of retaining good water quality by keeping banks stabilized and preventing erosion and may reduce the scenic integrity of shoreland areas.

The Applicant-proposed measures outlined in Section 6.3.1.2, including temporary erosion control measures and BMPs for waterbody crossings would reduce construction impacts on water resources, which would help to meet the watershed districts' goals of conserving watershed functions and limiting impacts on water quality from development. With implementation of Applicant-proposed measures, pipeline construction would result in minor temporary impacts on waterbodies and watershed district goals.

<u>Operations Impacts</u>

The types of land use impacts and the compatibility of pipeline operations within land use zones for RA-08 would be the same as those discussed above for the Applicant's preferred route. The difference would be in the amount of land that would be affected, as shown in Table 6.2.1.11.

Compatibility with Comprehensive Plans and Zoning Ordinances

County and local comprehensive plans generally have long-term goals. While short-term impacts from construction may temporarily interrupt desired land uses, long-term effects of operation of the pipeline may represent greater impacts, as detailed below.

Agriculture/Forestry. Operation of an oil pipeline would be compatible with the goal of preserving agricultural land because farming would be permitted in the right-of-way after construction, resulting in no compatibility impacts on land zoned as agricultural during operations. The goal of preserving forested land would not be compatible with operation of the proposed Project; however, as no trees would be allowed within the permanent right-of-way, resulting in a loss of forested land and an impact that would be minor to major and permanent.

Residential. The presence of buried oil pipeline in residential areas would partially limit development of residential land during operation, as no structures would be permitted over the permanent right-of-way. However, land outside the permanent right-of-way would be available for such development. The loss of a 50-foot-wide permanent right-of-way corridor to residential development would represent a minor permanent impact on residential land use.

Commercial. The presence of buried oil pipeline would limit development of commercial land within the permanent right-of-way during operation as no structures would be permitted for development in this area. However, only a small amount of land is zoned as commercial (0.6 acre) within the permanent right-of-way, and land outside the permanent right-of-way would be available for commercial development. The loss of a 50-foot-wide permanent right-of-way corridor to commercial development would represent a minor permanent impact on commercial use.

Industrial. The presence of buried oil pipeline would partially limit development of Industrial land within the permanent right-of-way during operation as no structures would be permitted for development in this area. However, only a small amount of land is zoned as industrial (0.9 acre) within the permanent right-of-way, and land outside the permanent right-of-way would be available for industrial development. The loss of a 50-foot-wide permanent right-of-way corridor to industrial development would represent a minor permanent impact on commercial use.

Public/Municipal. The majority of land zoned for public/municipal use crossed by RA-08 is state forest land, as described further in Section 6.3.6. The loss of forest from clearing trees would be a major permanent impact along the permanent right-of-way, which would be maintained free of trees and woody vegetation. For purposes of local government planning and zoning, the land would remain public;

however, goals and impacts would vary across the different public land types and these, are discussed further in Section 6.3.6. Other public uses may be permitted to resume after construction is complete.

Conservation/Recreation. Operation of RA-08 in areas zoned for conservation/recreation would be compatible with recreation in that the permanent right-of-way would be revegetated and would revert to its original use. Land in this land use zone that is used for conservation purposes, however, would be periodically disturbed by maintenance mowing in the permanent right-of-way, but the small amount of land affected (0.3 mile) would result in negligible impacts.

Shoreland. During operations, RA-08 would largely be compatible with shoreland goals since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions, with the exception of the permanent right-of-way at the water's edge where trees would not be allowed to grow along the banks. The goal of preserving vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation, which would preserve other goals of water quality and bank stability, for example. Operation of RA-08 in shoreland areas would be a minor permanent impact on shoreland goals.

Compatibility with Overlay Districts

RA-08 would largely be compatible with shoreland goals since the pipeline would be buried beneath waterbodies and would generally not affect shoreland functions. Where the pipeline crosses waterbodies, the permanent right-of-way abutting the water's edge would be maintained clear of trees and large woody vegetation and the goal of preserving buffers and shade trees along waterbodies would be partially prevented. However, the permanent right-of-way would be planted with other vegetation, which would preserve other goals of maintaining water quality and bank stability. Impacts and mitigation associated with water resources are further discussed in Section 6.3.1. Operation of RA-08 in shoreland overlay districts would be a minor permanent impact on overlay district goals.

Because the pipeline would be buried underground and the ground cover conditions would be restored, the Project would be compatible with floodplain overlay requirements during operation. The buried pipeline would not be an obstruction in the floodplain and would not affect the water channel or flood levels.

Compatibility with Existing Land Use

During operation, the permanent footprint of RA-08 would cover approximately 141 acres of agricultural land, 320 acres of forested land, 405 acres of wetlands, 10 acres of open land, 35 acres of developed land, and 10 acres of open water. This analysis reviews the compatibility of the Project with these adjacent land uses during operation.

Agricultural. Operation of RA-08 would be compatible with the use of agricultural land because farming would occur in the right-of-way after construction, resulting in no compatibility impacts on land used for agriculture during operations.

Developed Land. The presence of a buried oil pipeline in developed areas would partially limit residential, commercial, and industrial development in these areas during operation as no structures would be permitted over the permanent right-of-way. However, only a small amount of land is designated as developed (approximately 35 acres) within the permanent right-of-way, and land outside the permanent right-of-way would be available for development. The loss of a 50-foot-wide permanent right-of-way corridor to residential, commercial, and industrial development would represent a minor permanent impact on developed land use.

Forested Land. Forested land also may fall under the Public/Municipal zone, especially for areas of state or national forests. Operation of RA-08 would be least compatible with preservation of forested land because trees would not be permitted in the permanent right-of-way. The loss of approximately 320 acres of forest land from clearing trees would be a major permanent impact along the permanent right-of-way, which would be maintained free of trees and woody vegetation.

Open Land. Open land may correspond most closely with the Conservation/Recreation zone type. Maintenance vegetation mowing in the permanent right-of-way would be incompatible with goals of preserving undeveloped natural areas, but would be consistent with goals of providing public use of open areas. For this analysis, the approximately 87 acres of open land that would be maintained during operations is considered to be a minor permanent impact, as these areas could continue to be used as open space after restoration is complete.

Open Water. Typically, the Open Water land use category is not a planned zone. From a planning and zoning perspective, pipeline operation in open water areas would be compatible with the open water land use category, because open waters crossed by RA-08 would remain in their current use, and there would be no impacts.

Wetlands. Wetlands would most closely correspond with the Shoreland zone in local comprehensive plans. During operations, because the pipeline would be buried beneath waterbodies and would generally not affect wetland functions, with the exception of the permanent right-of-way where trees and large woody vegetation would not be allowed to grow. Preservation of wetland vegetation buffers and shade trees along waterbodies would be partially restricted in the permanent right-of-way in these areas. However, the right-of-way would be planted with other vegetation that would preserve other wetland functions such as water quality and bank stability. Operation of RA-08 in wetland areas would be minor and long-term as wetlands would generally return to functionality. Wetlands are further discussed in Section 6.3.1.3.

Compatibility with Watershed District Goals

During operation of RA-08, the pipeline would be compatible with watershed district goals, including erosion control and water quality. During operation of a pipeline, maintenance of vegetation in the permanent right-of-way in and around wetlands and waterbodies may result in minor impacts on water resources in watersheds, as discussed further in Section 6.3.1. Vegetation in watershed areas acts to slow water runoff, stabilize banks, prevent erosion, and enhance scenic views from the water. Removal of large woody vegetation in and around waterbodies could reduce some of these benefits (and associated watershed district goals) and may reduce the scenic integrity of shoreland areas, although other vegetation would be retained which would provide many of these benefits. Generally, operation of an oil pipeline in wetland areas would be consistent with wetland land uses, resulting in minor, temporary impacts.

6.2.1.4 Summary and Mitigation

6.2.1.4.1 Summary

Table 6.2.1-12 presents a summary of potential impacts related to compatibility with planning and zoning regulations and land use for the Applicant's preferred route and route alternatives between

Clearbrook and Carlton. Review of the relevant comprehensive plans and zoning ordinances found that pipelines are not listed as an allowed use for any of the zones that would be crossed by the Applicant's preferred route or the route alternatives.

The length of Shoreland zone and watershed district crossed and acres of open water crossed are shown in Table 6.2.1-11, which gives an estimated relative area of concern for protection of resources. The Applicant's preferred route crosses the most miles of Shoreland zone at approximately 7 miles, and RA-08 crosses the least at 0.6 mile. RA-06 crosses the most miles of watershed districts (approximately 52 miles), and RA-08 crosses the least (approximately 13 miles). Although not considered an allowed use for any of the overlay plans considered (shorelands, floodplains, and watershed districts), potential pipeline effects on the overlay plan goals were found to be no impact or minor in all cases. Overall, the impacts in shoreland areas would be minor because of the small amount of land along waterbodies that would be affected, and although trees would not be allowed, other vegetation would be planted. The impacts would be permanent because trees and woody vegetation would not be allowed to regrow in the right-of-way. Because the pipeline would be buried underground and the ground cover conditions would be restored, the Project would be compatible with floodplain overlay requirements during operation. The buried pipeline would not be an obstruction in the floodplain and would not affect the water channel or flood levels.

Effects of a pipeline on all other land use classifications were found to be no impact or minor and temporary to permanent impact.

Table 6.2.1-11 shows that forestry land use is the predominant designation for the Applicant's preferred route, RA-06, and RA-07; agricultural land is the predominant designation for RA-03AM; and wetlands is the predominant designation for RA-08. While agricultural use is typically compatible with the presence of a pipeline, forestry use is not. Forestry would be the most affected of any of the land use designations because some portion of the forested lands would be removed for construction and would remain cleared along the permanent right-of-way during operations. Major impacts are anticipated where land in forestry use/zoning would be cleared, based on the reduction in forestry use. The permanent right-of-way of the Applicant's preferred route crosses the largest amount of forested land during operation (631 acres). The least amount of forested land is crossed by the permanent right-of-way of RA-07 (242 acres). The remaining three route alternatives range from approximately 320 to 471 acres of forested land crossed.

6.2.1.4.2 Mitigation

Replanting appropriate tree species for restoration within forested areas cleared for construction to reduce the recovery time and prevent changes in watershed hydrology and runoff impacts that could alter stream geomorphology could mitigate the incompatibility with forest uses and zoning. Additionally, in temporary construction workspaces, topsoil segregation methods will be implemented in forested areas in order to assist with the revegetation after construction is complete.

With implementation of Applicant-proposed measures related to sediment and erosion control, streambank restoration, and waterbody crossings, no further mitigation has been identified to minimize impacts related to planning and zoning.

Table 6.2.1-12. Summary of Potential Impacts related to Compatibility with Planning and Zoning Regulations and Land Use for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Compatibility with comprehensive plans and zoning ordinances	Temporary to permanent/ (negligible to minor) to major	Temporary to permanent/ (negligible to minor) to major	Temporary to permanent/ negligible to major	Temporary to permanent/ negligible to major	Temporary to permanent/ negligible to major
Compatibility with overlay districts	Temporary to permanent/ minor impacts	Temporary to permanent/ minor impacts	Temporary to permanent/ minor impacts	Temporary to permanent/ minor impacts	Temporary to permanent/ minor impacts
Compatibility with existing land use	Temporary to permanent/ minor to major impacts	Temporary to permanent/ minor to major impacts	Temporary to permanent/ minor to major impacts	Temporary to permanent/ minor to major impacts	Temporary to permanent/ minor to major impacts
Compatibility with watershed district goals	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts
Operations Impacts					
Compatibility with comprehensive plans and zoning ordinances	No impact to permanent/ major impacts	No impact to permanent/ major impacts	No impact to permanent/ major impacts	No impact to permanent/ major impacts	No impact to permanent/ major impacts
Compatibility with overlay districts	No impact to minor/ permanent impact	No impact to minor/ permanent impact	No impact to minor/ permanent impacts	No impact to minor/ permanent impacts	No impact to minor/ permanent impacts
Compatibility with existing land use	No impact to permanent/ major impacts	No impact to permanent/ major impacts	No impact to permanent/ major impacts	No impact to permanent/ major impacts	No impact to permanent/ major impacts
Compatibility with watershed district goals	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts

[a] **No single factor in this summary table provides a complete indication of all relevant impacts to planning and zoning. However, together these factors provide a reasonably comprehensive indication of the potential impacts. The appropriate weight to place on any given impact is the subject to debate, even among technical experts, so the weight that the user places on one type of impact or another may legitimately vary based on individual preferences and values.**

[b] **Duration and magnitude descriptions in the table (terms defined in Section 6.1.3) should be coupled with the qualitative and quantitative descriptions of impacts that are contained in the text in this section on pages 6-24 to 6-52. The table above, for example provides a general assessment of the duration and magnitude of potential impacts to watershed district goals; however, a more complete discussion of the qualitative nature of impacts that could occur to watershed district goals is contained in the text of this section (terms defined in Section 6.1.3).**

Table 6.2.1-12. Summary of Potential Impacts related to Compatibility with Planning and Zoning Regulations and Land Use for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-24 to 6-32. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-32 to 6-40. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-40 to 6-46. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[f] **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on page 6-46. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-46 to 6-52. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

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6.2.2 Noise and Vibration

Occupants of residences, schools, churches, and hospitals/medical centers can be sensitive to changes in noise levels (referred to as “sensitive receptors”). The associated buildings also could be susceptible to vibration damage. Pipeline construction can temporarily increase nearby noise levels and cause ground-borne vibration over existing ambient levels at nearby receptors, and the operation of pipeline pump stations can increase nearby noise levels over existing ambient levels.

The following analysis of impacts on sensitive resources from noise and vibration during construction and operation of the Applicant’s preferred route and route alternatives considered the following:

- Exceedance of Minnesota Noise Standards for residential and other sensitive uses;
- Exceedance of Federal Transit Administration (FTA) noise impact criteria; and
- Exceedance of FTA construction vibration damage criteria for extremely susceptible buildings.

This section first describes the existing conditions for noise and vibration along the Applicant’s preferred route and route alternatives, where sensitive receptors could be affected by construction and operation. Next, the section evaluates the potential impacts on receptors sensitive to noise and buildings susceptible to vibration damage and compares these impacts for each of the five routing options (the Applicant’s preferred route, RA-03-AM, RA-06, RA-07, and RA-08). Chapter 10 addresses the noise impacts resulting from a crude oil release. An assessment of noise impacts on wildlife is included in Section 6.3.4.

For better understanding of this subject, noise and vibration terminologies and descriptors are provided herein.

Noise Terminology

Sound is mechanical energy transmitted by pressure waves in media, such as air or water (FTA 2006). When the sound level becomes excessive, annoying, or unwanted, it is referred to as “noise.” Noise may be continuous (constant noise at a steady level), steady (constant noise with a fluctuating level), impulsive (having a high peak of short duration), stationary (occurring from a fixed source), intermittent (at intervals of high and low levels), or transient (occurring at different levels).

Noise levels are quantified using decibels (dB), which are units of sound pressure. The A-weighted sound level, expressed as dBA, is an expression of the relative loudness of sounds in air, as perceived by the human ear. Therefore, A-weighted sound levels are usually used to quantify audible sound and its effect on people (EPA 1978). On the dBA scale, normal conversation occurs at about 60 to 65 dBA, and sleep disturbance occurs at about 40 to 45 dBA.

Existing ambient noise levels, or background noise levels, are the sounds from natural and artificial sources at the receptors. The magnitude and frequency of background noise at any given location may vary considerably over the course of a day or night and throughout the year. The variations are caused in part by weather conditions, seasonal vegetative cover, and human activity. Two common measures used to relate the time-varying quality of environmental noise levels to known effects on people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night sound level (L_{dn}).

- The $L_{eq(24)}$ is the level of steady sound with the same total energy as the time-varying sound, averaged over a 24-hour period.
- The L_{dn} is the $L_{eq(24)}$ with 10 dBA added to the nighttime sound levels between the hours of 10:00 pm and 7:00 am to account for people's tendency to be more sensitive to sound during nighttime hours.

Where the nature of a new sound is similar to the ambient noise level, an increase of 3 dBA is barely detectable by the human ear, and an increase of 5 dBA is considered clearly noticeable. Increases of 10 dBA are perceived as a doubling of noise (i.e., twice as loud). Table 6.2.2-1 provides examples of common activities and their associated noise levels in dBA. Table 6.2.2-2 contains examples of outdoor day-night noise levels.

Table 6.2.2-1. Common Activities and Associated Noise Levels

Activity	Noise Level (dBA)
Loud live band music	110
Truck 50 feet away	80
Gas lawnmower 100 feet away	70
Normal conversation indoors	60
Moderate rainfall on vegetation	50
Refrigerator	40
Bedroom at night	25

Source: Caltrans 2009.
dBA = A-weighted decibel(s).

Table 6.2.2-2. Examples of Outdoor Noise Levels for Various Land Uses

Outdoor Location	Noise Levels (L_{dn} in dBA)
Apartment next to freeway	88
Core commercial, heavier industry	75
Urban row housing on major avenue	68
Lighter industry	60
Wooded residential	51
Agricultural cropland	44
Rural residential	39
Open space (wetland, forest, open land, abandoned land)	35

Sources: Caswell and Jakus 1977; EPA 1978.
dBA = A-weighted decibel(s), L_{dn} = day-night sound level expressed in dBA.

Vibration Terminology

Ground-borne vibration consists of oscillating motion within the ground and is typically caused by construction activities, such as blasting, pile driving, and operating heavy construction equipment. The effects of ground-borne vibration are typically no more than a nuisance; however, at extreme vibration levels, buildings can be damaged. Ground-borne vibration can be felt outdoors, but it is typically more of an annoyance to people when they are indoors (FTA 2006). This is because the associated effects of a shaking building are more noticeable indoors, where people tend to be moving less and thus are more likely to perceive vibration. Induced ground-borne noise is an effect of ground-borne vibration and occurs only indoors, because it is produced from noise radiated from the motion of the walls and floors of a room or the rattling of windows or dishes on shelves.

Two forms of vibration velocity are used to evaluate the effects of vibration. Peak particle velocity (PPV) is referred to as "vibration velocity amplitude," which is an instantaneous measure, and vibration velocity decibels (VdB) are referred to as "vibration velocity level," which is an average measure typically calculated over a 1-second period. Table 6.2.2-3 shows common vibration sources with their associated estimated VdB and PPV at a relative distance from the source.

Table 6.2.2-3. Typical Levels of Ground-Borne Vibration Associated with Construction Activities

Vibration Source	Distance from the Source (feet)	Vibration Velocity Level (VdB)	Peak Particle Velocity (in/sec)
Pile driver (impact type)	25	104–112	0.644–1.518
Pile driver (sonic or vibratory type)	25	93–105	0.170–0.734
Large bulldozer	25	87	0.089
Caisson drilling	25	87	0.089
Jackhammer	25	79	0.035
Loaded trucks	25	86	0.076
Small bulldozer	25	58	0.003
Blasting	50	100	0.300[a]

Sources: FTA 2006; Lucca 2003.

[a] Peak particle velocity measured at 50 feet distance from blast area and 4 pounds charge weight of explosive.

in/sec = inch(es) per second, VdB = vibration velocity decibels referenced to 1×10^{-6} in/sec.

6.2.2.1 Regulatory Context and Methodology

6.2.2.1.1 Regulatory Context

Minnesota regulates daytime (7:00 am to 10:00 pm) and nighttime (10:00 pm to 7:00 am) noise levels based on the land use activity at the location of the receiver (e.g., residential, commercial, or industrial land uses) (Minn. R. 7030.0040). These noise standards are expressed as a range of acceptable noise levels (dBA) within a 1-hour period: L_{50} is the noise level (dBA) that cannot be exceeded more than 50 percent of the time within 1 hour, while L_{10} is the dBA that cannot be exceeded more than 10 percent of the time within 1 hour. Table 6.2.2-4 describes Minnesota's applicable noise standards.

Table 6.2.2-4. Minnesota Noise Standards

Noise Area Classification	Daytime (dBA)		Nighttime (dBA)	
	L_{50}	L_{10}	L_{50}	L_{10}
Residential and other sensitive uses (e.g., educational, medical, cultural and designated recreational areas)	60	65	50	55
Non-residential uses (e.g., commercial areas, transportation facilities, and governmental services)	65	70	65	70
Non-residential uses (e.g., industrial/manufacturing areas, utilities, and highways/streets)	75	80	75	80

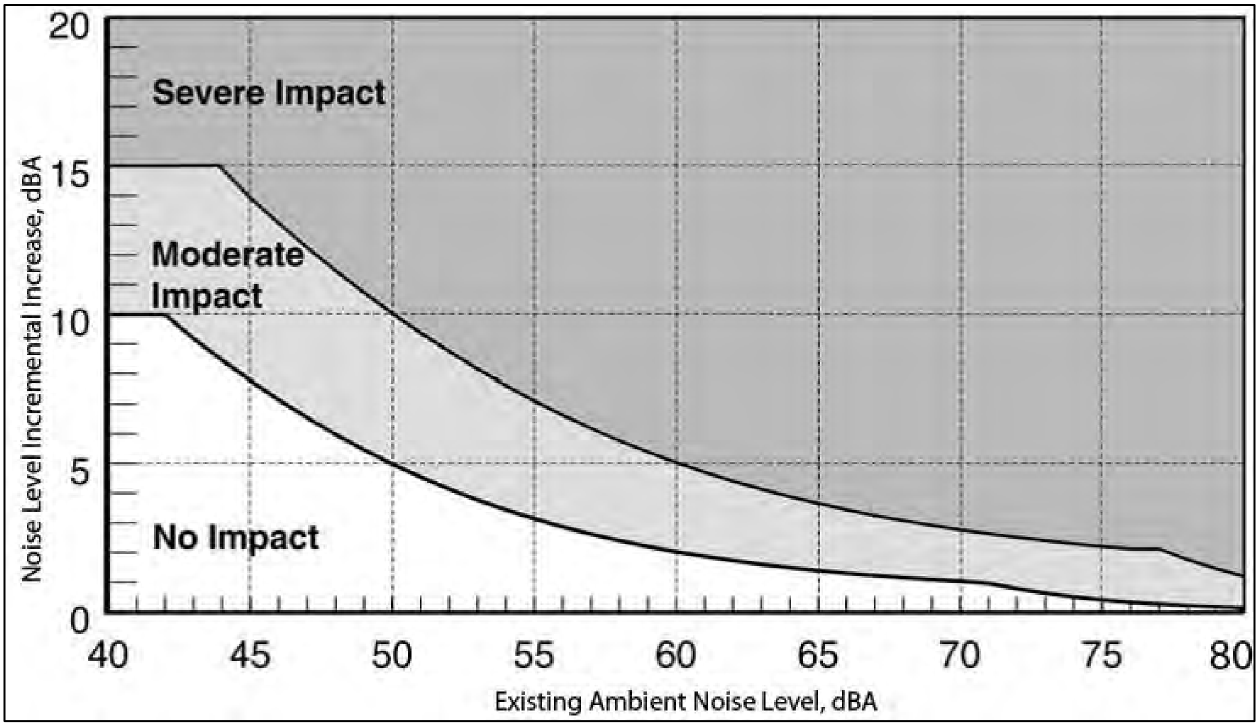
Source: Minnesota PCA 2000.

dBA = A-weighted decibel(s), L10 = the dBA that may be exceeded 10 percent of the time within 1 hour, L50 = the dBA that may be exceeded 50 percent of the time within 1 hour.

FTA regulations and criteria are not enforceable or otherwise directly applicable to a pipeline project. However, the FTA's noise impact criteria for combined noise increases (Figure 6.2.2-1) can be used to provide a qualitative description of long-term impacts from increases in ambient sound levels (i.e., the criteria are not suggested for use in defining short-term noise impacts that occur during construction). FTA impacts are categorized as no impact, moderate impact, or severe impact based on general community reactions to noise at varying levels. The criteria are based on the land use category of the receiving properties, including the following:

- Category 1 land uses are tracts of land where quiet is an essential element in their intended purpose and includes lands set aside for serenity and quiet, such as outdoor amphitheaters and concert pavilions, and National Historic Landmarks (NHLs), where outdoor interpretation usually occurs.
- Category 2 land uses are residences and buildings where people normally sleep. For Category 2 receiving properties, the FTA criteria include consideration of the potential for sleep disturbance.
- Category 3 land uses are institutional land uses with primary daytime and evening uses, including schools, libraries, theaters, and churches. Certain historical sites and parks are also included.

Based on the FTA impact criteria, locations with low existing ambient noise levels can be exposed to greater incremental increases in overall noise before impacts would occur, and locations with higher existing ambient noise levels can be exposed to lesser incremental increases in overall noise before impacts would occur (Figure 6.2.2-1).



Source: FTA 2006.

Notes:

Noise level incremental increases should be calculated in terms of $L_{eq(h)}$ for Categories 1 and 3 land uses, and L_{dn} for Category 2 land uses, where $L_{eq(h)}$ is the hourly equivalent sound level.

dBA = A-weighted decibel(s).

Figure 6.2.2-1. Federal Transit Administration Impact Criteria for Combined Noise Level Increases

When assessing the effects of vibration, the FTA states that vibration should be assessed quantitatively in cases where there is a significant potential for impact from construction activities, such as blasting, pile driving, vibratory compaction, demolition, and drilling or excavation in proximity to sensitive structures. The FTA construction vibration damage criteria are listed in Table 6.2.2-5.

Table 6.2.2-5. Construction Vibration Damage Criteria

Building Category	Vibration Velocity Level (VdB)	Peak Particle Velocity (in/sec)
Reinforced-concrete, steel or timber (no plaster)	102	0.500
Engineered concrete and masonry (no plaster)	98	0.300
Non-engineered timber and masonry buildings	94	0.200
Buildings extremely susceptible to vibration damage	90	0.120

Source: FTA 2006.

in/sec = inch(es) per second, VdB = vibration velocity decibels referenced to 1 × 10-6 in/sec.

6.2.2.1.2 Methodology

The ROI for the noise and vibration impacts analysis includes the sensitive receptors located near the proposed construction work areas that may be affected by noise from construction-related activities and equipment, along with the sensitive receptors located near the proposed pump stations that may be affected by noise from pump station operations. Impacts on receptors sensitive to noise and buildings susceptible to vibration damage were assessed by the following:

- Using GIS data supplied by the Applicant and data available from the U.S. Geological Survey (USGS) National Structures Dataset to identify the locations of sensitive receptors and associated buildings near the Applicant's preferred route and route alternatives (Enbridge 2014; USGS ESRI 2014).
- Calculating noise levels generated by construction-related activities and equipment at various distances from the proposed construction work areas. Where the calculated noise levels could potentially exceed the Minnesota Noise Standards for residential and other sensitive uses, the number of potentially affected sensitive receptors was quantified.
- Calculating noise levels generated by operation of pump stations at the nearest sensitive receptors and comparing results with the Minnesota Noise Standards for residential and other sensitive uses.
- Calculating the increased noise levels associated with operation of pump stations over the existing ambient levels at the nearest sensitive receptor locations and comparing the results with the FTA impact criteria for Category 2 land uses.
- Calculating vibration levels generated by construction-related activities and equipment at the nearest sensitive receptor building locations. Where the calculated vibration levels would exceed the FTA construction vibration damage criteria for buildings that are extremely susceptible to vibration damage, the number of potentially affected sensitive receptors was quantified.

No single one of the data sources identified above provides a complete indication of all relevant impacts from noise and vibration, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, USGS National Structures Dataset identifies the locations of sensitive receptors but does not consider specific building use or land use types. However, land use types also discussed in this section can aid the reader in understanding the extent of potential impacts on these sensitive receptors.

Furthermore, the quantitative information from these data sources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, of numbers of sensitive receptors within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a full understanding of the qualitative nature of impacts that could occur to different types of sensitive receptors is contained in the text of this section.

6.2.2.2 Existing Conditions

Sensitive receptors near the proposed construction work areas may be affected by both noise and vibration from construction-related activities and equipment, and sensitive receptors near the proposed pump stations may be affected by noise from operations. The existing ambient noise levels for these receptors along the alternative routes are described below.

6.2.2.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the noise and vibration ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

The land use along the Applicant's preferred route west of Clearbrook is primarily agricultural, while the land use east of Clearbrook is mainly forested land. Both of these land use types typically generate relatively low noise levels (Section 6.2.2.1). Existing ambient noise levels in areas that would be crossed by the Applicant's preferred route are estimated at 35 to 44 dBA L_{dn} (Table 6.2.2-2; EPA 1978). The estimated background vibration velocity level along the Applicant's preferred route is estimated at 52 VdB (representative of typical background vibration), which is below the threshold of perception for humans of approximately 65 VdB (FTA 2006).

Table 6.2.2-6 summarizes the existing ambient noise levels at the sensitive receptors nearest the pump stations for the Applicant's preferred route. These existing ambient (preconstruction) noise levels were determined by surveys completed by the Applicant (Enbridge 2016a). Because noise decreases with distance, the noise level at the nearest sensitive receptor to each of the proposed pump stations would experience the greatest impact.

Table 6.2.2-6. Sensitive Receptors and Existing Ambient Noise Levels near Proposed Pump Stations for the Applicant's Preferred Route in Minnesota

Pump Station	Distance from Pump Station to Nearest Sensitive Receptor (feet)	Existing Ambient Noise Level at Nearest Sensitive Receptor (dBA)
Donaldson	1,850	41.1
Plummer	1,350	38.2
Viking	2,550	34.9
Clearbrook	1,850	36.5
Two Inlets	1,000	38.6
Palisade	1,150	35.6
Backus	750	42.2
Cromwell	1,650	33.4

Source: Enbridge 2016a.
dBA = A-weighted decibel(s).

6.2.2.2.2 Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to noise and vibration for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the noise and vibration ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-03AM between Clearbrook and Carlton would be 95 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-03AM are primarily agricultural and forest, which typically generate relatively low noise levels. Since the land uses are similar to those along the Applicant's preferred route, the existing ambient noise and vibration levels were assumed to be within the same range (35 to 44 dBA L_{dn} and 52 VdB).

Based on the spacing of pump stations along the Applicant's preferred route, it was assumed that six pump stations would be required along the route of RA-03AM between Clearbrook and Carlton. However, the existing conditions near the six pump stations cannot be specified because the locations of pump stations for RA-03AM have not been determined.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the noise and vibration ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-06 between Clearbrook and Carlton would primarily establish a new right-of-way corridor, with only 20 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-06 are primarily agricultural and forest, which typically generate relatively low noise levels. Since the land uses are similar to those along the Applicant's preferred route, the existing ambient noise and vibration levels were assumed to be within the same range (35 to 44 dBA L_{dn} and 52 VdB).

Based on the spacing of pump stations along the Applicant's preferred route, it was assumed that four pump stations would be required along the route of RA-06 between Clearbrook and Carlton. However, the existing conditions near the four pump stations cannot be specified because the locations of pump stations for RA-06 have not been determined.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the noise and vibration ROI for

RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-07 between Clearbrook and Carlton would be 100 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-07 are primarily agricultural and forest, which typically generate relatively low noise levels. Since the land uses are similar to those along the Applicant's preferred route, the existing ambient noise and vibration levels were assumed to be within the same range (35 to 44 dBA L_{dn} and 52 VdB).

Based on the spacing of pump stations along the Applicant's preferred route, it was assumed that four pump stations would be required along the route of RA-07 between Clearbrook and Carlton. It was assumed that existing pump stations along the Enbridge Mainline corridor could be upgraded to accommodate new pumps for RA-07. However, which existing pump stations would be upgraded has not been determined. Thus, the existing conditions near the four existing pump stations cannot be specified.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the noise and vibration ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-08 between Clearbrook and Carlton would be 100 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-08 are primarily agricultural and forest, which typically generate relatively low noise levels. Since the land uses are similar to those along the Applicant's preferred route, the existing ambient noise and vibration levels were assumed to be within the same range (35 to 44 dBA L_{dn} and 52 VdB).

Based on the spacing of pump stations along the Applicant's preferred route, four pump stations would be required along the route of RA-08 between Clearbrook and Carlton. It was assumed that existing pump stations along the Enbridge Mainline corridor could be upgraded to accommodate new pumps for RA-08. However, which existing pump stations would be upgraded has not been determined. Thus, the existing conditions near the four existing pump stations cannot be specified.

6.2.2.3 Impact Assessment

Project-related noise effects generally fall into two categories: temporary effects resulting from the use of construction equipment and activities and permanent effects resulting from pump station operations. Vibration, as it relates to potential for building damage, would result primarily from construction equipment and activities, causing temporary effects.

Noise impacts from construction were determined for typical construction equipment, HDD, and blasting. Construction noise levels are temporary and are rarely steady; they fluctuate depending on the number and type of equipment in use at any given time. In addition, construction-related sound levels experienced at a sensitive receptor near the construction activity are a function of distance; other noise sources; and the presence and extent of vegetation, structures, and intervening topography between the noise source and the sensitive receptor.

Pipeline construction generally proceeds several hundred feet to 1 mile per day. Because of the assembly-line method of construction, active pipeline construction in any one area would generally last from 1 week to 30 days. As a result, noise impacts on nearby sensitive receptors would typically be localized, intermittent, and temporary. Construction of associated facilities generally takes longer to complete, but noise impacts would still be expected to be localized, intermittent, and temporary. The nighttime noise levels normally would be unaffected because typical construction would be limited to daylight hours. For this analysis, noise impacts for typical construction equipment were calculated using noise levels generated by two bulldozers, two dump trucks, one generator, one front-end loader, two excavators, one light plant, and a drill rig (Federal Highway Administration [FHWA] 2006). This is a typical scenario for construction equipment that could be operating at roughly the same time and location during a construction phase.

Noise impacts from HDD and blasting also were considered. HDD is used to install the pipeline crossing under waterbodies and railroad tracks, and is typically a 24-hour-per-day operation. For this analysis, noise impacts were calculated using noise levels generated by HDD at the entry point and at the exit point, with equipment not operating concurrently at both locations. HDD equipment at the entry point includes one drill rig, one mud pump, one generator, one air compressor, one crane, one pump generator, and two excavators; HDD equipment at the exit point includes one mud pump, one generator, one pump generator, and two excavators (FHWA 2006). This is a typical scenario for the construction equipment that could be operating at roughly the same time and location.

Noise impacts produced during blasting would be instantaneous and would vary based on a number of factors, such as the type and amount of explosives used, distance of the receptor to the blast site, below-ground depth of explosives, and noise minimization measures applied. However, typical construction blasting noise levels have been documented at about 94 dBA at a distance of 50 feet (FHWA 2006).

Noise impacts from operation of the pipeline primarily would originate from the pump stations. Crude oil traveling through the buried pipeline would not be expected to emit audible noise above the surface or a perceptible level of vibration. Furthermore, noise and vibration levels from operation of the Clearbrook terminal would not be expected to increase beyond the existing levels, and noise and vibration levels from routine inspection and maintenance activities would not be expected to result in perceptible noise or vibration level increases at the nearest sensitive receptors.

6.2.2.3.1 Applicant’s Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant’s preferred route will have on the existing environment within the noise and vibration ROI for the Applicant’s preferred route as described above. It should be noted that even in areas where the Applicant’s preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, thisPproject will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Noise levels for typical construction equipment at various distances from the construction work area were calculated and compared to the Minnesota Noise Standards. Typical construction noise attenuates to compliance levels with the daytime noise standards at 1,250 feet from the noise source. A total of 911 sensitive receptors are located less than 1,250 feet from the construction work area for the Applicant's preferred route and may experience noise at levels that exceed the daytime Minnesota Noise Standards, resulting in major temporary and intermittent impacts. Note that the calculations utilized an acoustical usage factor to estimate the fraction of time each piece of equipment is operating at full power (i.e., its loudest condition) during an hour to account for intermittent operation. Actual noise levels and the resulting number of affected sensitive receptors may differ than those predicted if the number, type, and usage of equipment varies. The Applicant proposes to minimize typical construction-related noise impacts by limiting pipeline construction activities to daylight hours, maintaining equipment in good working order, limiting transportation to areas of active construction, and using manufacturer-supplied silencers when available (Enbridge 2016b). As explained in detail in Section 6.2.4, the Applicant also proposes to remove or re-locate any residence located within the permanent pipeline right-of-way.

For the Applicant's preferred route, HDD would be used at 21 locations, and blasting likely would be required between MP 354.6 and MP 356.6 (Enbridge 2016a, 2016b). The noise levels for HDD and blasting were calculated at 0.5 mile (2,640 feet) from the activity, and results were compared with the Minnesota Noise Standards. The noise from HDD attenuates to levels in compliance with the nighttime noise standards at 2,640 feet; therefore, a total of 81 sensitive receptors located less than 0.5 mile (2,640 feet) from an HDD site may experience noise at levels that exceed the standard, resulting in major intermittent and temporary impacts. Note that the calculations utilized an acoustical usage factor to estimate the fraction of time each piece of equipment is operating at full power (i.e., its loudest condition) during an hour to account for intermittent operation. Actual noise levels and the resulting number of affected sensitive receptors may differ than those predicted if the number, type, and usage of equipment varies. The Applicant proposes to limit noise impacts by maintaining equipment in good working order and using manufacturer-supplied silencers when available (Enbridge 2016b).

The Applicant anticipates the need for four blasting events, each covering 400 feet (Enbridge 2016a). In any 1 day, there would be only one blasting event (Enbridge 2016a). Three sensitive receptors are less than 0.5 mile (2,640 feet) from potential blasting locations. However, blasting would comply with the daytime noise standard at both 0.5 mile (2,640 feet) and 0.3 mile (1,758 feet), the distance of the nearest sensitive receptor, resulting in negligible, temporary impacts. Note that blasting also produces concussion waves within the lower inaudible frequency range of human hearing, which can cause annoyance to humans and damage to structures. The Applicant incorporated the lower frequencies into calculations, and results at the nearest sensitive receptor were below the value established by the U.S. Bureau of Mines for potential to cause damage to buildings (Enbridge 2016a). The Applicant would prepare a site-specific blasting plan to address safety, use, storage, and transportation of explosives. The plan would include public and agency notification protocols.

Table 6.2.2-7 compares vibration velocity impact levels from construction equipment and activities with the FTA vibration velocity damage criteria at the nearest sensitive receptor. Results indicate that vibration from HDD and blasting would not be above the damage criteria at any sensitive receptor. However, vibration from typical construction equipment could be above the damage criteria for sensitive receptors located within the construction work area, depending on their proximity to the source. As stated in Section 6.2.4, seven residences are within the construction work area for the Applicant's preferred route (excluding one residence located within the permanent right-of-way that would be removed or re-located). The exact placement of typical construction equipment within the construction work area is unknown. If construction equipment is operated less than 20 feet from sensitive receptors, calculations indicate that vibration from typical construction equipment could exceed FTA's damage criteria, resulting in major intermittent and temporary impacts.

Table 6.2.2-7. Construction Vibration Levels and Impacts for the Applicant's Preferred Route in Minnesota

Construction Activity	Distance to Nearest Sensitive Receptor[a] (feet)	Construction Vibration Velocity Level (VdB)	Vibration Velocity Level Damage Criteria[a] (VdB)	Construction Peak Particle Velocity (in/sec)	Peak Particle Velocity Damage Criteria[b] (in/sec)	Compliance with FTA Criteria
North Dakota Border to Clearbrook						
Typical construction equipment	95	69.6	90	0.012	0.120	Yes
Horizontal directional drilling	578	46.1		0.001		Yes
Blasting	--	--		--		--
Clearbrook to Carlton						
Typical construction equipment	20	89.9	90	0.120	0.120	Yes
Horizontal directional drilling	275	55.8		0.002		Yes
Blasting	1,758	53.6		0.001		Yes
Carlton to Wisconsin Border						
Typical construction equipment	89	70.5	90	0.013	0.120	Yes
Horizontal directional drilling	--	--		--		--
Blasting	--	--		--		--

Sources: FHWA 2006; FTA 2006.

[a] Nearest sensitive receptor is the closest residence, school, church, and hospital/medical center. For typical construction equipment, distance is measured from the right-of-way centerline to the nearest receptor.

[b] Damage criteria selected for buildings extremely susceptible to vibration damage as worst-case assessment per Table 6.2.2-5.

FTA = Federal Transit Administration, in/sec = inch(es) per second, VdB = vibration velocity decibels referenced to 1×10^{-6} in/sec.

Operations Impacts

Table 6.2.2-8 identifies the noise levels at the closest sensitive receptor from operation of pump stations. Results indicate that all pump stations would produce noise levels at the nearest sensitive receptors in compliance with the more restrictive nighttime Minnesota Noise Standards resulting in negligible permanent impacts. The Applicant's design measures restrict the noise levels around neighboring dwellings and industrial facilities to 40 dBA, measured at a distance of 50 feet from the affected structure, unless state regulations allow higher noise levels. If noise is determined to be above the Minnesota Noise Standards, the Applicant would be required to implement design measures to come into compliance with those standards, such as placement of pumps and motors inside a building.

Additional noise measures proposed by the Applicant may include insulation, acoustic louvers, and acoustic silencers. The Applicant also has committed to conducting post-construction noise surveys at each of the nearest sensitive receptors to ensure compliance with the Minnesota Noise Standards (Enbridge 2016b).

Table 6.2.2-8. Noise Levels and Impacts from Pump Station Operations for the Applicant's Preferred Route in Minnesota

Pump Station	Nearest Sensitive Receptor Distance (feet)	Existing Ambient Noise Level[a] (dBA)	Estimated Operations Noise (dBA)		Combined Noise, Ambient + Operations (dBA)		Increased Noise over Ambient Noise Level (dBA)	Minnesota Noise Standards[b] (dBA)		Compliance with Minnesota Noise Standards	FTA Impact Criteria
			L_{50}	L_{10}	L_{50}	L_{10}		L_{50}	L_{10}		
North Dakota Border to Clearbrook											
Donaldson	1,850	41.1	28.2	28.2	41.3	41.3	0.2	50	55	Yes	No impact
Plummer	900	38.2	35.1	35.1	39.9	39.9	1.7			Yes	No impact
Viking	2,900	34.9	23.5	23.5	35.2	35.2	0.3			Yes	No impact
Clearbrook to Carlton											
Clearbrook	2,950	36.5	23.1	23.1	36.7	36.7	0.2	50	55	Yes	No impact
Two Inlets	1,000	38.6	33.9	33.9	39.9	39.9	1.3			Yes	No impact
Palisade	1,250	35.6	31.8	31.8	37.1	37.1	1.5			Yes	No impact
Backus	750	42.2	37.0	37.0	43.3	43.3	1.1			Yes	No impact
Cromwell	1,650	33.4	29.3	29.3	34.8	34.8	1.4			Yes	No impact

Source: Enbridge 2016a.

[a] Existing ambient noise levels identified from Table 6.2.2-6.

[b] Nighttime noise standard selected as applicable to residential and other sensitive uses (e.g., educational, medical, cultural, and designated recreational areas) per Table 6.2.2-4.

Notes:

No pump stations would be located in the Carlton-to-Wisconsin-border segment.

dBA = A-weighted decibel(s), FTA = Federal Transit Administration, in/sec = inch(es) per second, L_{10} = the dBA that may be exceeded 10 percent of the time within 1 hour, L_{50} = the dBA that may be exceeded 50 percent of the time within 1 hour, VdB = vibration velocity decibels referenced to 1×10^{-6} in/sec.

Table 6.2.2-8 also shows the increase in noise levels at the closest sensitive receptor from operation of pump stations. Results are compared to the FTA impact criteria for combined noise level increases for Category 2 land uses (Figure 6.2.2-1) in order to assess the magnitude of predicted impacts. According to this analysis, the increases in noise at the nearest sensitive receptor from operation of each of the pump stations would result in no impact on sensitive receptors. "No impact" by FTA definition is when introduction of a proposed project would result in insignificant increases in the number of people highly annoyed by the new noise (FTA 2006). It should be noted that the FTA criteria are based on general community reactions to noise at varying levels and are used to supplement the analyses based on regulatory levels.

6.2.2.3.2 Route Alternatives (from Clearbrook to Carlton)

As calculated for the Applicant's preferred route, typical construction noise levels for route alternatives RA-03AM, RA-06, RA-07, and RA-08 would attenuate to compliance with the daytime Minnesota Noise Standards at 1,250 feet from the noise source. This distance is considered valid for all route alternatives because the same construction equipment would be used for each route. Table 6.2.2-9 shows the number of sensitive receptors along the Clearbrook-to-Carlton segment that may be affected by noise from the route alternatives. Note that the noise calculations utilized an acoustical usage factor to estimate the fraction of time each piece of equipment is operating at full power (i.e., its loudest condition) during an hour to account for intermittent operation. Actual noise levels and the resulting number of affected sensitive receptors may differ than those predicted if the number, type, and usage of equipment varies.

Table 6.2.2-9 also identifies the number of sensitive receptor associated buildings located within the construction work areas along the Clearbrook-to-Carlton segment that may be affected by vibration from the route alternatives. Although the exact placement of typical construction equipment within the construction work areas is unknown, calculations indicate that vibration from typical construction equipment operating less than 20 feet from noise-sensitive receptors may not comply with the FTA's damage criteria (Table 6.2.2-5).

The noise and vibration impacts generated during HDD installation and blasting along the route alternatives also are expected to be comparable to the noise and vibration levels of these activities along the Applicant's preferred route. Because the locations of any HDD or blasting activities along the route alternatives have not been determined, it is not possible to quantify the number of sensitive receptors that could be affected by these activities.

Table 6.2.2-9. Number of Sensitive Receptors Affected by Typical Construction Noise and Vibration for the Route Alternatives between Clearbrook and Carlton

Route	Number of Sensitive Receptors within 1,250 Feet of Construction Work Area (Noise)	Number of Sensitive Receptors within the Construction Work Area (Vibration)
Route alternative RA-03AM	1,507	13
Route alternative RA-06	328	2
Route alternative RA-07	1,271	40
Route alternative RA-08	749	6

Sources: Enbridge 2014; USGS ESRI 2014.

Notes:

The number of sensitive receptors within the construction work area excludes receptors located within the permanent right-of-way that would be removed or re-located.

The noise generated during HDD installation and blasting along the route alternatives is expected to be comparable to the noise of these activities along the Applicant's preferred route. Because the locations of any HDD or blasting activities along the route alternatives have not been determined, it is not possible to quantify the number of noise-sensitive receptors that could be affected by these activities.

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the noise and vibration ROI for

RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

As indicated in Table 6.2.2-9, a total of 1,507 sensitive receptors are located less than 1,250 feet from the construction work area for RA-03AM and may experience noise from typical construction equipment at levels that exceed the daytime Minnesota Noise Standards, resulting in major intermittent and temporary impacts. The Applicant-proposed measures to minimize noise impacts during construction identified for the Applicant's preferred route also would be implemented for the route alternatives.

Vibration from typical construction equipment could be above the damage criteria for 13 sensitive receptors located within the construction work area for RA-03AM. If construction equipment is operated less than 20 feet from these sensitive receptors, calculations indicate that vibration could exceed FTA's damage criteria, resulting in major intermittent and temporary impacts.

Because the locations of any HDD or blasting activities along the route alternatives have not been determined, it is not possible to quantify the number of sensitive receptors that could be affected by noise or vibration from these activities.

Operations Impacts

The locations of pump stations along RA-03AM have not been determined; thus, the impacts for the nearest sensitive receptors affected by operation of pump stations cannot be quantified.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the noise and vibration ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

As indicated in Table 6.2.2-9, 328 sensitive receptors are located less than 1,250 feet from the construction work area for RA-06 and may experience noise from typical construction equipment at levels that exceed the daytime Minnesota Noise Standards, resulting in major intermittent and temporary impacts. The Applicant-proposed measures to minimize noise impacts during construction identified for the Applicant's preferred route also would be implemented for the route alternatives.

Vibration from typical construction equipment could be above the damage criteria for two sensitive receptors located within the construction work area for RA-06. If construction equipment is operated less than 20 feet from these sensitive receptors, calculations indicate that vibration could exceed FTA's damage criteria, resulting in major intermittent and temporary impacts.

Because the locations of any HDD or blasting activities along the route alternatives have not been determined, it is not possible to quantify the number of sensitive receptors that could be affected by noise or vibration from these activities.

Operations Impacts

The locations of pump stations along RA-06 have not been determined; thus, the impacts for the nearest sensitive receptors affected by operation of pump stations cannot be quantified.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the noise and vibration ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

As indicated in Table 6.2.2-9, 1,271 sensitive receptors are located less than 1,250 feet from the 205-foot-wide construction work area for RA-07 and may experience noise from typical construction equipment at levels that exceed the daytime standard, resulting in major intermittent and temporary impacts. The Applicant-proposed measures to minimize noise impacts during construction identified for the Applicant's preferred route also would be implemented for the route alternatives.

Vibration from typical construction equipment could be above the damage criteria for 40 sensitive receptors located within the construction work area for RA-07. If construction equipment is operated less than 20 feet from these sensitive receptors, calculations indicate that vibration could exceed FTA's damage criteria, resulting in major intermittent and temporary impacts.

Because the locations of any HDD or blasting activities along the route alternatives have not been determined, it is not possible to quantify the number of sensitive receptors that could be affected by noise or vibration from these activities.

Operations Impacts

The four pump stations along RA-07 that would be upgraded have not been identified; thus, the impacts for the nearest sensitive receptors affected by operation of pump stations cannot be quantified.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the noise and vibration ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

As indicated in Table 6.2.2-9, 749 sensitive receptors are located less than 1,250 feet from the construction work area for RA-08 and may experience noise from typical construction equipment at levels that exceed the daytime standard, resulting in major intermittent and temporary impacts. The Applicant-proposed measures to minimize noise impacts during construction identified for the Applicant's preferred route also would be implemented for the route alternatives.

Vibration from typical construction equipment could be above the damage criteria for six sensitive receptors located within the construction work area for RA-08. If construction equipment is operated less than 20 feet from these sensitive receptors, calculations indicate that vibration could exceed FTA's damage criteria, resulting in major intermittent and temporary impacts.

Because the locations of any HDD or blasting activities along the route alternatives have not been determined, it is not possible to quantify the number of sensitive receptors that could be affected by noise or vibration from these activities.

Operations Impacts

The pump stations along RA-08 that would be upgraded have not been identified; thus, the impacts for the nearest sensitive receptors affected by operation of pump stations cannot be quantified.

6.2.2.4 Summary and Mitigation

Summary

The impacts associated with noise and vibration from construction and operation of the Applicant's preferred route and the route alternatives between Clearbrook and Carlton are summarized in Table 6.2.2-10.

Construction noise would be temporary and intermittent along the Applicant's preferred route and the route alternatives. As shown in Table 6.2.2-10, the fewest sensitive receptors are located within 1,250 feet of the construction work area for RA-06 that may be affected by typical construction equipment noise, followed closely by the Applicant's preferred route and RA-08; considerably greater numbers of sensitive receptors potentially would be affected by typical construction equipment noise associated with RA-03AM and RA-07. HDD and blasting locations have not been identified for the route alternatives; thus, their associated noise impacts on noise-sensitive receptors cannot be compared with those for the Applicant's preferred route.

Even with implementation of the Applicant-proposed measures and additional potential mitigation measures described below, it is possible for typical construction noise and noise from specialized construction methods (e.g., HDD), although intermittent and of short duration, to exceed Minnesota Noise Standards for some sensitive receptors along the Applicant's preferred route and route alternatives. Specifically, noise from construction for any route would depend on the number, type, and usage of the equipment and its distance to noise-sensitive receptors. The resulting impact would be negligible for those sensitive receptors located far from the noise source and major (although intermittent and temporary) for nearby sensitive receptors.

Table 6.2.2-10 also identifies the sensitive receptor associated buildings located within the construction work areas along the Applicant's preferred route and route alternatives. If typical construction equipment is operated less than 20 feet from the sensitive receptors, calculations indicate that vibration could exceed FTA's damage criteria, resulting in major intermittent and temporary impacts. With implementation of mitigation described below, construction-related vibration from typical construction would be minor to negligible for sensitive receptors along any route. HDD and blasting locations have not been identified for the route alternatives; thus, their associated vibration impacts cannot be compared with those for the Applicant's preferred route.

Because the location of potential new and upgraded pump stations have not been determined for the route alternatives, the associated impacts on the nearest sensitive receptors cannot be assessed and compared with those of the Applicant's preferred route. The Applicant-proposed measures for the Applicant's preferred route also would be implemented for the route alternatives. Consequently, noise from pump station operations, although permanent, is expected to be negligible for all routes and is not expected to result in noise levels above the Minnesota Noise Standards or to affect any noise-sensitive receptor for any route.

Table 6.2.2-10. Summary of Potential Noise and Vibration Impacts for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Noise from typical construction equipment exceeding daytime Minnesota Noise Standards	Temporary and intermittent/major impacts • 524 sensitive receptors	Temporary and intermittent/major impacts • 1,507 sensitive receptors	Temporary and intermittent/major impacts • 328 sensitive receptors	Temporary and intermittent/major impacts • 1,271 sensitive receptors	Temporary and intermittent/major impacts • 749 sensitive receptors
Noise from HDD exceeding nighttime Minnesota Noise Standards	Temporary and intermittent/major impacts • 35 sensitive receptors	*HDD locations are not available for the route alternatives. Therefore, the number of affected sensitive receptors and resulting noise impacts cannot be quantified.*			
Noise from blasting exceeding daytime Minnesota Noise Standards	Temporary/negligible impacts • 0 sensitive receptors above standard	*Blasting locations are not available for the route alternatives. Therefore, the number of affected sensitive receptors and resulting noise impacts cannot be quantified.*			
Vibration from typical construction equipment exceeding FTA damage criteria	Temporary and intermittent/major impacts without mitigation • 5 sensitive receptors	Temporary and intermittent/major impacts without mitigation • 13 sensitive receptors	Temporary and intermittent/major impacts without mitigation • 2 sensitive receptors	Temporary and intermittent/major impacts without mitigation • 40 sensitive receptors	Temporary and intermittent/major impacts without mitigation • 6 sensitive receptors
Vibration from HDD and blasting exceeding FTA damage criteria	Temporary/negligible impacts • 0 sensitive receptors above criteria	*HDD and blasting locations are not available for the route alternatives. Therefore, the affected sensitive receptors and resulting vibration impacts cannot be quantified.*			

Table 6.2.2-10. Summary of Potential Noise and Vibration Impacts for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Operations Impacts		
Noise from pump stations exceeding nighttime Minnesota Noise Standards and FTA impact criteria	Permanent/negligible impacts • 0 sensitive receptors above standards and criteria	*New and upgraded pump station locations are not available for route alternatives. Therefore, the resulting noise impacts at the nearest sensitive receptors cannot be quantified.*

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to sensitive receptors. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, the number of sensitive receptors that experience an exceedance of daytime noise standards do not consider how nighttime noise is experienced. However, information from other datasets, like the noise from pump stations and blasting, helps to define the extent of potential impacts on receptors located near various project components. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in the tables should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-70 to 6-78. The table above, for example provides the number of sensitive receptors that experience noise from pump stations that exceed nighttime standards and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to sensitive receptors is contained in the impacts discussion in the text (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-71 to 6-74. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-75 to 6-76. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-76 to 6-77. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[f] **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on page 6-77. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.2.2-10. Summary of Potential Noise and Vibration Impacts for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-77 to 6-78. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Mitigation

In addition to the Applicant-proposed measures described above, the Applicant can further mitigate noise impacts from typical construction equipment when less than 1,250 feet from a sensitive receptor, as presented by FTA (2006), as follows:

- Equipping construction equipment with residential-grade mufflers, and/or constructing noise barriers or walled enclosures between noisy activities or clusters of noisy equipment and sensitive receivers as much as practical.
- Siting equipment on the construction lot as far away from sensitive receivers as possible.
- Combining noisy operations to occur in the same time period. The total noise level produced will not be significantly greater than the level produced if the operations were performed separately.
- Posting signage with contact phone number to notify sensitive receptors of pending and active construction.

The Applicant could mitigate potential vibration impacts by:

Locating construction equipment at least 20 feet from a sensitive receptor.

6.2.2.5 References

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6.2.3 Aesthetics/Visual Resources

The aesthetic or visual quality of the landscape is of importance as a resource to residents, tourists, and other users of a given area. The value of the resource varies with the type of land cover, topography, and availability of locations where a viewshed can be observed. Changes in the land cover (e.g., removal of forested areas or development) and introduction of man-made facilities (e.g., a pipeline and its associated facilities) into a viewshed may change the quality of the visual experience. Certain areas have higher sensitivity to changes in a viewshed. These include parks, forests, and other special management areas; Indian reservations; scenic byways, scenic rivers, and trails; and residences.

The analysis of impacts on aesthetics and visual resources from construction and operation of the Applicant's preferred route and the route alternatives considers the following issues:

- Removal of existing vegetation, grading, and the presence of construction workers and equipment in a viewshed;
- Presence of permanent aboveground facilities in a viewshed; and
- Maintenance clearing along rights-of-way and access roads.

This section describes the existing aesthetic/visual resources within an area along the construction work area for the Applicant's preferred route and each of the route alternatives where receptors (viewshed users) could be affected by construction and operation of the Project. The potential impacts of Project-related construction and operation on aesthetics and visual resources are considered, and potential impacts are assessed. Potential impacts for each route option (the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08) also are assessed and compared to each other. A summary and comparison of potential impacts are included at the end of the section. Chapter 10 addresses impacts on aesthetics and visual resources resulting from crude oil releases.

6.2.3.1 Regulatory Context and Methodology

6.2.3.1.1 Regulatory Context

Aesthetic or visual resources were considered relative to the general guidance of Minnesota Statute 116D, which identifies the State's responsibility to "assure for all the people of the state safe, healthful, productive, and aesthetically and culturally pleasing surroundings." Specific regulations that define standards governing allowable effects on the quality of the visual environment have not been established in Minnesota. As discussed below, guidance on methodologies for undertaking such assessments are available.

6.2.3.1.2 Methodology

Guidance by the U.S. Forest Service (USFS) and the Service's Scenic Management System (SMS) was used as a basis for understanding the quality of, location of, and potential impacts on aesthetic resources. The SMS provides a framework for consistently evaluating and managing landscapes and thus maintaining aesthetically and culturally pleasing surroundings (USFS 1995). The SMS uses the following key elements when evaluating landscapes:

- **Scenic Attractiveness.** Scenic value can be divided into one of three classes based on whether landscapes are distinctive, typical, or indistinctive.

- **Scenic Integrity.** The scenic integrity of a landscape is ranked on a scale of very high to unacceptably low. The rank is determined based on the intactness of or degree of disruption to the landscape character.
- **Landscape Visibility.** The visibility of a landscape relates first to the importance of a landscape to the viewer and second to the distance between the viewer and the landscape.
- **Constituent Analysis.** The importance of landscapes to the constituents is expressed as a concern level of low to high.
- **Seen Areas and Distance Zones.** Distance zones of immediate foreground, foreground, middleground, and background are used to understand the relative sensitivity of a landscape based on its distance from the observer.

Through County Visual Quality committees, Minnesota has developed visual sensitivity classifications for highways, roads, designated recreation trails, lakes, and rivers in forested areas. These areas are collectively referred to as "travel routes and areas" for the purposes of this EIS. Visual sensitivity classes have been determined for 16 counties in northeast and central Minnesota (Minnesota DNR 2016a). The rating system consists of three classes: high scenic quality (*most sensitive*), moderate scenic quality (*moderately sensitive*), and low scenic quality (l*ess sensitive*). Similar to the USFS methods of analyzing visual resources, the ranking system used in Minnesota reflects the type and volume of users in determining sensitivity. For example, low-sensitivity areas may include public, low-volume local forest roads and non-recreational lakes and rivers. High sensitivity is given to travel routes and areas with significant public use and high user concern for visual resources (Minnesota DNR 2016a).

Impacts on aesthetics and visual resources and the alterations to viewsheds that may occur from construction and operation of the Applicant's preferred route and route alternatives were evaluated by:

- Following guidance by the USFS SMS framework described above for consistently evaluating landscapes.
- Identifying existing land use and the potential locations of sensitive viewers, using available GIS information. Data included the locations and distribution of forested areas, agricultural and open areas, scenic byways, special management areas, and Indian reservations. These datasets provide information about landscape visibility and the locations of sensitive areas, including areas of high use and areas of high viewer sensitivity. Special attention was given to Project areas that would cross through forested areas or be co-located with existing rights-of-way because those factors can greatly influence the magnitude of visual impacts.
- Using GIS to identify visual sensitivity classes (described above) for travel routes and areas crossed by the Applicant's preferred route and the route alternatives.
- Comparing the number of residences that occur within sensitive viewsheds near construction activities, permanent facilities, and landscape changes. Residences and residential areas represent areas where the importance of surrounding landscapes to the constituents, as well as the number of users, is likely to be moderate to high.

No single one of the data sources considered above provides a complete indication of all relevant impacts to aesthetics and visual resources, but together the different metrics provide a reasonably comprehensive indication of the potential impacts. For example, while counts of residences in the ROI can aid in identifying the number of potentially affected people, information about visual sensitivity

class can provide a better understanding severity of changes in visual and aesthetic experience at these receptors.

Furthermore, the quantitative information from these data sources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, of acres of special management areas, scenic byway crossings, etc. within the ROI, however a full understanding of the qualitative nature of impacts that could occur to different types of visual resources is contained in the text of this section. Users of this EIS should review both the text and tables to gain a full understanding of the potential impacts of the proposed Project and alternatives to the proposed Project.

The ROI for this analysis includes all areas of high use and high user concern within the viewshed of a pipeline route or aboveground facilities. This can include parks, forests, and other special management areas; Indian reservations; scenic byways, scenic rivers, and trails; and the built environment. The "viewshed" was considered to be the immediate foreground (or 300 feet) from the edge of the construction work area and within 0.25 mile of aboveground facilities. Given the land cover and topography of the area, viewers within the immediate foreground would represent the most sensitive viewers. For permanent aboveground facilities of any appreciable size, viewers within 0.25 mile would represent the most sensitive viewers.

6.2.3.2 Existing Conditions

6.2.3.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the visual resources ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

The majority of existing land uses that would be crossed by the Applicant's preferred route are agricultural lands, followed by forested lands, wetlands, open lands, developed lands, and open water (Table 6.2.1-2). Approximately 82 percent of the Applicant's preferred route is co-located with existing rights-of-way, which are generally maintained in a cleared condition or may be in agricultural production. This includes 100 percent of the route from the North Dakota border to Clearbrook, 73 percent of the route from Clearbrook to Carlton, and 89 percent of the route from Carlton to the Wisconsin border.

The Applicant's preferred route would not cross any Indian reservation lands. The acreage of special management areas, including Wildlife Management Areas (WMAs) and state forests that would be crossed by the pipeline route, is provided in Table 6.2.3-1.

Table 6.2.3-1. Special Management Areas Crossed by the Applicant's Preferred Route in Minnesota

Route Segment	Special Management Area	Acres within Construction Work Area
North Dakota border to Clearbrook	None	0.0
Clearbrook to Carlton	Grayling Marsh Wildlife Management Area	14.1
	Lawler Wildlife Management Area	2.9
	Foot Hills State Forest	42.3
	Hill River State Forest	102.9
	Huntersville State Forest	96.9
	Land O'Lakes State Forest	130.2
	Mississippi Headwaters State Forest	25.1
	Paul Bunyan State Forest	<0.1
	Savanna State Forest	8.7
	Waukenabo State Forest	15.8
Carlton to Wisconsin border	None	0.0

Scenic byways are part of the National Scenic Byways Program under the U.S. Department of Transportation (USDOT) and the FHWA. Scenic byways are created to recognize archaeological, cultural, historic, natural, recreational, and scenic qualities. From the North Dakota border to Clearbrook, no scenic byways would be crossed. Between Clearbrook and Carlton, the Great River Road Scenic Byway and Lake Country Scenic Byway each would be crossed twice. The Great River Road Scenic Byway is a multi-state scenic byway that follows the Mississippi River through Arkansas, Illinois, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Tennessee, and Wisconsin. The Great River Road Scenic Byway recognizes several historical developments, including the Underground Railroad, and offers numerous historic sites and cultural artifacts to travelers (FHWA 2016). From Carlton to Superior, the Project would cross the Veterans Memorial Scenic Byway once.

The Mississippi River, which is classified as a State Water Trail, would be crossed twice by the Applicant's preferred route. The Applicant's preferred route also would cross snowmobile and all-terrain vehicle (ATV) trails, which often are found in scenic areas with potentially high use.

The visual sensitivity classification for travel routes and areas crossed by the Applicant's preferred route are provided in Table 6.2.3-2, and the number of residences that would be near construction and operation of the pipeline is provided in Table 6.2.3-3. Note that the USFS SMS defines the area within 300 feet of the observer as the immediate foreground (USFS 1995).

Table 6.2.3-2. Visual Sensitivity Classifications of Travel Routes and Areas Crossed by the Applicant's Preferred Route in Minnesota

Segment	Visual Sensitivity Classification			TOTAL
	Low	Moderate	High	
North Dakota border to Clearbrook[a]	0	1	8	**9**
Clearbrook to Carlton	23	21	95	**139**
Carlton to Wisconsin border	4	2	7	**13**

[a] A portion of the route would cross counties without complete visual sensitivity classifications.

Table 6.2.3-3. Residences near the Applicant's Preferred Route

Segment	Residences within Construction Work Area	Residences within 300 Feet of Construction Work Area[a]
North Dakota border to Clearbrook	0	30
Clearbrook to Carlton	6	78
Carlton to Wisconsin border	2	16

[a] Residences within 300 feet of the construction work area include those within the construction work area.

6.2.3.2.2 Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to aesthetics and visual resources for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the visual resources ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-03AM would be 95 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Existing land uses along RA-03AM are primarily agricultural and forested land (Table 6.2.1-11). RA-03AM would not cross any Indian reservation lands. The acreage of special management areas, including WMAs and state forests that would be crossed by the RA-03AM route is provided in Table 6.2.3-4.

Table 6.2.3-4. Special Management Areas Crossed by Route Alternative RA-03AM

Special Management Area	Acres within Construction Work Area
Mississippi Headwaters State Forest	25.7
Neitermeier Wildlife Management Area	5.4
Lake Alexander Woods Scientific and Natural Area	1.0

The following scenic byways would be crossed by RA-03AM:

- Great River Road Scenic Byway (two crossings),
- Lake Country Scenic Byway (two crossings), and
- St. Croix Scenic Byway (two crossings).

Several scenic rivers and water trails, including the Kettle River, Rum River, and Mississippi River, would be crossed by RA-03AM. This route would cross the Mississippi River multiple times, including once near Lake Itasca, considered the headwaters of the Mississippi, and again approximately 5 miles north of Little Falls, Minnesota (Minnesota DNR 2016b). The permanent right-of-way for RA-03AM would cross 6 miles of snowmobile and ATV trails, including crossing the Munger State Trail several times between Hinckley and Carlton, Minnesota.

RA-03AM would cross 177 travel routes and areas classified by Minnesota for visual sensitivity, including:

- 20 low visual sensitivity travel routes and areas,
- 19 medium visual sensitivity travel routes and areas, and
- 138 high visual sensitivity travel routes and areas.

Some travel routes and areas crossed by RA-03AM have not been classified for visual sensitivity.

Sixteen residences would be within the construction work area, and 368 residences would be within 300 feet of the construction work area.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the visual resources ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-06 between Clearbrook and Carlton would primarily establish a new right-of-way corridor, with only 20 percent of the route co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-06 are primarily forested land and wetlands (Table 6.2.1-11). The acreage of special management areas, including national and state forests that would be crossed by the pipeline route is provided in Table 6.2.3-5.

Table 6.2.3-5. Special Management Areas Crossed by Route Alternative RA-06

Special Management Area	Acres within Construction Work Area
Chippewa National Forest	86.1
George Washington State Forest	458.1
Big Fork State Forest	294.4
Fond du Lac State Forest	36.5

RA-06 would cross 13 miles of the Fond du Lac Reservation, requiring approximately 79 acres for the permanent right-of-way and 189 acres for the construction work area.

RA-06 would require one crossing of the National Forest Avenue of Pines Scenic Byway and the Edge of the Wilderness Scenic Byway, which offer scenic natural views to travelers along with recreation and interpretive sites. RA-06 would not cross the Mississippi River but would cross the Big Fork River State Water Trail (Minnesota DNR 2016b). The permanent right-of-way for RA-06 would cross less than 1 mile of snowmobile and ATV trails, and would require approximately 2 miles of crossings to accommodate the construction work area.

RA-06 would cross 102 travel routes and areas classified by Minnesota for visual sensitivity, including:

- 22 low visual sensitivity travel routes and areas,
- 16 medium visual sensitivity travel routes and areas, and
- 46 high visual sensitivity travel routes and areas.

Nine residences would be within the construction work area, and 76 residences would be within 300 feet of the construction work area.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the visual resources ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-07 would be 100 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-07 are primarily forested land and wetlands (Table 6.2.1-11). The acreage of special management areas, in this case only state forests that would be crossed by the pipeline route, is provided in Table 6.2.3-6.

RA-07 would cross approximately 56 miles of Indian reservation land, requiring that approximately 338 acres be established as a permanent right-of-way and affecting approximately 1,383 acres during construction (Table 6.2.3-7).

Table 6.2.3-6. Special Management Areas Crossed by Route Alternative RA-07

Special Management Area	Acres within Construction Work Area
Bowstring State Forest	408.5
Fond du Lac State Forest	36.5
Mississippi Headwaters State Forest	77.3
Chippewa National Forest	87.7

Table 6.2.3-7. Indian Reservations Crossed by Route Alternative RA-07

Indian Reservation	Centerline (miles)	Acres within Permanent Right-of-Way	Acres within Construction Work Area
Fond du Lac Reservation	13.0	78.7	321.5
Leech Lake Reservation	42.7	258.8	1,061.0
TOTAL	**55.7**	**337.5**	**1,382.5**

RA-07 would require two crossings of the Great River Road Scenic Byway and one crossing of the Edge of the Wilderness Scenic Byway, which offer scenic natural views to travelers along with recreation and interpretive sites. RA-07 would cross the Mississippi River twice, once near Bemidji and again at Ball Club, approximately 20 miles west of Grand Rapids (Minnesota DNR 2016b). RA-07 also would cross the Paul Bunyan State Trail near Bemidji, the Heartland State Trail near Cass Lake, and the Taconite State Trail at the north end of Grand Rapids, Minnesota. The permanent right-of-way for RA-07 would cross approximately 3 miles of snowmobile and ATV trails during operation, and would require approximately 7 miles of crossings to accommodate the construction work area.

RA-07 would cross 144 travel routes and areas classified by Minnesota for visual sensitivity, including:

- 31 low visual sensitivity travel routes and areas,
- 27 medium visual sensitivity travel routes and areas, and
- 66 high visual sensitivity travel routes and areas.

Forty residences would be within the construction work area, and 237 residences would be within 300 feet of the construction work area.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the visual resources ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-08 would be 100 percent co-located with existing pipelines or other linear infrastructure rights-of-way. Land uses along RA-08 are primarily agricultural and forested land. The acreage of special management areas, including WMAs and state forests, that would be crossed by the pipeline route is provided in Table 6.2.3-8.

Table 6.2.3-8. Special Management Areas Crossed by Route Alternative RA-08

Special Management Area	Acres within Construction Work Area
Chippewa National Forest	84.4
Bemidji Slough Wildlife Management Area	4.1
Swan River Deer Yard Wildlife Management Area	7.4
Bowstring State Forest	410.0
Fond du Lac State Forest	35.5
Mississippi Headwaters State Forest	68.2
Welsh Lake State Forest	15.4
Savanna State Forest	38.2

RA-08 would cross approximately 61 miles of Indian reservation land, requiring that approximately 339 acres be established as a permanent right-of-way and affecting approximately 813 acres during construction (Table 6.2.3-9).

Table 6.2.3-9. Indian Reservations Crossed by Route Alternative RA-08

Indian Reservation	Centerline (miles)	Acres within Permanent Right-of-Way	Acres within Construction Work Area
Fond du Lac Reservation	13.0	78.1	187.5
Leech Lake Reservation	48.0	260.8	625.7
TOTAL	**61**	**338.9**	**813.2**

RA-08 would require two crossings of the Great River Road Scenic Byway and one crossing of the Edge of the Wilderness Scenic Byway, which offer scenic natural views to travelers along with recreation and interpretive sites. RA-08 would cross the Mississippi River twice, once near Bemidji and again at Ball Club, approximately 20 miles west of Grand Rapids. RA-08 also would cross the Paul Bunyan State Trail near Bemidji, the Heartland State Trail near Cass Lake, and the Taconite State Trail at the north end of Grand Rapids, Minnesota (Minnesota DNR 2016b). The permanent right-of-way for RA-08 would cross 3 miles of snowmobile and ATV trails during operation, and would require approximately 11 miles of crossings to accommodate the construction work area.

RA-08 would cross 150 travel routes and areas classified by Minnesota for visual sensitivity, including:

- 28 low visual sensitivity travel routes and areas,
- 25 medium visual sensitivity travel routes and areas, and

- 75 high visual sensitivity travel routes and areas.

Nine residences would be within the construction work area, and 168 residences would be within 300 feet of the construction work area.

6.2.3.3 Impact Assessment

Potential impacts on aesthetic resources from construction and operation of the Project include impacts on landscape visibility, scenic integrity, and scenic attractiveness through visual scarring, removal of trees and vegetation, and construction activity. The extent and magnitude of these impacts are influenced by the existing scenic integrity, the landscape visibility, and the importance of a landscape to its observers. The duration of potential Project impacts on visual resources along the pipeline rights-of-way could range from a couple of days during active construction to permanent (e.g., aboveground facilities or a new cleared corridor through forested areas). During construction, the greatest impacts would be caused by clearing of vegetation, as well as the presence of workers and construction equipment. Operations impacts would be limited to the addition of aboveground facilities and changes in viewsheds, primarily because of cleared forested land.

6.2.3.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the visual resources ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

The majority of the Applicant's preferred route would be located within or adjacent to existing rights-of-way, with a small portion of the route creating a new right-of-way. Consequently, the visual integrity along the co-located portions of the route has been previously affected by installation of similar linear infrastructure projects. Most new right-of-way would be established between Clearbrook and Carlton (approximately 60 miles, 27 percent of the route). Construction of the route would affect approximately 562 acres of agricultural land and 308 acres of open land, where views of construction equipment and personnel would be visible from longer distances. Impacts on visual resources associated with the construction work area include removal of existing vegetation, grading, and the presence of construction workers and equipment.

For the Applicant's preferred route, approximately 1,447 acres of forested land would be cleared between Clearbrook and Carlton during construction. Cleared forested areas would alter the landscape integrity and viewed areas, particularly for viewers adjacent to or crossing the right-of-way. Trees outside the permanent right-of-way would be allowed to regrow; however, they would take decades to reestablish and may not return to preconstruction conditions during the life of the Project.

The Applicant's preferred route would not cross any Indian reservations and therefore would not result in visual impacts on reservations during construction. The route would require construction work areas located within special management areas; the greatest impact would be approximately 130 acres of construction work area within the Land O'Lakes State Forest. The Mississippi River, which is classified as a State Water Trail, would be crossed twice.

In addition, the Applicant's preferred route would cross 95 travel routes and areas designated as having a high visual sensitivity (Table 6.2.3-2). These crossings may include scenic roads, trails, and rivers. The Applicant's preferred route would cross eight state forests, affecting approximately 422 acres of state forested land during construction. The construction work area would be within 300 feet of 124 residences, of which 78 residences are between Clearbrook and Carlton.

Overall, visual impacts would be greatest where the pipeline route crosses or parallels roads, trails, or residences. The duration of visual impacts would be short-term along the construction work area in or near open lands; special management areas; scenic byways, scenic rivers, and trails; and residences. Impacts would be minor because they would be limited to the period of construction until vegetation has reestablished. In areas where trees would be cleared, visual impacts would be permanent and minor. The Applicant has reduced the extent of potential impacts by co-locating most of the Applicant's preferred route and route alternatives with existing rights-of-way.

Operations Impacts

Operations impacts for the Applicant's preferred route would be associated mainly with aboveground facilities and permanent forest clearing along the right-of-way and access roads. Cleared forested land outside the permanent right-of-way would be allowed to reestablish. Within the right-of-way, forests would remain permanently cleared, altering the landscape integrity and viewed areas and resulting in permanent minor impacts on viewsheds near the 631 acres of forested land maintained as a right-of-way. These impacts would be strongest where they are in the immediate foreground for sensitive observers. Permanent impacts on scenic integrity along the right-of-way are not expected in areas of open and agricultural land, where the vegetation along the right-of-way would be restored. The presence of permanent aboveground facilities near residences would cause a greater visual impact, whereas the presence of permanent aboveground facilities in open land may affect viewers from a greater distance. In partially cleared forested areas, the impacts would be limited to observers at pipeline crossings or residents in proximity to the permanent right-of-way; however, these impacts would be permanent. Residents with immediate foreground views of permanent aboveground facilities and cleared forested areas are a highly sensitive viewer group.

The Applicant's preferred route would require 8 pump stations and 27 mainline valves (MLVs). In general, impacts on scenic integrity from MLVs are expected to be minimal because of the scale of the MLV and small size of each site (typically less than 0.1 acre) and because they would be located within the permanent right-of-way. Pump stations would result in greater visual impact as they are typically much larger and contain several buildings, piping, and other large structures. Of the eight pump stations proposed for the Applicant's preferred route, four would be located between Clearbrook and Carlton. The Cromwell pump station would be constructed in open land, with little other development nearby. Two residences are within 0.3 mile of the proposed pump station, and direct views of the site are possible from both residences. This represents a permanent major impact on the viewshed of the residents. The Palisade pump station would be constructed in mainly forested land. The area surrounding the site is dominated by mature woody vegetation, creating a natural buffer to nearby residences and viewers. Both the Backus and Two Inlets pump stations would be constructed in open land. The Backus pump station would be constructed adjacent to a ranch and would be visible to its residents. The Two Inlets pump station would be within 0.2 mile of two residences, each with a partial view of the permanent structure. Views of the new pump station would be somewhat blocked by existing vegetation surrounding the residences. Additionally, the pump station will likely be visible to travelers along U.S. Highway 71. For travelers on U.S. Highway 71 and the nearby residences, impacts as a result of the new pump station would likely be a permanent major impact on the viewshed. The Two Inlets pump station would be located in an open, undeveloped area that would somewhat alter the characteristic of the existing natural landscape.

Of the remaining four pump stations located between the North Dakota border and Clearbrook, three would be upgrades to existing pump stations and one is an upgrade at the existing Clearbrook terminal. The additional buildings and structures associated with the upgrades would cause visual impacts, especially where placed apart from existing pump stations. Visual impacts associated with pump station upgrades would be less than those for new pump stations because of the presence of similar structures in nearby viewsheds. The Donaldson pump station upgrade would be located on open land with adjacent agricultural fields. Several agricultural outbuildings that are located nearby likely would have views of the Donaldson pump station upgrade. The closest residence is approximately 0.8 mile east and is somewhat shielded by vegetation, but the pump station addition may be visible from the property. This would result in a permanent negligible impact on the viewshed for residents. The Viking pump station upgrade would be on agricultural land; the nearest residence is approximately 0.5 mile south of the pump station. Due to intervening agricultural fields, the Viking pump station upgrade likely would be visible from this residence. This would result in a permanent negligible impact on the viewshed for residents. Other nearby residences are farther away, and intervening vegetation would block views of the proposed pump station upgrade. The Plummer pump station upgrade would be constructed in mainly forested land. Two residences are located within 0.5 mile of the pump station upgrade, but the pump station would be visible only from one because of intervening vegetation. This could result in a permanent minor impact on the viewshed for residents. The Clearbrook pump station upgrade would be located approximately 0.3 mile southeast of the town of Clearbrook on partially agricultural, partially forested land. Forested land would block potential views from the town. Seven residences are located within 0.5 mile of the proposed pump station upgrade. Forested areas and other buildings would block views of the pump station from a majority of these residences. The proposed upgrade may be visible from one to three of the nearby residences, which would result in a permanent negligible to minor impact on the viewshed for nearby residents.

6.2.3.3.2 Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the visual resources ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

<u>Construction Impacts</u>

The majority of RA-03AM (95 percent) would be located within or adjacent to existing rights-of-way, with a small portion of the route creating a new right-of-way. Consequently, the visual integrity along the co-located portions of the route has been previously affected by installation of similar linear infrastructure projects. Construction of the route would affect approximately 1,611 acres of agricultural land and 340 acres of open land, where views of construction equipment and personnel would be visible from longer distances. Impacts on visual resources associated with the construction work area include removal of existing vegetation, grading, and the presence of construction workers and equipment.

Construction of RA-03AM would require clearing approximately 1,138 acres of forested land. Cleared forested areas would alter the landscape integrity and viewed areas, particularly for viewers adjacent to or crossing the right-of-way. Trees outside the permanent right-of-way would be allowed to regrow; however, they would take decades to reestablish and may not return to preconstruction conditions during the life of the Project.

RA-03AM would not cross any Indian reservations and therefore would not result in visual impacts on reservations during construction. Three scenic byways would be crossed by RA-03AM, as would scenic rivers and water trails, including the Kettle River, Rum River, and the Mississippi River, and snowmobile and ATV trails. The route would require construction work areas located within special management areas (although much less than for the Applicant's preferred route); the greatest impact would be 26 acres of construction work area within the Mississippi Headwaters State Forest.

RA-03AM would cross 138 travel routes and areas with a high visual sensitivity classification and would be located within 300 feet of 368 residences. The scenic attractiveness and scenic integrity in these areas of moderate to high constituent concern would be affected by the presence of construction equipment and clearing of vegetation in the construction work area.

Overall, visual impacts would be greatest where the pipeline route crosses or parallels roads, trails, or residences. Visual impacts along the construction work area in open lands; special management areas; scenic byways, scenic rivers, and trails; and residences would be temporary to short-term and minor as impacts would be limited to the period of construction until vegetation has reestablished. In areas where trees would be cleared, visual impacts would be permanent and minor. Visual impacts would be minimized in areas where the pipeline construction occurs along existing rights-of-way, which are generally maintained in a cleared condition.

Operations Impacts

Similar to the operations impacts discussed for the Applicant's preferred route, permanent impacts on aesthetic resources for RA-03AM would include those from forest clearing and the presence of aboveground facilities. Cleared forested land outside the permanent right-of-way would be allowed to reestablish, which may require decades. Within the permanent right-of-way, forests would remain permanently cleared, altering the landscape integrity and viewed areas and resulting in permanent minor impacts on viewsheds near the 470 acres of forested land maintained as a right-of-way. Maintenance clearing in non-forested areas would occur throughout the life of the Project. Impacts from maintenance clearing would be temporary and negligible, as the work crews would be small and the cleared vegetation likely would be similar to the surrounding areas.

Given the spacing between the proposed pump stations for the Applicant's preferred route, it was assumed that RA-03AM would require six pump stations, which may result in more residences within the immediate foreground of pump stations. Pump stations typically are constructed in areas of agricultural or open land, away from residential and urban areas. As such, it is not likely that residences would be located within the immediate foreground of the pump stations, and impacts are expected to be permanent and negligible to minor.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the visual resources ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure

and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Only 20 percent of RA-06 route would be adjacent to existing rights-of-way; much of the route would require construction of new right-of-way. Construction of a new right-of-way would increase the magnitude of impacts on the viewshed, as it would necessitate additional grading, vegetation removal, and construction of facilities. Construction of the route would affect approximately 257 acres of agricultural land and 354 acres of open land, where views of construction equipment and personnel would be visible from longer distances. Impacts on visual resources associated within the construction work area include removal of existing vegetation, grading, and the presence of construction workers and equipment.

Construction of RA-06 would require clearing approximately 1,107 acres of forested land. Cleared forested areas would alter the landscape integrity and viewed areas, particularly for viewers adjacent to or crossing the right-of-way. Trees outside the permanent right-of-way would be allowed to regrow; however, they would take decades to reestablish and may not return to preconstruction conditions during the life of the Project.

RA-06 would cross the Fond du Lac Reservation. Where facilities cross Indian reservations, tribal members often express a high concern level for landscapes within those reservations and in the areas outside the reservation that are ceded lands with tribal use rights for hunting, fishing, subsistence, and spiritual use. Chapter 9 addresses impacts on Indian reservations and tribal resources.

Two scenic byways would be crossed by RA-06. Although RA-06 would not cross the Mississippi River, it would cross the Big Fork River State Water Trail (Minnesota DNR 2016b). The greatest impact would be a total of 458 acres of construction work areas within the George Washington State Forest.

RA-06 would cross 46 travel routes and areas with a high visual sensitivity classification, and would be located within 300 feet of 76 residences. The scenic attractiveness and scenic integrity in these areas of moderate to high constituent concern would be affected by the presence of construction equipment and clearing of vegetation in the construction work area.

Overall, visual impacts would be greatest where the pipeline route crosses or parallels roads, trails, or residences. Visual impacts along the construction work area to open lands; special management areas; scenic byways, scenic rivers, and trails; and residences would be short-term and minor as impacts would be limited to the period of construction until vegetation has reestablished. In areas where trees would be cleared, visual impacts would be permanent and minor. Visual impacts would be less in areas where the pipeline construction occurs along existing rights-of-way, which are generally maintained in a cleared condition; however, RA-06 is co-located for only 20 percent of the route.

Operations Impacts

Similar to the operations impacts discussed for the Applicant's preferred route, permanent impacts on aesthetic resources for RA-06 would be primarily those from forest clearing and the presence of aboveground facilities. Cleared forested land outside the permanent right-of-way would be allowed to reestablish, which may require decades. Within the right-of-way, forests would remain permanently cleared, altering the landscape integrity and viewed areas, and resulting in permanent minor impacts on viewsheds near the approximately 461 acres of forested land maintained as a right-of-way. Maintenance clearing in non-forested areas would occur throughout the life of the Project. Impacts from maintenance clearing would be temporary and negligible, as the work crews would be small and the cleared vegetation likely would be similar to the surrounding areas.

Given the spacing between the proposed pump stations for the Applicant's preferred route, it was assumed that RA-06 would require four pump stations. Pump stations typically are constructed in areas of agricultural or open land, away from residential and urban areas. As such, it is not likely that residences would be located within the immediate foreground of the pump stations, and impacts are expected to be permanent and negligible to minor.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the visual resources ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

All of RA-07 would be located within and adjacent to existing rights-of-way. RA-07 would include removal and reinstallation of a pipeline in the same location as the existing Line 3 for a portion of the route and would require a slightly wider construction work area (205 feet). Since RA-07 involves replacement of the existing Line 3, most impacts would be within the existing permanent right-of-way. The remainder of the construction work area would be within the footprint of the former construction work area for Line 67, limiting the extent of impacts on aesthetic resources in the affected area. Impacts on visual resources associated with the construction work area include removal of existing vegetation, grading, and the presence of construction workers and equipment. Construction of the route would affect approximately 402 acres of agricultural land and 692 acres of open land, where views of construction equipment and personnel would be visible from longer distances.

Construction of RA-07 would require clearing approximately 1,146 acres of forested land. Cleared forested areas would alter the landscape integrity and viewed areas, particularly for viewers adjacent to or crossing the right-of-way. Trees outside the permanent right-of-way would be allowed to regrow; however, they would take decades to reestablish and may not return to preconstruction conditions during the life of the Project.

RA-07 construction would cross the Fond du Lac Reservation and the Leech Lake Reservation. Where facilities cross Indian reservations, tribal members often express a high concern level for landscapes within those reservations and in the areas outside the reservation that are ceded lands with tribal use rights for hunting, fishing, subsistence, and spiritual use. Chapter 9 addresses impacts on Indian reservations and tribal resources.

Because two scenic byways would be crossed, a greater portion of the landscape crossed by RA-07 may have high scenic attractiveness and a high constituent concern level. Construction, including grading and vegetation removal, likely would be visible from crossings with scenic byways, as well as from crossings with trails, rivers, and other visual resource areas. Vegetation clearing, grading, and the presence of construction workers and equipment would detract from scenic attractiveness and integrity at the locations of the crossings. Visual impacts associated with the presence of construction equipment and construction activities primarily would be limited to the construction period. Impacts from vegetation clearing during construction would largely be short-term and minor, except the forested land along the RA-07 route, where impacts would be long-term to permanent, but minor because any tree clearing would be along existing cleared rights-of-way.

Construction of RA-07 would cross 66 travel routes and other areas in high visual sensitivity areas, and 237 residences would be within 300 feet of the construction work area. Because of their proximity to the construction work area and the extended durations of their views, observers associated with these residences are considered highly sensitive to the nearby landscape impacts—including the presence of construction workers and equipment, removal of vegetation, and construction of aboveground facilities.

Overall, visual impacts would be greatest where the pipeline route crosses or parallels roads, trails, or residences. The duration of visual impacts would be short-term along the construction work area to open lands; special management areas; scenic byways, scenic rivers, and trails; and residences. Impacts would be minor because they would be limited to the period of construction until vegetation has reestablished. In areas where trees would be cleared, visual impacts would be permanent and minor. Visual impacts would be minimized because all pipeline construction for RA-07 would occur along existing rights-of-way, and all new tree clearing would result in only a widening of the existing right-of-way.

Operations Impacts

Similar to the operations impacts discussed for the Applicant's preferred route, permanent impacts on aesthetic resources for RA-07 would be primarily those from forest clearing and the presence of aboveground facilities. Cleared forested land outside the permanent right-of-way would be allowed to reestablish, which may require decades. Within the right-of-way, forests would remain permanently cleared, altering the landscape integrity and viewed areas, and resulting in permanent minor impacts on viewsheds near the 242 acres of forested land maintained as a right-of-way. Maintenance clearing in non-forested areas would occur throughout the life of the Project. Impacts from maintenance clearing would be temporary and negligible, as the work crews would be small and the cleared vegetation likely would be similar to the surrounding areas.

Given the spacing between the proposed pump stations for the Applicant's preferred route, it was assumed that RA-07 would require four pump stations. Pump stations typically are constructed in areas of agricultural or open land, away from residential and urban areas. As such, it is not likely that residences would be located within the immediate foreground of the pump stations, and impacts are expected to be permanent and negligible to minor.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the visual resources ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

All of RA-08 would be located within or adjacent to existing rights-of-way. Route alternative RA-08 would result in construction impacts mainly on wetlands and forested land. The primary visual impact would result from removal of existing vegetation, which would detract from scenic integrity and alter landscape visibility. Construction of the route would affect approximately 336 acres of agricultural land and 207 acres of open land, where views of construction equipment and personnel would be visible from longer distances. Construction of RA-08 would require clearing approximately 773 acres of forested land. Cleared forested areas would alter the landscape integrity and viewed areas, particularly for viewers adjacent to or crossing the right-of-way. Trees outside the permanent right-of-way would be allowed to regrow; however, they would take decades to reestablish and may not return to preconstruction conditions during the life of the Project.

Construction of the RA-08 right-of-way would affect both the Fond du Lac Reservation and the Leech Lake Reservation. Where facilities cross Indian reservations, tribal members often express a high concern level for landscapes within those reservations and in the areas outside the reservation that are ceded lands with tribal use rights for hunting, fishing, subsistence, and spiritual use. Chapter 9 addresses impacts on Indian reservations and tribal resources.

Because of the proximity of the Mississippi River, RA-08 would cross the Great River Road Scenic Byway twice and would cross the Veterans Memorial Scenic Byway and the Edge of the Wilderness Scenic Byway. In the region of the Mississippi River between Bemidji and Grand Rapids, RA-08 would cross two different state trails.

The RA-08 route would cross 75 travel routes and areas in high visual sensitivity areas, and the construction work area would be within 300 feet of 168 residences. Because of their proximity to the construction work area and the extended durations of their views, observers associated with these residences are considered to be highly sensitive to the nearby landscape impacts—including the presence of construction workers and equipment, removal of vegetation, and construction of aboveground facilities. As a result of the two scenic byway crossings, a greater portion of the landscape crossed by RA-08 may have high scenic attractiveness and a high constituent concern level. Construction likely would be visible from crossings with scenic byways as well as crossings with trails, rivers, and other visual resource areas. Construction equipment and vegetation clearing would detract from scenic attractiveness and integrity at the locations of the crossings.

Overall, visual impacts would be greatest where the pipeline route crosses or parallels roads, trails, or residences. The duration of visual impacts would be short-term along the construction work area to open lands; special management areas; scenic byways, scenic rivers, and trails; and residences. Impacts would be minor as they would be limited to the period of construction until vegetation has reestablished. RA-08 would requiring clearing the greatest amount of forested land, where visual impacts would be permanent and minor. Visual impacts would be minimized because all pipeline construction would occur along existing rights-of-way, which are generally maintained in a cleared condition.

Operations Impacts

Similar to the operations impacts discussed for the Applicant's preferred route, permanent impacts on aesthetic resources for RA-08 would be limited to those from forest clearing and the presence of aboveground facilities. Cleared forested land outside the permanent right-of-way would be allowed to reestablish. Within the right-of-way, forests would remain permanently cleared, altering the landscape integrity and viewed areas, resulting in permanent minor impacts on viewsheds near the approximately 320 acres of forested land maintained as a right-of-way. Maintenance clearing in non-forested areas would occur throughout the life of the Project. Impacts from maintenance clearing would be temporary and negligible, as the work crews would be small and the cleared vegetation likely would be similar to the surrounding areas.

Given the spacing between the proposed pump stations for the Applicant's preferred route, it was assumed that RA-08 would require four pump stations. Pump stations typically are constructed in areas of agricultural or open land, away from residential and urban areas. As such, it is not likely that residences would be located within the immediate foreground of the pump stations, and impacts are expected to be permanent and negligible to minor.

6.2.3.4 Summary and Mitigation

6.2.3.4.1 Summary

Impacts on aesthetic resources would vary among all routes, both in the magnitude and duration of impacts. Potential impacts on visual resources for the Applicant's preferred route and each of the route alternatives are summarized in Table 6.2.3-10. Impacts on visual resources along most of each route option would be minor and short-term, as vegetation regrowth would diminish the visibility of clearing and grading. However, certain areas have higher viewer concern and greater scenic attractiveness. These areas are associated with features such as residences, scenic byways, and special management areas. Construction of RA-03AM would affect the greatest amount of agricultural land and open land, where views of construction equipment and personnel would be visible from longer distances. The Applicant's preferred route and RA-03AM are the only routes that would not cross any Indian reservations.

All of the routes would cross scenic byways multiple times (Table 6.2.3-10). RA-03AM would cross three scenic byways and would cross all three of them twice. RA-03AM would cross the highest number of features in areas of high visual sensitivity. RA-06, although affecting the least amount of forested land compared to the other routes, would result in relatively larger impacts on aesthetic resources given the limited amount of the route that is co-located with existing rights-of-way and the number of visually sensitive resources that would be crossed (e.g., reservation lands and a national forest). RA-06 also would cross the least travel routes and areas with a high visual sensitivity classification and would cross the fewest special management areas. RA-03AM would cross more travel routes and areas with a high visual sensitivity classification and scenic byways, and more residences are located within both the construction work area and permanent right-of-way for RA-03AM. The Applicant's preferred route would cross the highest number of special management areas.

The impact on residences within the immediate foreground of the construction work area would be similar across routes, although the number of residences affected varies (Table 6.2.3-10). The fewest residences are located within 300 feet of the construction work area for the Applicant's preferred route and RA-06, while RA-03AM would have the most. Generally, construction impacts on visual resources would be temporary to short-term and minor, as impacts would be limited to the period of construction until vegetation has reestablished. However, because of the proximity of some receptors—especially residences—to active construction in the immediate foreground, impacts during construction could be major for some observers.

During operation, aboveground facilities represent the biggest visual impact on residences. Several residences near the Cromwell and Two Inlets pump stations would have direct views of the pump station sites. Based on the assumptions described in Section 4.3, two additional pump stations would be needed along RA-03AM compared to the Applicant's preferred route and the other route alternatives.

This could result in more residences within view of pump stations along RA-03AM, resulting in permanent impacts on their viewsheds.

6.2.3.4.2 Mitigation

To minimize impacts on residents and visitors with immediate foreground views of construction activities, identified mitigation measures could include:

- Require Enbridge to coordinate in advance with residents and building owners in the construction work area.
- Require Enbridge to complete construction in areas near residences as quickly as safely practical to minimize the duration of potentially major visual impacts on these receptors.

To minimize permanent aesthetic impacts on residents and visitors with views of pump stations, identified mitigation measures could include:

- Require Enbridge to develop a visual screening plan in order to minimize visual impacts on residents with views of the pump stations, regardless of the route option that is selected.

Table 6.2.3-10. Summary of Potential Impacts on Aesthetics and Visual Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Viewsheds with existing linear infrastructure, with lower visual sensitivity to removal of existing vegetation, grading, and presence of construction activities	73 percent co-location	95 percent co-location	20 percent co-location	100 percent co-location	100 percent co-location
Land types with larger viewsheds and higher sensitivity to removal of existing vegetation, grading, and presence of construction activities	Short-term/minor impacts • 562 acres of agricultural land • 308 acres of open land Permanent/minor impacts • 1,447 acres of forested land	Short-term/minor impacts • 1,611 acres of agricultural land • 340 acres of open land Permanent/minor impacts • 1,138 acres of forested land	Short-term/minor impacts • 257 acres of agricultural land • 354 acres of open land Permanent/minor impacts • 1,107 acres of forested land	Short-term/minor impacts • 402 acres of agricultural land • 692 acres of open land Permanent/minor impacts • 1,146 acres of forested land	Short-term/minor impacts • 336 acres of agricultural land • 207 acres of open land Permanent/minor impacts • 773 acres of forested land
Indian reservations affected by removal of existing vegetation, grading, and presence of construction activities	None crossed	None crossed	79 acres	338 acres	339 acres

Table 6.2.3-10. Summary of Potential Impacts on Aesthetics and Visual Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Special management areas and scenic areas with higher sensitivity to removal of existing vegetation, grading, and presence of construction activities	Short-term/minor impacts • 439 acres of special management areas • 4 scenic byway crossings • 2 scenic river/state river trail crossings • 1 mile of trail crossings	Short-term/minor impacts • 32 acres of special management areas • 6 scenic byway crossings • 4 scenic river/state river trail crossings • 6 miles of trail crossings	Short-term/minor impacts • 875 acres of special management areas • 2 scenic byway crossings • 1 scenic river/state river trail crossings • 1 mile of trail crossings	Short-term/minor impacts • 610 acres of special management areas • 3 scenic byway crossings • 2 scenic river/state river trail crossings • 3 miles of trail crossings	Short-term/minor impacts • 663 acres of special management areas • 3 scenic byway crossings • 2 scenic river/state river trail crossings • 3 miles of trail crossings
High visual sensitivity classification travel routes and areas affected by removal of existing vegetation, grading, and presence of construction activities	Short-term/minor impacts • 95 crossings	Short-term/minor impacts • 138 crossings	Short-term/minor impacts • 46 crossings	Short-term/minor impacts • 66 crossings	Short-term/minor impacts • 75 crossings
Residences affected by removal of existing vegetation, grading, and presence of construction activities	Short-term/minor impacts • 6 residences within the construction work area • 78 residences within 300 feet of construction work area	Short-term/minor impacts • 16 residences within the construction work area • 368 residences within 300 feet of construction work area	Short-term/minor impacts • 9 residences within the construction work area • 76 residences within 300 feet of construction work area	Short-term/minor impacts • 40 residences within the construction work area • 237 residences within 300 feet of construction work area	Short-term/minor impacts • 9 residences within the construction work area • 168 residences within 300 feet of construction work area
Operations Impacts					
Viewshed alteration from clearance of trees in forested areas to maintain the pipeline right-of-way	Permanent/minor impacts • 631 acres cleared	Permanent/minor impacts • 471 acres cleared	Permanent/minor impacts • 461 acres cleared	Permanent/minor impacts • 242 acres cleared	Permanent/minor impacts • 320 acres cleared

Table 6.2.3-10. Summary of Potential Impacts on Aesthetics and Visual Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Landscape and viewshed alteration from presence of mainline valves (MLVs)	Permanent/negligible impacts	*Locations of MLVs have not been determined for the route alternatives. Therefore, the affected areas and receptors affected cannot be quantified.* In general, impacts on scenic integrity from MLVs are expected to be minimal because of the scale of the MLV and small size of each site (typically less than 0.1 acre) and because they would be located within the permanent right-of-way.			
Landscape and viewshed alteration from presence of pump stations	Permanent/negligible to minor impacts, except for one pump station Permanent/major impacts • 2 residences (Cromwell pump station)	*Locations of pump stations have not been determined for the route alternatives. Therefore, the affected areas and receptors affected cannot be quantified.* Pump stations typically are constructed in areas of agricultural or open land, away from residential and urban areas. As such, it is not likely that residences would be located within the immediate foreground of the pump stations, and impacts are expected to be permanent and negligible to minor. If a pump station was located in proximity to a large number of residences, the permanent impacts would be minor to major. Given the spacing between the proposed pump stations for the Applicant's preferred route, it was assumed that RA-06, RA-07, and RA-08 would require four pump stations. RA-03AM would require six pump stations.			

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to aesthetic and visual resources. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, while counts of residences in the ROI can aid in identifying the number of potentially affected people, information about special management areas can provide a better understanding severity of changes in visual and aesthetic experience at these receptors. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in the tables should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-94 to 6-102. The table above, for example, provides estimates of acres of special management areas, scenic byway crossings, etc. within the ROI; however, a more complete discussion of the qualitative nature of impacts that could occur to different types of visual resources is contained in the impacts discussion in the text (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-94 to 6-96. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-96 to 6-97. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.2.3-10. Summary of Potential Impacts on Aesthetics and Visual Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[e] Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-97 to 6-99. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-99 to 6-100. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-100 to 6-102. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.2.3.5 References

Federal Highway Administration (FHWA). 2016. America's Byways: Minnesota. http://www.fhwa.dot.gov/byways/states/MN. Accessed on November 20, 2016.

Minnesota Department of Natural Resources (Minnesota DNR). 2016a. Visual Sensitivity Classifications. http://dnr.state.mn.us/forestry/visual_sensitivity/index.html. Accessed on November 27, 2016.

_____. 2016b. Minnesota State Trails. http://www.dnr.state.mn.us/state_trails/index.html. Accessed on November 26, 2016.

U.S. Forest Service (USFS). 1995. Landscape Aesthetics: A Handbook for Scenery Management. http://www.fs.fed.us/cdt/carrying_capacity/landscape_aesthetics_handbook_701_no_append.pdf. Accessed on November 27, 2016.

6.2.4 Housing

Some portions of the Applicant's preferred route and route alternatives would affect housing near the proposed pipeline. The analysis of impacts on housing during construction and operation of the Applicant's preferred route and the route alternatives considers the following issues:

- The availability of housing to meet increased demand from the non-local construction and operations workforce,
- Access limitations or safety concerns caused by construction or operation of the pipeline near residences, and
- Changes in property values of homes during construction or operation from the presence of a pipeline easement.

This section first describes the existing conditions within an area along the Applicant's preferred route and route alternatives where housing could be affected by construction and operation of the Project. Potential Project-related impacts of construction and operation on existing housing are then discussed and compared for each of the five routing options (Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08). Chapter 10 addresses the impacts on housing resulting from an unanticipated release of crude oil.

6.2.4.1 Regulatory Context and Methodology

6.2.4.1.1 Regulatory Context

The criteria considered by the Commission for route permit determination (Minn. R. 7852.1900, Subp. 3) includes consideration of human settlement and takes into account the State's goals to minimize human settlement and other land use conflicts (Minn. Stat. § 216E.03, Subp. 7). The availability of and impacts on housing stock are key components of human settlement.

6.2.4.1.2 Methodology

The analysis of impacts on housing during construction and operations of the Applicant's preferred route and the route alternatives considers housing availability, residence access and safety, and property values.

Housing Availability

Impacts on housing availability and the ability of communities to absorb the influx of workers that would be required for the Project were assessed. Impacts related to housing availability were evaluated by:

- Identifying existing housing availability in counties that would be crossed by the Applicant's preferred route and each of the route alternatives, including residential housing units and motel and hotel units;
- Comparing those results with an estimate of the potential demand for housing units created by the incoming workforce; and
- Assessing the magnitude of potential impacts based on the amount of available housing in each county relative to the expected demand, especially if availability was less than the expected demand.

The existing conditions for housing availability were determined from data on available housing rentals from the U.S. Census Bureau and commercial data on hotel and motel availability in Minnesota. Using these data, the total number of available housing units was estimated in each county along each of the pipeline routes. Using estimates for the number of workers required for construction, a worst-case estimate of demand was calculated, assuming that all the workers would be from outside the area and would require local housing; however, it is anticipated that some local labor would actually be utilized for the project, based on Enbridge's commitment to the use of labor unions for construction of the Line 3 Project. If the available housing units were greater than the worst-case estimate for housing demand, housing was considered adequate and no impact would result. For operation and maintenance of the pipeline, it was assumed that workers would be located at the Applicant's regional maintenance facilities and operations centers.

The ROI for the analysis consisted of all counties crossed by the Applicant's preferred route and route alternatives. County-level data provide an approximation of housing availability in the areas crossed by the pipeline for purposes of this EIS. However, it should be noted that workers could commute from nearby counties that would not be crossed by the pipeline; and, in large counties, the available housing may be beyond a reasonable commuting distance. Due to the nature of pipeline work, many workers are used to commutes of an hour or more because the work location moves along the route as construction progresses.

Access and Safety

Impacts related to access and safety on residents near the construction work area were assessed. Access to residences may be affected if construction closes roads temporarily. This also may affect safety by limiting the access of emergency service vehicles and personnel to respond to an emergency. In addition, as the pipeline is being constructed, the open trench and construction area may represent a hazard for residents living nearby. Impacts related to access and safety during construction and operations were evaluated by:

- Overlaying the Applicant's preferred route and the route alternatives onto a GIS layer of residence locations;
- Identifying any residences or residential structures within the permanent right-of-way, within the construction work area, or within an area 50 feet outside of the construction work area for the Applicant's preferred route and each of the route alternatives, and
- Identifying permanent easements along the permanent right-of-way for operations and maintenance activities that would affect landowners.

The analysis used an ROI that extends 50 feet beyond the construction work area. While residences at farther distances could be affected by construction of the Project, those within 50 feet of the work area are likely to experience impacts more directly because of their proximity to construction work. Data used for the access and safety analysis were a combination of GIS datasets, including pipeline route layers provided by Enbridge and the USGS National Structures dataset. Because impacts on individual homes would be similar, the number of residences in proximity, and not necessarily their type, was reported for the analysis. A higher number of affected residences would result in a higher level of impact.

Property Values

Impacts on property values from construction and operation of the Applicant's preferred route and the route alternatives were assessed by:

- Estimating the existing residential property values using U.S. Census Bureau data for the median value of owner-occupied housing units at the county level, and
- Conducting a literature review of relevant studies of historical home sale data that were prepared to assess impacts on residential home values near pipelines or similar projects.

The ROI used for existing home values consisted of the counties crossed by the Applicant's preferred route and the route alternatives. Studies considered in the literature review included a range of properties up to 1 mile away from a permanent pipeline right-of-way.

No single one of the data sources considered above provides a complete indication of all relevant impacts to housing, but together the different metrics provide a reasonably comprehensive indication of the potential impacts. For example, housing availability information allows an assessment of just one aspect of potential impacts to housing but residential property value information is necessary to understand possible impacts to property values, which are also an important component of housing related effects.

Furthermore, the quantitative information from these data sources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, percentages of available housing within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a full understanding of the qualitative nature of impacts that could occur to available housing and property values is contained in the text of this section.

6.2.4.2 Existing Conditions

6.2.4.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the housing ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

U.S. Census Bureau data (2010, 2015) indicate that a total of 35,072 housing units and 672 vacant housing units were available to rent in the counties that would be crossed by the Applicant's preferred route between the North Dakota border and Clearbrook (Table 6.2.4-1). Between Clearbrook and Carlton, 118,732 total available housing units and 1,604 vacant housing units were available to rent in the counties crossed by the Applicant's preferred route. From Carlton to the Wisconsin border, the Applicant's preferred route would be entirely within Carlton County, where 15,719 housing units and 2,177 vacant housing units were available to rent according to the U.S. Census Bureau (2010, 2015).

Several hotels and motels are located in the counties crossed by the Applicant's preferred route (and route alternatives). There are 285 hotels and motels in the counties crossed by the Applicant's preferred route, including 256 between Clearbrook and Carlton. The average number of units per hotel or motel in Minnesota was 79 in 2016 (Explore Minnesota 2016). This equates to an estimated total of 20,224 individual rooms in the counties crossed by the Applicant's preferred route between Clearbrook and Carlton. Per the State of Minnesota's lodging performance metrics, an occupancy rate of 55% year-to-date (YTD) (STR, Inc. 2016) equates to an estimated total of 11,123 occupant individual rooms in the counties crossed by the Applicant's preferred route between Clearbrook and Carlton.

Eight homes are located within the proposed construction work area of the Applicant's preferred route, and 19 residences are located within 50 feet of the construction work area.

For the portion of the Applicant's preferred route between Clearbrook and Carlton, six residences are within the construction work area and an additional seven residences are within 50 feet of the construction work area. One residence is located in the permanent right-of-way and would require removal or re-location. Home values in counties along the Applicant's preferred route have a wide degree of variability. Table 6.2.4-1 lists the median value of owner-occupied housing units for the affected counties. The lowest median home value is $68,100 in Kittson County, while the highest median home value is $177,400 in Crow Wing County.

Table 6.2.4-1. Housing in Counties Crossed by the Applicant's Preferred Route in Minnesota

County	Total Housing Units[a]	Median Value of Owner-Occupied Housing Units[a]	Vacant Housing Units[a]	Rental Vacancy Rate[a]	Vacant Housing Units Available for Rent[b]	Hotels and Motels[c]	Occupied Hotel and Motel Units[d]
Minnesota	**2,364,149**	**$185,200**	**248,812**	**4.6%**	**48,091**	**2,175**	**11,123**
North Dakota Border to Clearbrook							
Kittson County	2,609	$68,100	692	6.6%	69	0	0
Marshall County	4,810	$90,500	738	8.3%	80	1	43
Pennington County	6,304	$113,400	482	7.4%	115	11	478
Red Lake County	1,960	$89,200	239	14.7%	47	2	87
Polk County	14,629	$130,500	1,987	3.6%	233	12	521
Clearwater County	4,760	$115,000	1,221	4.1%	128	3	130
Subtotal	***35,072***	***$101,117***	***5,359***	***7.5%***	***672***	***29***	***1,260***
Clearbrook to Carlton							
Hubbard County	14,578	$171,300	5,838	3.3%	158	43	1,868
Wadena County	6,925	$115,500	1,188	5.5%	127	16	695
Cass County	24,934	$172,800	12,058	4.2%	202	62	2,694
Crow Wing County	40,516	$177,400	13,862	3.9%	750	80	3,476
Aitkin County	16,060	$165,400	8,423	6.1%	161	12	521
Carlton County	15,719	$158,400	2,177	3.9%	206	14	608

Table 6.2.4-1. Housing in Counties Crossed by the Applicant's Preferred Route in Minnesota

County	Total Housing Units[a]	Median Value of Owner-Occupied Housing Units[a]	Vacant Housing Units[a]	Rental Vacancy Rate[a]	Vacant Housing Units Available for Rent[b]	Hotels and Motels[c]	Occupied Hotel and Motel Units[d]
Subtotal	***118,732***	***$160,133***	***43,546***	***4.5%***	***1,604***	***227***	***9,863***
TOTAL/AVERAGE	**153,804**	**$130,625**	**48,905**	**6.0%**	**2,276**	**256**	**11,123**

[a] Source: U.S. Census Bureau, 2010–2014 American Community Survey.

[b] Source: U.S. Census Bureau, 2010 Census.

[c] Source: HotelMotels.info (2016).

[d] Source: STR, Inc. (2017)Notes: The occupied Hotel and Motel Units column used the rounded 2017 year-to-date Lodging Performance occupancy rate (55 percent) for the State of Minnesota provided by STR, Inc.

The Clearbrook to Carlton section includes data up to the Wisconsin border.

6.2.4.2.2 Route Alternatives

Route alternatives RA-03AM, RA-06, RA-07, and RA-08 vary from the alignment of the Applicant's preferred route between the Clearbrook terminal and Carlton in Minnesota. Therefore, the existing conditions relevant to housing for each of the route alternatives are described only for the segment between Clearbrook and Carlton.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the housing ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

According to the U.S. Census Bureau (2010, 2015), there are 120,028 housing units in the counties that would be crossed by RA-03AM between Clearbrook and Carlton, and 1,717 vacant housing units are available to rent (Table 6.2.4-2). There are 135 hotels and motels located in the counties crossed by RA-03AM, with an estimated total of 10,665 rooms and an estimated total of 5,866 occupant rooms.

Sixteen homes are located within the proposed construction work area of RA-03AM, and an additional 39 residences are located within 50 feet of the construction work area. Three residences are located in the permanent right-of-way and would require removal or re-location, or an adjustment of the route centerline within the 750-foot route width to avoid the homes.

The median value values of owner-occupied housing units in counties along RA-03AM are listed in Table 6.2.4-2. The lowest median home value is $115,500 in Wadena County, and the highest median home value is $171,300 in Hubbard County.

Table 6.2.4-2. Housing in Counties Crossed by Route Alternative RA-03AM (Clearbrook to Carlton)

County	Total Housing Units[a]	Median Value of Owner-Occupied Housing Units[a]	Vacant Housing Units[a]	Rental Vacancy Rate[a]	Vacant Housing Units Available for Rent[b]	Hotels and Motels[c]	Occupied Hotel and Motel Units[d]
Hubbard County	14,578	$171,300	5,838	3.3%	158	43	1,868
Wadena County	6,925	$115,500	1,188	5.5%	127	16	695
Todd County	12,933	$129,700	2,982	7.8%	200	4	174
Morrison County	15,808	$152,200	2,314	2.3%	202	17	739
Benton County	16,273	$155,500	807	5.3%	445	1	43
Mille Lacs County	12,736	$141,900	2,487	4.7%	173	20	869
Kanabec County	7,810	$139,000	1,554	4.5%	97	3	130
Pine County	17,246	$141,600	5,630	4.1%	109	17	739
Carlton County	15,719	$158,400	2,177	3.9%	206	14	608
TOTAL/AVERAGE	**120,028**	**$145,011**	**24,977**	**4.6%**	**1,717**	**135**	**5,866**

[a] Source: U.S. Census Bureau, 2010–2014 American Community Survey.

[b] Source: U.S. Census Bureau, 2010 Census.

[c] Source: HotelMotels.info (2016).

[d] Source: STR, Inc. (2017)

Note:

Notes: The occupied Hotel and Motel Units column used the rounded 2017 year-to-date Lodging Performance occupancy rate (55 percent) for the State of Minnesota provided by STR, Inc.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the housing ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

According to the U.S. Census Bureau (2010, 2015), there are 182,768 housing units in the counties that would be crossed by RA-06 between Clearbrook and Carlton, and 2,894 vacant housing units are available to rent (Table 6.2.4-3). There are 193 hotels and motels located in the counties crossed by RA-06, with an estimated total of 15,247 rooms and an estimated total of 8,386 occupant rooms.

Nine homes are located within the proposed construction work area of RA-06, and an additional eight residences are located within 50 feet of the construction work area. Seven residences are located in the permanent right-of-way and would require removal or re-location or an adjustment of the route centerline within the 750-foot route width to avoid the homes.

The median value values of owner-occupied housing units in counties along RA-06 are listed in Table 6.2.4-3. The lowest median home value is $137,200 in St. Louis County, and the highest median home value is $165,400 in Aitkin County.

Table 6.2.4-3. Housing in Counties Crossed by Route Alternative RA-06 (Clearbrook to Carlton)

County	Total Housing Units[a]	Median Value of Owner-Occupied Housing Units[a]	Vacant Housing Units[a]	Rental Vacancy Rate[a]	Vacant Housing Units Available for Rent[b]	Hotels and Motels[c]	Occupied Hotel and Motel Units[d]
Beltrami County	20,635	$147,200	3,842	7.8%	302	26	1,130
Itasca County	27,145	$152,000	8,324	5.4%	303	71	3,085
Aitkin County	16,060	$165,400	8,423	6.1%	161	12	521
St. Louis County	103,209	$137,200	18,176	3.8%	1,922	70	3,041
Carlton County	15,719	$158,400	2,177	3.9%	206	14	608
TOTAL/AVERAGE	**182,768**	**$152,040**	**40,942**	**5.4%**	**2,894**	**193**	**8,386**

[a] Source: U.S. Census Bureau, 2010–2014 American Community Survey.

[b] Source: U.S. Census Bureau, 2010 Census.

[c] Source: HotelMotels.info (2016).

[d] Source: STR, Inc. (2017)

Note:

The occupied Hotel and Motel Units column used the rounded 2017 year-to-date Lodging Performance occupancy rate (55 percent) for the State of Minnesota provided by STR, Inc.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the housing ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

According to the U.S. Census Bureau (2010, 2015), there are a total of 222,280 housing units in the counties that would be crossed by RA-07 between Clearbrook and Carlton, and 3,254 vacant housing units are available to rent (Table 6.2.4-4). There are 298 hotels and motels located in the counties crossed by RA-07, with an estimated total of 23,542 rooms and an estimated total of 12,948 occupant rooms.

Forty homes are located within the proposed construction work area of RA-07, and an additional 16 residences are located within 50 feet of the construction work area. No residences would need to be removed from the permanent right-of-way.

The median value values of owner-occupied housing units in counties along RA-07 are listed in Table 6.2.4-4. The lowest median home value is $137,200 in St. Louis County, and the highest median home value is $172,800 in Cass County.

Table 6.2.4-4. Housing in Counties Crossed by Route Alternative RA-07 and RA-08 (Clearbrook to Carlton)

County	Total Housing Units[a]	Median Value of Owner-Occupied Housing Units[a]	Vacant Housing Units[a]	Rental Vacancy Rate[a]	Vacant Housing Units Available for Rent[b]	Hotels and Motels[c]	Occupied Hotel and Motel Units[d]
Beltrami County	20,635	$147,200	3,842	7.8%	302	26	1,130
Hubbard County	14,578	$171,300	5,838	3.3%	158	43	1,868
Cass County	24,934	$172,800	12,058	4.2%	202	62	2,694
Itasca County	27,145	$152,000	8,324	5.4%	303	71	3,085
Aitkin County	16,060	$165,400	8,423	6.1%	161	12	521
St. Louis County	103,209	$137,200	18,176	3.8%	1,922	70	3,041
Carlton County	15,719	$158,400	2,177	3.9%	206	14	608
TOTAL/AVERAGE	**222,280**	**$157,757**	**58,838**	**4.9%**	**3,254**	**298**	**12,948**

[a] Source: U.S. Census Bureau, 2010–2014 American Community Survey.

[b] Source: U.S. Census Bureau, 2010 Census.

[c] Source: HotelMotels.info (2016).

[d] Source: STR, Inc. (2017)

Note:

The occupied Hotel and Motel Units column used the rounded 2017 year-to-date Lodging Performance occupancy rate (55 percent) for the State of Minnesota provided by STR, Inc.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the housing ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Route alternative RA-08 would pass through the same counties as described above for RA-07 (Table 6.2.4-4); therefore, conditions for housing availability would be the same (222,280 total housing units; 3,254 housing units available to rent; and 298 hotels and motels, with an estimated total of 23,542 rooms and an estimated total of 12,948 occupant rooms).

Nine homes are located within the proposed construction work area of RA-08, and an additional 20 residences are located within 50 feet of the construction work area. Three residences would need to be removed or re-located from the permanent right-of-way or an adjustment of the route centerline within the 750-foot route width would need to be made to avoid these homes.

The median values of owner-occupied housing units in counties along RA-08 are listed in Table 6.2.4-4.

6.2.4.3 Impact Assessment

6.2.4.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the housing ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this pproject will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Housing Availability

The Applicant estimates that the maximum total construction workforce would be approximately 4,200 workers across seven separate construction spreads in Minnesota, with each spread expected to total between 500 and 600 workers. It is likely that Enbridge would hire a portion of its workers from outside the counties through which the routes pass; however, to analyze the worst-case scenario impacts it was assumed that all 4,200 workers would be non-local and would re-locate to the vicinity of the pipeline route during construction. In the counties crossed by the Applicant's preferred route, a total of 2,276 housing units (Table 6.2.4-1) are estimated to be vacant and available to rent, in addition to 256 hotels and motels (Table 6.2.4-1) with an estimated 20,224 rooms and an estimated total of 11,123 occupant rooms. If the entire workforce of 4,200 workers were to re-locate to the area, and assuming that they would occupy hotels and motels or rental units, they would use approximately 19 percent of the available temporary housing in these counties. Although some counties have limited temporary housing available (e.g., Kittson, Marshall, and Red Lake counties), adequate housing is available in surrounding counties, so workers could reasonably find housing in an area from which they could commute to the pipeline worksite.

The Applicant's preferred route between Clearbrook and Carlton would require four separate construction spreads. In the counties between Clearbrook and Carlton, approximately 11 percent of the available temporary housing would be required to accommodate a worst-case scenario of all four spreads with a maximum of 2,400 workers requiring housing at the same time. It is likely that only a single spread would be located in one county at any given time, reducing the number of workers that would need to find housing in the same area.

Impacts on housing availability during construction of the Applicant's preferred route would be temporary, i.e. limited to the construction period. These temporary impacts are expected to be minor given the relatively small percentage of available housing that would be required to accommodate workers even under a worst-case scenario.

Residential Access and Safety

During construction, access to residences may be restricted or limited at times when the pipeline crosses driveways or other local roads. In some instances, construction would disturb the road surface to make room for construction equipment and the open trench. This could represent an inconvenience to local residents during the construction period. However, the construction period generally would be limited at any one location.

The pipeline would cross paved roads by boring underneath the road or using HDD. These crossing methods prevent road closures by passing under the road without requiring disturbance to the road itself. Unpaved roads would be crossed using the open-cut method. Where road closures would occur, Enbridge would ensure emergency access for residences and neighborhoods at all times during construction and would coordinate construction schedules with affected homeowners. Detours with appropriate signage would be used where possible. When no detour is available, one lane would be kept open except for the brief period when the pipe is lowered into the trench. Fencing would be used in areas where the trench or construction site poses a risk to the public. Enbridge has indicated that they would complete all open-cut road crossings within three days, (see Chapter 2 for further details). Given Enbridge's use of bore crossings and HDDs across paved roads, as well as assurance that residences and emergency services would continue to have access on roads that are open cut, impacts related to residential access and safety would be temporary and minor to major for the 19 homeowners within 50 feet of construction (seven between Clearbrook and Carlton). For the eight residences within the construction work area (six between Clearbrook and Carlton), impacts may be more substantial because workers, construction equipment, and the pipeline trench would be in proximity to the residence, and use of the surrounding property would be limited. Therefore, residences within the construction work area would experience a temporary major impact related to safety and access.

Property Values

For homeowners who would be affected by construction, Enbridge would negotiate easements along the construction work area, which would address compensation for impacts resulting from construction of the pipeline and any hindrances created by the easement. Enbridge would be responsible for any construction-related damages and for returning affected property to its original condition to help maintain property value. Impacts on property values during construction would be temporary but likely to be major for homeowners attempting to sell their homes during construction.

Operations Impacts

Housing Availability

Operation and maintenance of the pipeline would require few additional workers, and those workers would be located at the Applicant's regional maintenance facilities and operations centers. Operations and maintenance would not require significant numbers of workers along the pipeline route and would have no or negligible impact on housing availability in the counties crossed by the Project.

Residential Access and Safety

During operation, the pipeline would be underground, and standard operations and maintenance would not pose any access or safety threats. Safety associated with accidental releases of crude oil is discussed in Chapter 10.

Residential structures were identified within the permanent right-of-way for the Applicant's preferred route. Because no barns, homes, or other structures would be allowed within the permanent right-of-way, Enbridge would need to remove or re-locate those structures, as negotiated with the landowner. Enbridge has identified 18 structures within the permanent right-of-way that would need to be removed and has reached an agreement with each of the affected landowners. Because Enbridge has negotiated agreements with each of the landowners, no unknown or unquantified impacts on structures in the permanent right-of-way would occur.

For aboveground facilities, the Applicant's preferred route would require 27 MLVs, 4 new pump stations, and upgrades to 4 existing pump stations. Operation of the aboveground facilities would not affect an individual's ability to access their home; however, a landowner would no longer have access to the 0.1-acre MLV site on their property, which would be enclosed by a fence. Depending on the overall size of the parcel, this would be a minor to major permanent impact related to access. The expanded area of existing pump stations and any new pump stations would be enclosed by a fence to exclude access to all but Enbridge personnel. Enbridge would purchase the pump station sites from the landowner to eliminate any landowner access issues.

Property Values

A review of relevant literature provided limited to no conclusive evidence that the presence of an oil or gas pipeline and associated r easement would have an effect—negative or otherwise—on surrounding property values. Various studies are available characterizing effects on property values related to proximity to oil and natural gas pipelines. This literature review focused on studies of the relation of property values to the mere presence of a pipeline facility; spills, ruptures and other incidents may have a greater impact on property values and are discussed in Chapter 10.

Table 6.2.4-5 summarizes the results of the literature review. Ultimately, the findings were inconclusive, disputed, or showed minimal to no relationship between pipeline easements and property values. It should be noted that some of the studies listed in the literature review were prepared by an industry group or project developer/applicant, or consultant on behalf of either; studies included in peer-reviewed journals are listed first within the table below. Furthermore, property values are often based on local or regional factors; the conclusions of a study focused on a different state or region of the U.S. may not apply in this case based on external local or regional factors.

Table 6.2.4-5. Summary of Property Values Literature Review

Citation	Summary	Conclusions
Wilde et al. (2012)	A literature review by Gnarus Advisors on the effects of pipelines on property values. Published in *Journal of Real Estate Literature*.	Gnarus Advisors found, "There is no credible evidence based on actual sales data that proximity to pipelines reduces property values."
Boxall, P.C., Chan, W.H. & McMillan, M.L. (2005)	The impact of oil and natural gas facilities on rural residential property values: a spatial hedonic analysis. *Resource and energy economics*. The study examines the impact of oil and gas facilities on rural residential property values using data from Central Alberta, Canada.	The results show that property values are negatively correlated with the number of sour gas wells and flaring oil batteries within 4 km of a property. This study also reviewed associated pipelines, but results suggest that it is the total numbers of wells but not the number of sour pipelines that have significant negative impacts on property prices.
Hansen, J.L., Benson, E.D. & Hagen, D.A. (2006)	Environmental hazards and residential property values: evidence from a major pipeline event. *Land Economics*. Study evaluates residential properties within one mile of a pipeline; one subject pipeline had an accident, and one did not.	Results suggest that in the absence of a highly publicized event, location near a pipeline is not viewed as a significant environmental risk. Negative effects diminish over time – with regard not necessarily to the pipeline, but to where an accident occurred.
Diskin et al. (2011)	The effect of natural gas pipelines on residential value. *Right of Way.* The study analyzed sales data from approximately 1,000 residential properties in Arizona to determine whether proximity to a natural gas pipeline affected real estate sales prices.	The study was unable to identify a systematic relationship between proximity to a pipeline and sales price or property value.

Table 6.2.4-5. Summary of Property Values Literature Review

Citation	Summary	Conclusions
Allen, Williford, & Seale (2001)	Study sponsored by the Interstate Natural Gas Association of America (INGAA) reviewed home sales in neighborhoods that were crossed by pipelines of various diameter.	The study found no evidence that the presence of a pipeline on a property significantly altered its sales price, and surrounding development was not impeded.
Fruits (2008)	Study on the impacts of the South Mist Pipeline Expansion on property values in Oregon. Included price modeling using over 10,000 property transactions within 1 mile of the pipeline.	The study found that the pipeline had "no statistically significant or economically significant relationship with residential property values."
PGP Valuation (2008)	Study conducted by PGP Valuation and released by Palomar Gas Transmission, LLC on the effects of the SMPE pipeline on property values in Oregon. Study used sales data for 18 properties that were affected by the pipeline right-of-way easements and compared them with sales of comparable unencumbered properties.	PGP Valuation concluded that natural gas pipelines had no measurable long-term impact on property values. The study also found that variations in short-term values were not substantial or were nonexistent, and that residential properties were not affected by the pipeline easement any more or less than other property types.
Diskin et al. (2011)	The study analyzed sales data from approximately 1,000 residential properties in Arizona to determine whether proximity to a natural gas pipeline affected real estate sales prices.	The study was unable to identify a systematic relationship between proximity to a pipeline and sales price or property value.
Integra Realty Resources (IRR) (2016)	INGAA released a study conducted by IRR on the impacts on property values of several natural gas transmission pipelines.	The study concluded that the presence of the pipeline had no measurable effect on sales prices and that the size of the pipeline had no effect on sales prices.

Given the lack of a conclusive, quantitative relationship between property values and proximity to pipelines, it is infeasible to quantify the potential for impacts of operation of the Project on property values, both in general and specific to any parcels or areas. Furthermore, reaching a conclusion that property values would be generally affected – positively or negatively – by the presence of a pipeline would be considered speculative at best.

6.2.4.3.2 Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the housing ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Route alternative RA-03AM is approximately 50 miles longer than the Applicant's preferred route between Clearbrook and Carlton; therefore, construction of the route may require an additional spread (a total of five spreads) in this segment. If the entire workforce were to re-locate to the area (a maximum of 3,000 workers), and assuming that they would occupy hotels and motels or rental units, they would use approximately 24 percent of the available temporary housing in the counties crossed by RA-03AM. Although some counties have limited temporary housing available (e.g., Benton County), adequate housing is available in surrounding counties, so workers could reasonably find housing in an area from which they could commute to the pipeline worksite. Additionally, it is likely that only a single spread would be located in one county at any given time, reducing the number of workers that would need to find housing in the same area. Impacts on housing availability during construction of RA-03AM would be temporary impacts limited to the construction period. These temporary impacts are expected to be minor given the relatively small percentage of available housing that would be required to accommodate workers even under a worst-case scenario.

During construction, access to residences may be restricted at times when the pipeline crosses driveways or other local roads. In some instances, construction would disturb the road surface to make room for construction equipment and the open trench. This could represent an inconvenience to local residents during construction of RA-03AM. Given Enbridge's use of bore crossings and HDDs across paved roads, as well as assurance that residences and emergency services would continue to have access on roads that are open cut, impacts related to residential access and safety would be temporary and minor to major for the 39 homeowners within 50 feet of construction. For the 16 residences within the construction work area, impacts may be more substantial because workers, construction equipment, and the pipeline trench would be in proximity to the residence, and use of the surrounding property would be limited. Therefore, residences within the construction work area would experience a temporary major impact related to safety and access.

For homeowners who would be affected by construction of RA-03AM, construction-related damages may affect property value unless repairs return the property to its previous condition. Impacts on property values during construction would be temporary but likely to be major for homeowners attempting to sell their homes during construction.

Operations Impacts

Operation of the pipeline would not require significant numbers of workers along RA-03AM and would have no to negligible impact on housing availability in the counties through which the route alternative passes.

Impacts associated with access and safety for RA-03AM during operation would be similar to those described for the Applicant's preferred route. The permanent right-of-way for RA-03AM would intersect three residences and Enbridge would need to remove or re-locate those structures, as negotiated with the landowner, or the centerline of the route would need to be adjusted within the 750-foot route width to avoid the homes. Removal of the structures represents a major permanent impact for those affected. During operation, the pipeline would be underground, and standard operations and maintenance would not pose any residential access or safety threats.

Property Values

As described in Section 6.2.4.3.1 and accompanying Table 6.2.4-5, a review of relevant literature provided no conclusive evidence that an oil/gas pipeline and easement would affect surrounding property values. It should be noted that few studies relating to this topic exist; that some of the studies listed in the literature review were prepared by an industry group or project developer/applicant, or consultant on behalf of either; and that property values are often based on local or regional factors, so conclusions of a study focused on one region or state may not apply to another location.

Given the lack of a conclusive, quantitative relationship between property values and proximity to pipelines, it is infeasible to quantify the potential for impacts of operation of RA-03AM on property values or speculate on whether property values are likely to increase or decrease based on the presence of RA-03AM.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the housing ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Because RA-06 is similar in length to the Applicant's preferred route between Clearbrook and Carlton, it likely would require the same number of construction spreads (about four spreads, totaling a maximum of 2,400 workers). If the entire workforce were to re-locate to the area, and assuming that they would occupy hotels and motels or rental units, they would use approximately 13 percent of the available temporary housing in the affected counties. Additionally, it is likely that only a single spread (between 500 and 600 workers) would be located in one county at any given time, reducing the number of workers that would need to find housing in the same area. Impacts on housing availability during construction of RA-06 would be temporary, i.e. limited to the construction period. These temporary impacts are expected to be minor given the relatively small percentage of available housing that would be required to accommodate workers even under a worst-case scenario.

During construction, access to residences may be restricted at times when the pipeline crosses driveways or other local roads. In some instances, construction would disturb the road surface to make room for construction equipment and the open trench. This would represent an inconvenience to local residents during construction of RA-06. Given Enbridge's use of bore crossings and HDDs across paved roads, as well as assurance that residences and emergency services would continue to have access on roads that are open cut, impacts related to residential access and safety would be temporary and minor to major for the eight homeowners within 50 feet of construction. For the nine residences within the construction work area, impacts are likely to be more substantial because workers, construction equipment, and the pipeline trench would be in close proximity to the residence, and use of the surrounding property would be limited. Therefore, residences within the construction work area would experience a temporary major impact related to safety and access.

For homeowners who would be affected by construction of RA-06, construction-related damages would likely affect property value unless repairs return the property to its previous condition. Impacts on property values during construction would be major for homeowners attempting to sell their homes during construction.

Operations Impacts

Operation of the pipeline would not require significant numbers of workers along RA-06 and would not affect housing availability in the counties surrounding the Project.

Impacts associated with residential access and safety for RA-06 during operation would be similar to those described for the Applicant's preferred route. The permanent right-of-way for RA-06 would cross seven residences and Enbridge would need to remove or re-locate those structures, as negotiated with the landowner, or the centerline of the route would need to be adjusted within the 750-foot route width to avoid the homes. Removal of the structures represents a major, permanent impact for those affected. During operation, the pipeline would be underground, and standard operations and maintenance would not pose any residential access or safety threats.

Property Values

As described in Section 6.2.4.3.1 and accompanying Table 6.2.4-5, a review of relevant literature provided no conclusive evidence that an oil/gas pipeline and easement would affect surrounding property values. It should be noted that few studies relating to this topic exist; that some of the studies listed in the literature review were prepared by an industry group or project developer/applicant, or consultant on behalf of either; and that property values are often based on local or regional factors, so conclusions of a study focused on one region or state may not apply to another location.

Given the lack of a conclusive, quantitative relationship between property values and proximity to pipelines, it is infeasible to quantify the potential for impacts of operation of RA-06 on property values or speculate on whether property values are likely to increase or decrease based on the presence of RA-06.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the housing ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Route alternative RA-07 is similar in length to the Applicant's preferred route between Clearbrook and Carlton. Therefore, it is likely to require the same number of construction spreads (about four totaling a maximum of 2,400 workers). Additional laborers may be needed to complete both the removal of the existing Line 3 and construction of the new Line 3. In addition, a longer construction period would be required to complete both removal and replacement, so laborers would be present, occupying housing in the affected counties for a longer period of time. If the entire workforce of 2,400 workers were to re-locate to the area, and assuming that they would occupy hotels and motels or rental units, they would use approximately 9 percent of the available temporary housing in the affected counties. Even if the required number of workers was doubled to address removal and replacement, less than 20 percent of the available housing would be occupied by these workers. Additionally, it is likely that only a single spread would be located in one county at any given time, reducing the number of workers that would need to find housing in the same area. Impacts on housing availability during construction of RA-07 would be temporary, i.e. limited to the construction period. These temporary impacts are expected to be minor given the relatively small percentage of available housing that would be required to accommodate workers, even under a worst-case scenario.

During construction, access to residences may be restricted at times when the pipeline crosses driveways or other local roads. In some instances, construction would disturb the road surface to make room for construction equipment and the open trench. This would represent an inconvenience to local residents during construction of RA-07, particularly given the extended construction time required to first remove the existing line and then put the new line in place. Given Enbridge's use of bore crossings and HDDs across paved roads, as well as assurance that residences and emergency services would continue to have access on roads that are open cut, impacts related to residential access and safety would be temporary and minor to major for the 16 homeowners within 50 feet of construction. For the 40 residences within the construction work area, impacts would likely be more substantial because workers, construction equipment, and the pipeline trench would be in proximity to the residence, and use of the surrounding property would be limited. Therefore, residences within the construction work area would experience a temporary major impact related to safety and access.

For homeowners who would be affected by construction of RA-07, construction-related damages may affect property value unless repairs return the property to its previous condition. Impacts on property values during construction would be temporary but major for homeowners attempting to sell their homes during construction.

Operations Impacts

Operation of the pipeline would not require significant numbers of workers along RA-07 and would not affect housing availability in the counties surrounding the Project.

Impacts associated with access and safety for RA-07 during operation would be similar to those described for the Applicant's preferred route. Because the permanent right-of-way for RA-07 would not intersect any residences, no impact from removal of homes and permanent structures or displacement of residents would occur. During operation, the pipeline would be underground, and standard operations and maintenance would not pose any residential access or safety threats.

Property Values

As described in Section 6.2.4.3.1 and accompanying Table 6.2.4-5, a review of relevant literature provided no conclusive evidence that an oil/gas pipeline and easement would affect surrounding property values. It should be noted that few studies relating to this topic exist; that some of the studies listed in the literature review were prepared by an industry group or project developer/applicant, or consultant on behalf of either; and that property values are often based on local or regional factors, so conclusions of a study focused on one region or state may not apply to another location.

Given the lack of a conclusive, quantitative relationship between property values and proximity to pipelines, it is infeasible to quantify the potential for impacts of operation of RA-07 on property values or speculate on whether property values are likely to increase or decrease based on the presence of RA-07. If a relationship does exist between property values and proximity to pipelines, however, the location of RA-07, within the existing Mainline corridor would make it very unlikely that RA-07 would affect existing property values.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the housing ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Because RA-08 is similar in length to the Applicant's preferred route between Clearbrook and Carlton, it is likely to require the same number of construction spreads (about four spreads totaling a maximum of 2,400 workers). If the entire workforce were to re-locate to the area, and assuming that they would occupy hotels and motels or rental units, they would use approximately 9 percent of the available temporary housing in the affected counties. It is likely that only a single spread (between 500 and 600 workers) would be located in one county at any given time, reducing the number of workers that would need to find housing in the same area. Impacts on housing availability during construction of RA-08 would be temporary, i.e. limited to the construction period. These temporary impacts are expected to be minor given the relatively small percentage of available housing that would be required to accommodate workers even under a worst-case scenario.

During construction, access to residences may be restricted at times when the pipeline crosses driveways or other local roads. In some instances, construction would disturb the road surface to make room for construction equipment and the open trench. This would represent an inconvenience to local residents during construction of RA-08. Given Enbridge's use of bore crossings and HDDs across paved roads, as well as assurance that residences and emergency services would continue to have access on roads that are open cut, impacts related to residential access and safety would be temporary and minor to major for the 20 homeowners within 50 feet of construction. For the nine residences within the construction work area, impacts would likely be more substantial because workers, construction equipment, and the pipeline trench would be in proximity to the residence, and use of the surrounding property would be limited. Therefore, residences within the construction work area would experience a temporary major impact related to safety and access.

For homeowners who would be affected by construction of RA-08, construction-related damages may affect property value unless repairs return the property to its previous condition. Impacts on property values during construction would be temporary but major for homeowners attempting to sell their homes during construction.

Operations Impacts

Operation of the pipeline would not require significant numbers of workers along RA-08 and would not affect housing availability in the counties surrounding the Project.

Impacts associated with access and safety for RA-08 during operation would be similar to those described for the Applicant's preferred route. The permanent right-of-way for RA-08 would intersect three residences and Enbridge would need to remove or re-locate those structures, as negotiated with the landowner, or the centerline of the route would need to be adjusted within the 750-foot route width to avoid the homes. Removal of the structures represents a major permanent impact for those affected. During operation, the pipeline would be underground, and standard operations and maintenance would not pose any residential access or safety threats.

Property Values

As described in Section 6.2.4.3.1 and accompanying Table 6.2.4-5, a review of relevant literature provided no conclusive evidence that an oil/gas pipeline and easement would affect surrounding property values. It should be noted that few studies relating to this topic exist; that some of the studies listed in the literature review were prepared by an industry group or project developer/applicant, or consultant on behalf of either; and that property values are often based on local or regional factors, so conclusions of a study focused on one region or state may not apply to another location.

Given the lack of a conclusive, quantitative relationship between property values and proximity to pipelines, it is infeasible to quantify the potential for impacts of operation of RA-08 on property values or speculate on whether property values are likely to increase or decrease based on the presence of RA-08. If a relationship does exist between property values and proximity to pipelines, however, the location of RA-08, within the existing Mainline corridor would make it very unlikely that RA-08 would affect existing property values.

6.2.4.4 Summary and Mitigation

6.2.4.4.1 Summary

Table 6.2.4-6 summarizes the potential impacts of construction and operations on housing availability, residential access and safety, and property values for the Applicant's preferred route and each of the route alternatives. Overall, the affected counties for all routes contain sufficient available housing to absorb the non-local workforce, and none of the routes represents a significant advantage over the others in terms of housing. For all routes, impacts on housing availability during construction would be minor and temporary. During operations, there would be no to negligible impact on housing availability for any route option.

Residents within or adjacent to the construction work area for each route option would experience temporary minor to major impacts from restricted access and construction safety hazards. The Applicant's preferred route would affect the fewest residences within 50 feet of the construction work area (7) and therefore would result in the least impacts on residential access and safety, while RA-03AM would affect the most residences within 50 feet of the construction work area (39). Residences within the construction work area would be subject to a variety of impacts, including potential limits on access and impacts on safety. RA-07 would also affect the most residences within the construction work area (40), while the Applicant's preferred route would affect the fewest residences within the construction work area (6).

For homeowners who experience construction-related damages, property value could be affected unless repairs return the property to its previous condition. Impacts on property values during construction would be temporary but could be major for homeowners attempting to sell their homes during construction.

Operation of the pipeline could result in displacement of residents with homes located within the permanent right-of-way. Homes and associated structures located within the permanent right-of-way would be removed or re-located, or the route centerline would need to be adjusted within the 750-foot route width, because no structures are permitted within the permanent right-of-way. Enbridge has reached agreements with the landowners for all structures, including residences, identified within the permanent right-of-way for the Applicant's preferred route. Overall, RA-06 represents the largest potential permanent impact on residences, with seven residential structures located within the permanent right-of-way; while RA-07 would represent the least impact, as no residences are located within the existing Mainline corridor where RA-07 would run.

A review of relevant literature provided no conclusive evidence that an oil/gas pipeline and easement would negatively affect surrounding property values. A collection of studies is available that characterizes impacts related to proximity to a hazardous or potentially hazardous site, proximity to oil and natural gas pipelines, and proximity to oil pipeline ruptures. Ultimately, the findings were inconclusive, disputed, or showed no relationship between pipeline easements and home values. Given the lack of a conclusive, quantitative relationship between property values and proximity to pipelines, it is infeasible to estimate or quantify the potential for impacts from operation of the project on property values. If a relationship does exist between property values and proximity to pipelines, however, the location of RA-07 in the existing Mainline corridor and RA-08 along this corridor would make it very unlikely that either of these routing options would affect existing property values.

6.2.4.4.2 Mitigation

Identified mitigation includes reduction of impacts associated with restricted access and construction safety hazards on residences within 50 feet of the construction work area, specifically development of site-specific construction plans for all residences within 50 feet of the construction work area. These plans could include the use of safety fences, designated access routes, and limitations on construction activity.

If one of the route alternatives is selected as the preferred route, identified mitigation for residences located within the permanent right-of-way includes:

- Negotiating compensation for impacts resulting from construction of the pipeline and any hindrances created by the easement.
- Refining the route centerline to avoid residences where agreements with landowners cannot be reached.

Table 6.2.4-6. Summary of Potential Impacts on Housing for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Use of available temporary housing in affected counties to meet increased demand from the non-local workforce	Temporary/minor impacts • 11 percent of available temporary housing	Temporary/minor impacts • 24 percent of available temporary housing	Temporary/minor impacts • 13 percent of available temporary housing	Temporary/minor impacts • 9 percent of available temporary housing	Temporary/minor impacts • 9 percent of available temporary housing
Access limitations or safety concerns for residences within the construction work area	Temporary/minor to major impacts • 6 residences	Temporary/minor to major impacts • 16 residences	Temporary/minor to major impacts • 9 residences	Temporary/minor to major impacts • 40 residences	Temporary/minor to major impacts • 9 residences
Access limitations or safety concerns for additional residences within 50 feet of the construction work area	Temporary/minor to major impacts • 7 residences	Temporary/minor to major impacts • 39 residences	Temporary/minor to major impacts • 8 residences	Temporary/minor to major impacts • 16 residences	Temporary/minor to major impacts • 20 residences
Changes in property values of homes during construction of a pipeline	Temporary/major impacts (*if homeowner is attempting to sell home during construction*)	Temporary/major impacts (*if homeowner is attempting to sell home during construction*)	Temporary/major impacts (*if homeowner is attempting to sell home during construction*)	Temporary/major impacts (*if homeowner is attempting to sell home during construction*)	Temporary/major impacts (*if homeowner is attempting to sell home during construction*)
Operations Impacts					
Availability of housing to meet increased demand from the non-local workforce	Operations and maintenance would not require significant numbers of workers along the pipeline route and would not affect housing availability.				
Access limitations or safety concerns from removal of structures within permanent right-of-way	No impact (*Negotiated agreements with landowners of* 18 *structures requiring removal or re-location*)	Permanent/major impacts • 3 residences require removal or re-location	Permanent/major impacts • 7 residences require removal or re-location	No impact	Permanent/major impacts • 3 residences require removal or re-location

Table 6.2.4-6. Summary of Potential Impacts on Housing for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Access limitations or safety concerns from restricted property access	Permanent/minor to major impacts • Restricted access to 0.1-acre mainline valve site	*Locations of permanent structures and access roads have not been determined for the route alternatives. Therefore, the location and number of properties affected cannot be quantified. However, impacts would be expected to be minor to major.*			
Changes in property values of homes during operation of a pipeline	Available studies were inconclusive; therefore, it is infeasible to accurately estimate the potential for impacts of operation of the Applicant's preferred route or route alternatives on property values.				

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to housing. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, housing availability information allows an assessment of just one aspect of potential impacts to housing, but information about restricted property access is necessary to understand possible access limitations or safetly concerns, which are also an important component of housing related effects. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in the tables should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-117 to 6-128. The table above, for example, provides counts and percentages of available housing within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to housing is contained in the impacts discussion in the text (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-117 to 6-120. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-120 to 6-122. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-122 to 6-123. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.2.4-6. Summary of Potential Impacts on Housing for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-123 to 6-124. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-125 to 6-126. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.2.4.5 References

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6.2.5 Transportation and Public Services

This section addresses potential impacts on transportation and public services in the areas crossed by the Applicant's preferred route and route alternatives. The analysis considered the potential for the following:

- Road closures, increased traffic, and road damage resulting from pipeline construction or operation;
- Disruption of rail travel and airport operation due to pipeline construction or operation;
- Disruption of utilities during construction and operation, including local, intrastate, and interstate utilities and transmission lines; and
- Increased need for emergency services during construction and operations.

This section first describes the existing conditions within an area along the Applicant's preferred route and each of the route alternatives where transportation and public services could be affected by construction and operation of the Project. The potential construction- and operations-related impacts on transportation, utilities, and public services for the routing options (the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08) are addressed next. The impact analysis focuses on the segment of the Applicant's preferred route and route alternatives between Clearbrook and Carlton, as described below. A summary and comparison of the impacts for the five routing options are included at the end of the section.

6.2.5.1 Regulatory Context and Methodology

6.2.5.1.1 Regulatory Context

Project construction would require permits from the Minnesota Department of Transportation (MNDOT) to cross state roads and to create access points onto state highways and county roads from private lands. At road and highway crossings, the Applicant would be subject to county, town, or city regulations that apply to roadways (Minn. Stat. § 222.37) during construction, operation, and maintenance of the pipeline route.

Federal Aviation Administration (FAA) regulations in 14 CFR 77 describe the standards used for determining obstructions to air navigation, navigational aids, or navigational facilities. Those regulations require that any construction project that includes structures with a height of 200 feet or more above ground level or above the established airport elevation (whichever is higher), within 3 nautical miles of an airport, comply with criteria presented in its regulations. The Applicant is not proposing to construct facilities that fall under those criteria; therefore, this issue is not further addressed in this EIS.

FAA regulations also state that the responsible party would have to notify FAA if construction would exceed a defined slope that, depending on various factors, could extend 20,000 feet from the nearest runway. For the purposes of this EIS, airports within 20,000 feet of an alternative route were identified.

The Minnesota Gopher State One-Call system (GSOC) requires notification 48 hours in advance of proposed excavations to allow time to inform utility operators with underground facilities near the excavation areas of the pending excavation (Minn. Stat. 216D.02). In addition, GSOC requires that white markings be placed to define the entire area where excavation would occur.

6.2.5.1.2 Methodology

Construction and operation of the Project have the potential to affect transportation and public services. The following methods were used to identify the relevant existing conditions:

- GIS datasets were used to identify major and minor roads, railways, and utility lines that would be crossed by the Applicant's preferred route and route alternatives, and airports within 20,000 feet of the routes and aboveground facilities;
- The annual average daily traffic (AADT) was estimated for major roads crossed by the route options, using available data for major roadways in the state; and
- Online datasets were used to identify the number of police, fire, and medical services available in counties crossed by the Applicant's preferred route and route alternatives.

Using these data, impacts were evaluated as follows:

- Crossing methods used for each road and railway were compared and qualitatively assessed, and the magnitude of the impacts on traffic due to access loss and traffic increases was determined;
- The estimated traffic from construction workers and vehicles was compared to the AADT estimates for major roads crossed by the route options to determine the magnitude of impacts on traffic;
- The potential impacts on the availability of emergency services were considered by using the number of available services to develop a qualitative assessment of the relative magnitude of potential Project-related needs for those services; and
- The potential effects and the magnitude of those effects on utilities were considered based on the number of service lines crossed by the route options.

No single one of the data sources considered above provides a complete indication of all relevant impacts to transportation and public services, but together the different metrics provide a reasonably comprehensive indication of the potential impacts. For example, AADT information allows an assessment of potential traffic congestion issues, but information about potential project related demand for emergency services is necessary to understand impacts to emergency service availability, which is also an important component of transportation and public service related effects.

Furthermore, the quantitative information from these data sources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, of number of roadways/utility lines crossed within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a full understanding of the qualitative nature of impacts that could occur to different types of roadways/utility lines is contained in the text of this section.

The Applicant's preferred route and all of the route alternatives have the same route between the North Dakota border and Clearbrook, and from Carlton to the Wisconsin border. Therefore, comparison of impacts among the route options focused on the segments of the routes between Clearbrook and Carlton.

The ROI for the impact assessment on roads, railroads, and utilities consists of the actual crossing locations of the infrastructure crossed by the Applicant's preferred route and the route alternatives. The ROI for the analysis of potential impacts on regional airports consists of airports within 20,000 feet of the construction work areas and aboveground facilities. The ROI for impacts of construction traffic on local traffic is all major roads crossed by the Applicant's preferred route and the route alternatives.

Potential impacts on emergency services were reviewed at the county level, with the ROI consisting of the counties crossed by each of the route options. Data for Clearwater County were included in the assessment of the common route for the Applicant's preferred route and route alternatives between the North Dakota border and Clearbrook. The ROI for public services for the remainder of the Applicant's preferred route and route alternatives included all counties crossed by the routes, except for Clearwater County. Because the impact analysis for public services was based on county data, comparisons were made using data for existing conditions in all of Clearwater County, in which Clearbrook is located, and all of Carlton County, in which Carlton is located.

6.2.5.2 Existing Conditions

An overview of the transportation network within Minnesota that would be crossed by the Applicant's preferred route and route alternatives is shown in Figure 6.2.5-1.

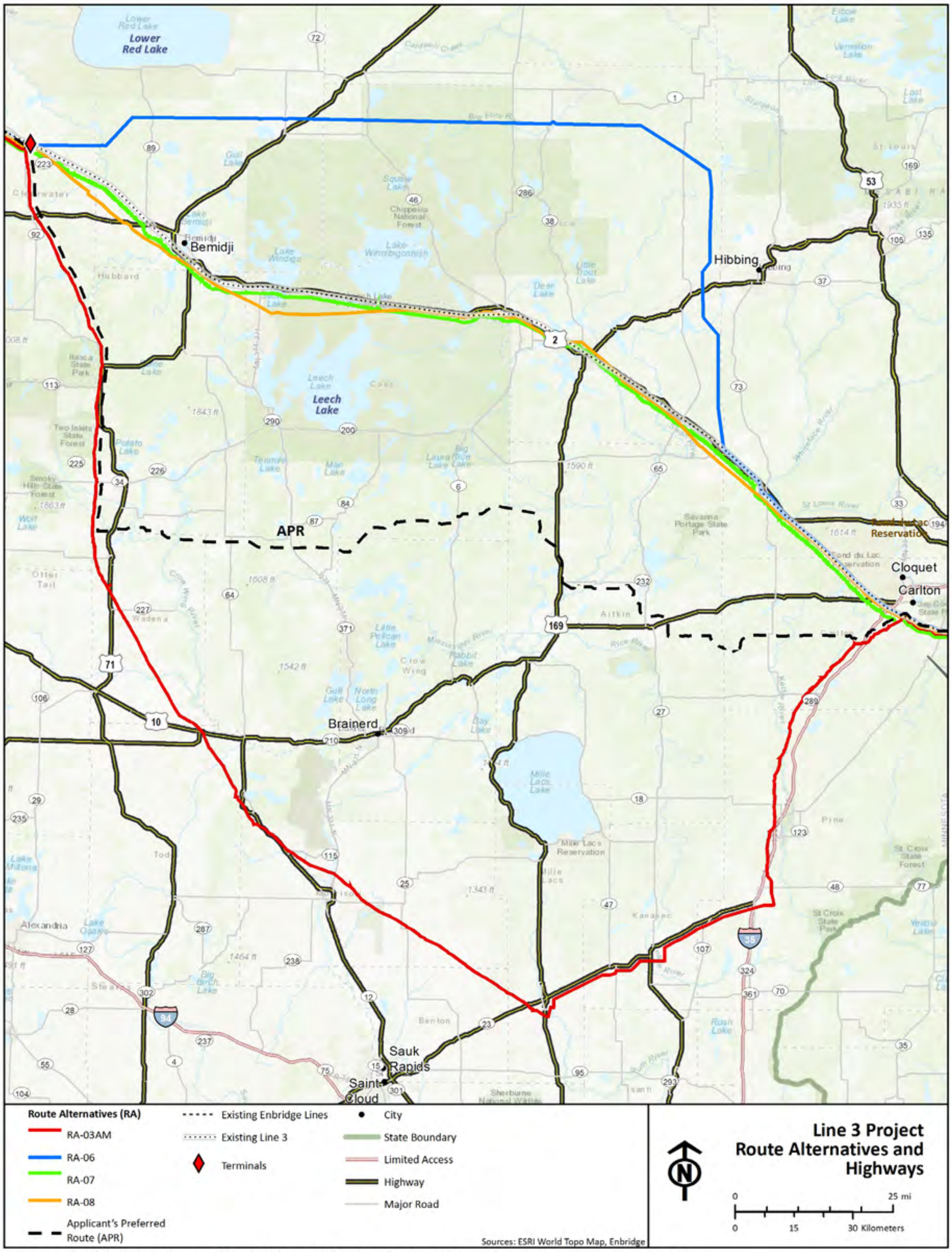

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Figure 6.2.5-1. Roads and Highway Infrastructure along Route Alternatives

6.2.5.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the transportation and public services ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Roads and Highways

The Applicant's preferred route lies roughly in the area north of Interstate 94, east of Interstate 29, and west of Interstate 35 (Figure 6.2.5-1). U.S. highways in the area include Highways 2, 10, 59, 71, 75, and 169. Several other state and local highways are also in the area. The Applicant's preferred route would require 12 road and highway crossings from the North Dakota border to Clearbrook, 164 road and highway crossings between Clearbrook and Carlton, and 144 road and highway crossings from Carlton to the Wisconsin border. Table 6.2.5-1 lists the numbers of road and highway crossings for the Applicant's preferred route along with crossings of railroads, pipelines, and electrical transmission lines.

Table 6.2.5-1. Number of Infrastructure Crossings by the Applicant's Preferred Route in Minnesota

Route	Roads and Highways	Railroads	Pipelines	Electrical Transmission Lines
North Dakota border to Clearbrook	12	5	15	12
Clearbrook to Carlton	164	2	25	42
Carlton to Wisconsin border	144	1	13	3

MNDOT calculates AADT for most township, county, state, and interstate roads within Minnesota. Table 6.2.5-2 presents the AADT for major federal and state roads crossed by the Applicant's preferred route (MNDOT 2015).

Railroads, Utilities, and Airports

The Applicant's preferred route would require eight passenger and freight railroad crossings; these include five railroad crossings from the North Dakota border to Clearbrook, two crossings between Clearbrook and Carlton, and one crossing between from Carlton and the Wisconsin Border (Figure 6.2.5-2).

The number of utility lines crossed by the Applicant's preferred route are listed in Table 6.2.5-1. These include 53 pipeline crossings and 57 electric transmission line crossings. The pipelines may be transporting natural gas, oil, or refined products. Other utility types that were not identified but would likely be crossed include sewer lines and water lines. Between Clearbrook and Carlton, the route would cross 25 pipelines and 42 electrical transmission lines (Figures 6.2.5-3 and 6.2.5-4).

Thief River Falls Regional Airport in Pennington County is within 20,000 feet of the Applicant's preferred route in the area between the North Dakota border and Clearbrook.

Table 6.2.5-2. Annual Average Daily Traffic Estimates for Major Roads Crossed by the Applicant's Preferred Route

Road/Highway	Annual Average Daily Traffic (vehicles per day)
North Dakota Border to Clearbrook	
State Highway 1	970
State Highway 11	1,900
State Highway 32	4,200
State Highway 59	2,750
State Highway 75	550
State Highway 92	600
Clearbrook to Carlton	
Interstate 35	16,400
U.S. Highway 71	2,000
U.S. Highway 2	5,900
State Highway 169	2,050
State Highway 210	3,750
State Highway 223	295
State Highway 34	3,400
State Highway 371	4,850
State Highway 6	1,300
State Highway 64	1,800
State Highway 65	5,200
State Highway 73	1,450
State Highway 84	1,300
Carlton to Wisconsin Border	
State Highway 23	265

Source: MNDOT 2015.

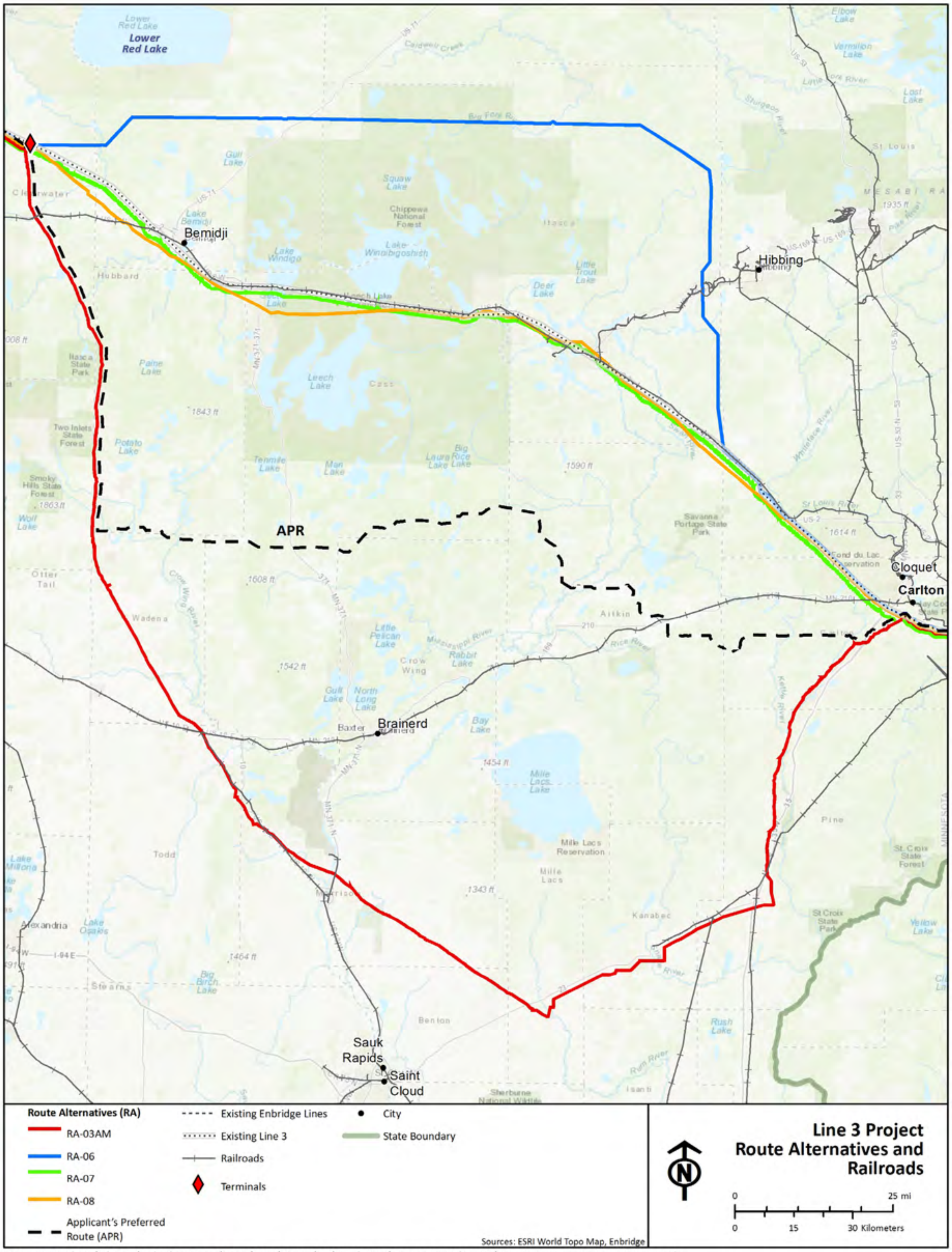

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Figure 6.2.5-2. Railroads along Route Alternatives

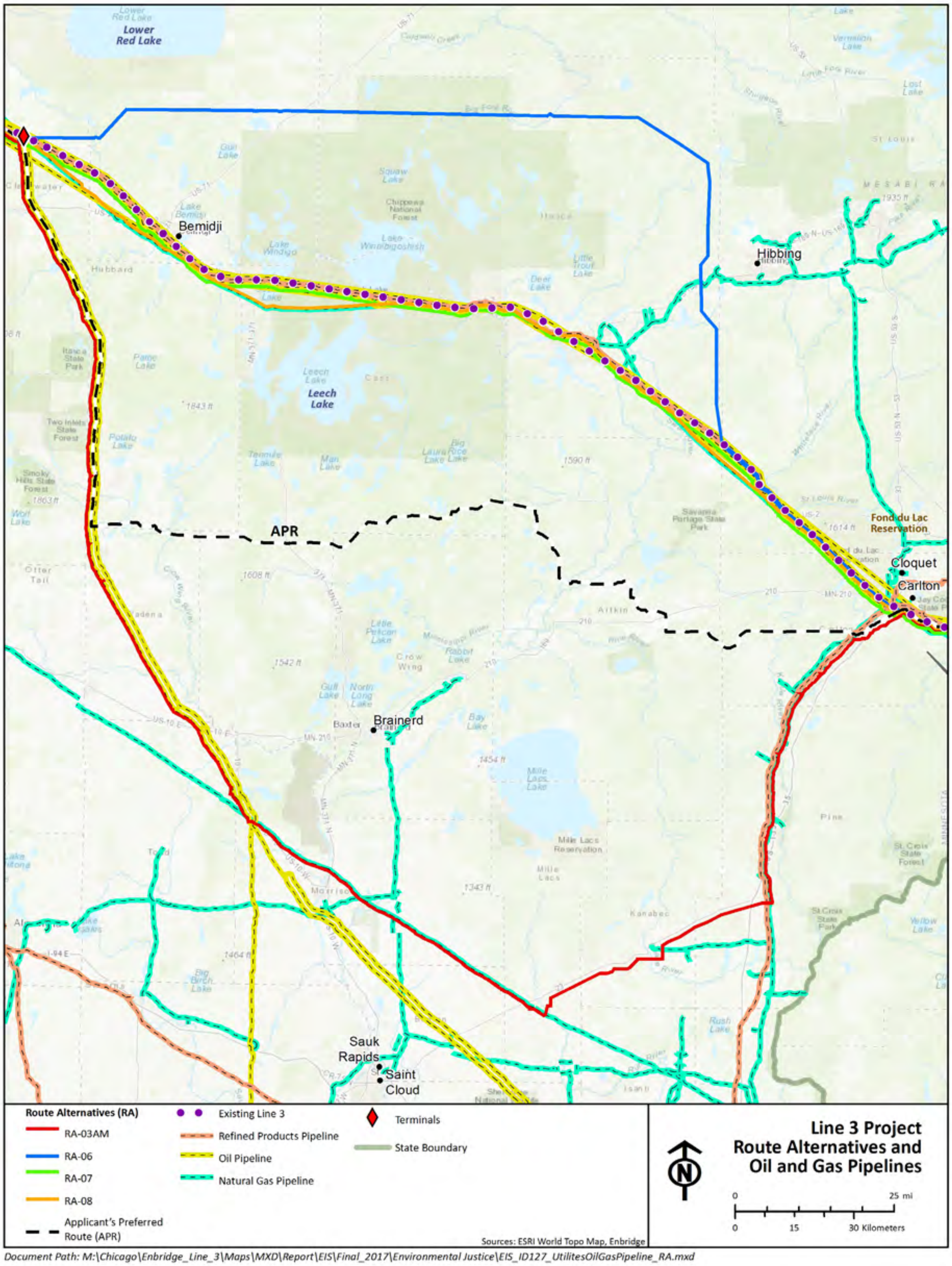

Figure 6.2.5-3. Pipelines and Utilities along Route Alternatives

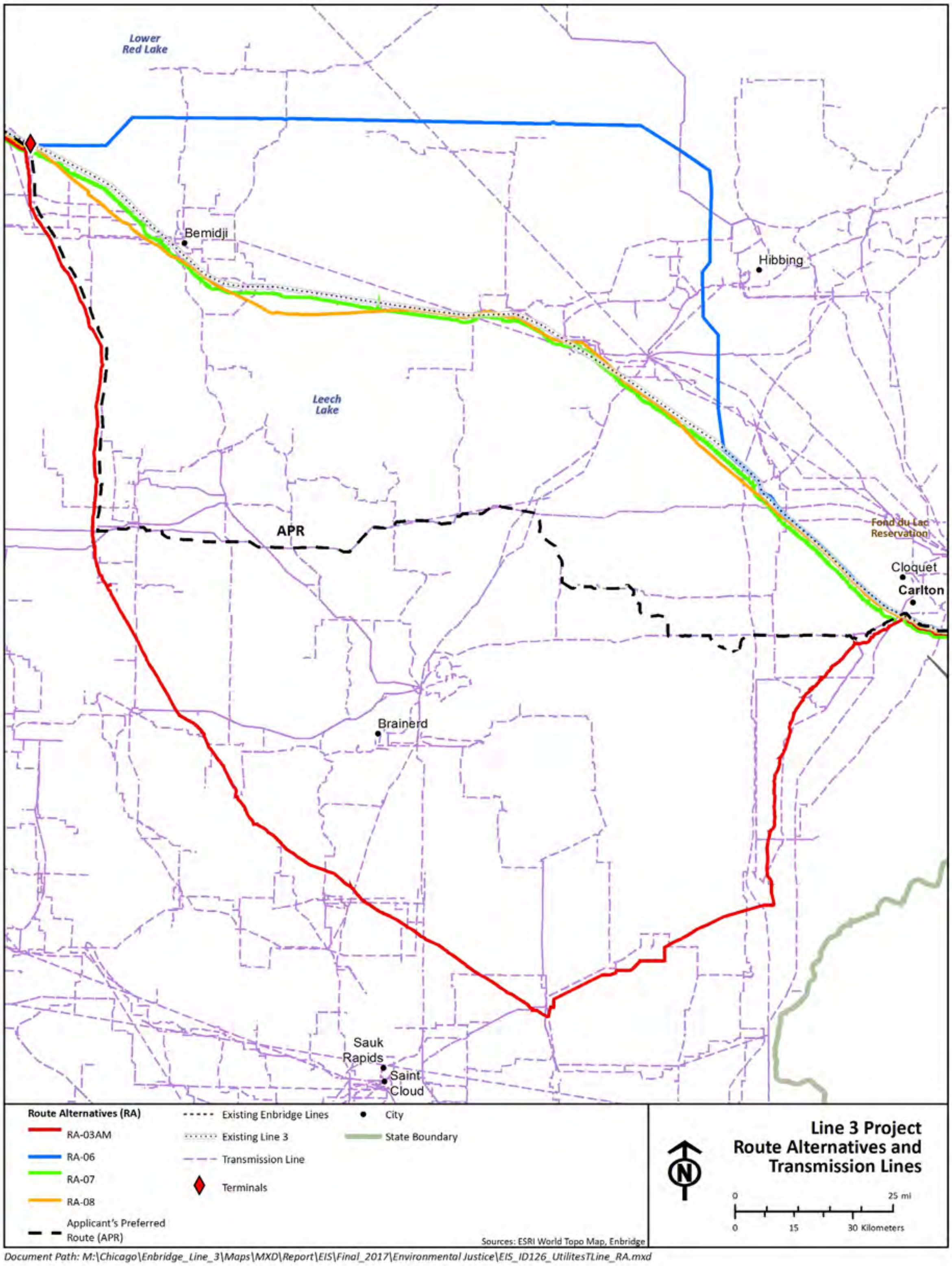

Figure 6.2.5-4. Transmission Lines along Route Alternatives

Emergency Services

Law enforcement agencies, fire departments, and hospitals within the ROI for the Applicant's preferred route are listed in Table 6.2.5-3. Although Red Lake County does not have a hospital, the county is relatively small and surrounded by two counties (Pennington and Polk) that collectively have three hospitals.

Table 6.2.5-3. Emergency Services in Counties Crossed by the Applicant's Preferred Route

County	Law Enforcement Agencies[a,b]	Fire Departments[a]	Hospitals[c]
North Dakota Border to Clearbrook			
Kittson County	3	5	1
Marshall County	3	7	1
Pennington County	3	3	1
Red Lake County	2	1	0
Polk County	8	10	2
Clearwater County	5	2	1
Subtotal	***24***	***28***	***6***
Hubbard County to Wisconsin Border			
Hubbard County	5	5	1
Wadena County	5	3	2
Cass County	6	6	1
Crow Wing County	8	10	4
Aitkin County	3	3	1
Carlton County	6	15	2
Subtotal	***33***	***42***	***11***

[a] Source: Capitol Impact 2016.

[b] Law enforcement agencies include police departments, sheriff's offices, coroners, medical examiners, and state agencies.

[c] Source: American Hospital Directory 2016.

6.2.5.2.2 Route Alternatives

As noted above, the only area where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to transportation and public services for the route alternatives between Clearbrook and Carlton are described below; for county-wide assessments, the comparison is for counties outside of Clearwater County since that county is addressed for the segment from the North Dakota border to Clearbrook, which is in Clearwater County.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its

275.1-mile length (see Section 6.7). Descriptions of existing conditions within the transportation and public services ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Roads and Highways

Portions of RA-03AM parallel State Route 23 (Figure 6.2.5-1). This route alternative would require a total of 329 road and highway crossings between Clearbrook and Carlton. The AADT for major roads and highways that would be crossed by the route are listed in Table 6.2.5-4.

Table 6.2.5-4. Annual Average Daily Traffic Estimates for Major Roads Crossed by Route Alternative RA-03AM

Road/Highway	Annual Average Daily Traffic (vehicles per day)
Interstate 35	16,400
U.S. Highway 71	2,000
U.S. Highway 2	5,900
State Highway 115	1,200
State Highway 169	15,400
State Highway 18	2,250
State Highway 223	295
State Highway 227	1,450
State Highway 23	5,500
State Highway 25	2,000
State Highway 27	2,450
State Highway 34	3,400
State Highway 371	11,600
State Highway 47	1,300
State Highway 48	9,500
State Highway 73	2,050
State Highway 87	1,000

Source: MNDOT 2015.

Railroads, Utilities, and Airports

RA-03AM would require 11 passenger and freight railroad crossings between Clearbrook and Carlton (Figure 6.2.5-2). Portions of RA-03AM are parallel and near the routes of the Minnesota Pipe Line Company pipeline, the Magellan Refined Products pipeline, and/or the Northern Natural Gas pipeline. The route would have 47 pipeline crossings and 59 electric transmission line crossings; the pipelines may be transporting natural gas, oil, or refined products (Figures 6.2.5-3 and 6.2.5-4). No airports occur within the ROI for RA-03AM.

Emergency Services

Law enforcement agencies, fire departments, and hospitals within the ROI for RA-03AM are listed in Table 6.2.5-5.

Table 6.2.5-5. Emergency Services in Counties Crossed by Route Alternative RA-03AM

County	Law Enforcement Agencies[a,b]	Fire Departments[a]	Hospitals[c]
Hubbard County	5	5	1
Wadena County	5	3	2
Todd County	7	7	2
Morrison County	6	8	1
Benton County	4	3	0
Mille Lacs County	6	4	1
Kanabec County	3	2	1
Pine County	2	8	2
Carlton County	6	15	2
TOTAL	**44**	**55**	**12**

[a] Source: Capitol Impact 2016.

[b] Law enforcement agencies include police departments, sheriff's offices, coroners, medical examiners, and state agencies.

[c] Source: American Hospital Directory 2016.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the transportation and public services ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Roads and Highways

Route alternative RA-06 would require a total of 112 road and highway crossings between Clearbrook and Carlton (Figure 6.2.5-1). The AADT of major roads and highways that would be crossed by the route are listed in Table 6.2.5-6.

Table 6.2.5-6. Annual Average Daily Traffic Estimates for Major Roads Crossed by Route Alternative RA-06

Road/Highway	Annual Average Daily Traffic (vehicles per day)
Interstate 35	16,400
U.S. Highway 71	1,200
U.S. Highway 2	3,800
State Highway 169	7,700
State Highway 210	4,450
State Highway 38	1,000
State Highway 46	580
State Highway 6	330
State Highway 65	270
State Highway 72	1,350
State Highway 73	1,650
State Highway 89	1,650

Source: MNDOT 2015.

Railroads, Utilities, and Airports

RA-06 would require four passenger and freight railroad crossings between Clearbrook and Carlton (Figure 6.2.5-2). The route would have 29 pipeline crossings and 22 electric transmission line crossings; the pipelines may be transporting natural gas, oil, or refined products (Figures 6.2.5-3 and 6.2.5-4). No airports occur within the ROI for RA-06.

Emergency Services

Law enforcement agencies, fire departments, and hospitals within the ROI for RA-06 are listed in Table 6.2.5-7.

Table 6.2.5-7. Emergency Services in Counties Crossed by Route Alternative RA-06

County	Law Enforcement Agencies[a,b]	Fire Departments[a]	Hospitals[c]
Beltrami County	4	4	3
Itasca County	9	11	3
Aitkin County	3	3	1
St. Louis County	21	50	8
Carlton County	6	15	2
TOTAL	**43**	**83**	**17**

Notes:

[a] Source: Capitol Impact 2016.

[b] Law enforcement agencies include police departments, sheriff's offices, coroners, medical examiners, and state agencies.

[c] Source: American Hospital Directory 2016.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the transportation and public services ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Roads and Highways

Route alternative RA-07 would require a total of 185 road and highway crossings between Clearbrook and Carlton (Figure 6.2.5-1). The AADT of major roads and highways that would be crossed by the route are listed in Table 6.2.5-8.

Table 6.2.5-8. Annual Average Daily Traffic Estimates for Major Roads Crossed by Route Alternative RA-07

Road/Highway	Annual Average Daily Traffic (vehicles per day)
Interstate 35	16,400
U.S. Highway 2	5,800
State Highway 169	12,200
State Highway 197	5,700
State Highway 210	4,450
State Highway 223	295
State Highway 371	5,700
State Highway 38	4,300
State Highway 65	870

Table 6.2.5-8. Annual Average Daily Traffic Estimates for Major Roads Crossed by Route Alternative RA-07

Road/Highway	Annual Average Daily Traffic (vehicles per day)
State Highway 73	1,650

Source: MNDOT 2015.

Railroads, Utilities, and Airports

RA-07 would require seven passenger and freight railroad crossings between Clearbrook and Carlton (Figure 6.2.5-2). The route would have 42 pipeline crossings and 43 electric transmission line crossings; the pipelines may be transporting natural gas, oil, or refined products (Figures 6.2.5-3 and 6.2.5-4). The Bemidji Regional Airport is within the ROI for RA-07.

Emergency Services

Law enforcement agencies, fire departments, and hospitals within the ROI for RA-07 are listed in Table 6.2.5-9.

Table 6.2.5-9. Emergency Services in Counties Crossed by Route Alternative RA-07

County	Law Enforcement Agencies[a,b]	Fire Departments[a]	Hospitals[c]
Beltrami County	4	4	3
Hubbard County	5	5	1
Cass County	6	6	1
Itasca County	9	11	3
Aitkin County	3	3	1
St. Louis County	21	50	8
Carlton County	6	15	2
TOTAL	**54**	**94**	**19**

[a] Source: Capitol Impact 2016.

[b] Law enforcement agencies include police departments, sheriff's offices, coroners, medical examiners, and state agencies.

[c] Source: American Hospital Directory 2016.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the transporation and public services ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Roads and Highways

Route alternative RA-08 would require a total of 162 road and highway crossings between Clearbrook and Carlton (Figure 6.2.5-1). The roads and highways that would be crossed by the route have a minimum AADT of 5 vehicles and a maximum AADT of 16,400 vehicles (Table 6.2.5-10; MNDOT 2015).

Table 6.2.5-10. Annual Average Daily Traffic Estimates for Major Roads Crossed by Route Alternative RA-08

Road/Highway	Annual Average Daily Traffic (vehicles per day)
Interstate 35	16,400
U.S. Highway 2	5,800
State Highway 169	12,200
State Highway 200	640
State Highway 210	4,450
State Highway 223	295
State Highway 371	3,600
State Highway 38	4,300
State Highway 65	870
State Highway 71	8,600
State Highway 73	1,650

Source: MNDOT 2015.

Railroads, Utilities, and Airports

RA-08 would require five passenger and freight railroad crossings between Clearbrook and Carlton (Figure 6.2.5-2). The route would have 41 pipeline crossings and 36 electric transmission line crossings; the pipelines may be transporting natural gas, oil, or refined products (Figures 6.2.5-3 and 6.2.5-4). The Bemidji Regional Airport is within the ROI for RA-08.

Emergency Services

Law enforcement agencies, fire departments, and hospitals within the ROI for RA-08 are listed in Table 6.2.5-11.

Table 6.2.5-11. Emergency Services in Counties Crossed by the Route Alternative RA-08

County	Law Enforcement Agencies[a,b]	Fire Departments[a]	Hospitals[c]
Beltrami County	4	4	3
Hubbard County	5	5	1
Cass County	6	6	1
Itasca County	9	11	3
Aitkin County	3	3	1
St. Louis County	21	50	8
Carlton County	6	15	2
TOTAL	**54**	**94**	**19**

[a] Source: Capitol Impact 2016.

[b] Law enforcement agencies include police departments, sheriff's offices, coroners, medical examiners, and state agencies.

[c] Source: American Hospital Directory 2016.

6.2.5.3 Impact Assessment

The impact analysis conducted for transportation and public services for the Applicant's preferred route and the route alternatives considered the potential for the following:

- Road closures, increased traffic, and road damage caused by pipeline construction or operation;
- Disruption of rail travel and airport operation due to pipeline construction or operation;
- Disruption of utilities during construction and operation, including local, intrastate, and interstate utilities and transmission lines; and
- Increased need for emergency services during construction and operations.

6.2.5.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the transportation and public services ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Roads and Highways

The Applicant proposes to cross all paved roads using either the guided bore or HDD method. The guided bore method involves boring with an auger through the material under the road from an excavated pit on one side of the road to an excavated pit on the other side (see Section 2.7.2.8). The HDD method is similar, requiring an excavated pit on each side of the crossing, but it uses a computer-controlled drill to create the hole for pipe installation under the rail bed (see Section 2.7.2.8). Use of either method would avoid road closures. Although presence of the construction crews and vehicles in the areas adjacent to the crossings may cause some drivers to reduce their speed, the resultant impacts on transportation on paved roads due to pipeline crossings would be temporary and negligible.

Construction across unpaved roads would require temporary road closures since they would be crossed using the open-cut method, similar to construction of the main portion of the route across land. Where open-cut methods are used, detours would be established to route around road closures. If no detour is available, at least one lane would be kept open, except for the limited time when the pipe is being installed. Disturbances at the open-cut road crossings would typically be limited to 1 day. The Applicant would implement measures such as creating detours, posting warnings, providing traffic control personnel, and installing safety signs to minimize the impacts on local traffic. Because most unpaved roads are in rural areas, detours and delays during temporary closures could result in longer driving times, causing a temporary minor impact on road users. Impacts on local access from road closures are addressed in Section 6.2.4.3.

Traffic along roads within the ROI may also be affected by the increased traffic volume from construction workers and construction equipment vehicles. Construction would be conducted along construction spreads, with the Applicant's preferred route requiring a total of seven spreads. Each spread would have a peak workforce of 500 to 600 workers. At that point of construction, work would be distributed along the work spread; as a result, not all workers would be in the same area at the same time. The Applicant stated that construction workers would either (1) drive directly to the work site and park near ATWS or along the road shoulder; or (2) drive to construction yards and be bussed or carpool to the work site. At the peak of construction, the Applicant expects a maximum of approximately 590 total trips per day per construction spread (there would be four construction spreads between Clearbrook and Carlton). Most workers would use major roadways to travel to and from the construction area, as well as some county and local roads to access the right-of-way. However, not all roads crossed by the route would be used as access points for workers. For major roads crossed by the route, AADT ranges from 265 to 16,400 vehicle per day (Table 6.2.5-2). Since workers would be distributed among the individual construction spreads, it is unlikely that any single road would be subject to an increase of 500 to 600 workers at a given time. For roads with low traffic counts, users may notice the increase in the number of vehicles; however, the impact on traffic is likely to be temporary and minor since impacts would be limited to the construction period and traffic increases are not expected to result in delays or safety concerns.

During construction at pump stations, all workers would be in a single location, which would result in localized increases in traffic volumes, particularly during the morning and evening commuting times for the construction workers. The Applicant estimated that construction of each pump station would require about 81 to 86 total vehicle trips per day. Each pump station would be near an existing road. County Road 74 near the Clearbrook pump station has the lowest estimated traffic count, with approximately 65 vehicles per day (MNDOT 2015). While construction at the Clearbrook pump station would more than double the number of vehicles during the morning and evening commutes, the road should be able to accommodate the increase of 86 total vehicle trips per day without causing substantial impacts on traffic. Although many variables influence the efficiency or level of service for a section of road, the typical base saturation flow rate (or maximum capacity) for a highway is 1,900 cars per hour per lane (TRB 2000). Even if the 81 to 86 vehicle trips were to occur in the same peak hour, which is not likely, this would only represent roughly 5 percent of the roadway's capacity. Therefore, with the short duration and small change in traffic relative to the roadway capacity, impacts on traffic during construction of pump stations are expected to be temporary and minor.

Construction may cause deterioration of road surfaces from the increased worker vehicle traffic and construction vehicles with heavy loads. Construction vehicles also could track dirt and debris onto the road surface. The Applicant would implement measures to minimize debris tracking, including requiring contractors to remove the debris within 24 hours. The Applicant also committed to restoring all road surfaces to preexisting conditions. With post-construction restoration and proposed measures to minimize debris tracking during the construction period, the impact on road surfaces due to construction of the Applicant's preferred route would be temporary and minor.

Railroads, Utilities, and Airports

The Applicant's preferred route would cross eight railroads (Table 6.2.5-1). All active railroads would be crossed using the guided bore or HDD method. As noted above, both methods require an excavated pit on each side of the crossing; the crossings would be bored or drilled under the rail bed from one pit to the other. The use of either method would result in no impacts on the railroad or its uses.

The Applicant's preferred route would cross pipelines, utilities, and transmission lines. The Applicant would consult with all underground utility companies prior to construction and use the GSOC system prior to excavation to ensure that utility owners or operators are informed of the planned construction and that potentially affected pipelines and underground utilities are properly marked. With these safeguards in place, accidental damage to the utilities is not likely and disruption of service is not expected; therefore, impacts on utilities are not expected. However, it is possible that not all of the locations of local utility lines are known by the local communities or counties. If utility lines are accidentally damaged, disruption to service could result. The Applicant would be required to repair damaged utilities to allow the provider to restore service. In the event of a disruption, impacts on local residents would be temporary and major.

Before initiating crossings under overhead electrical transmission lines, the Applicant would consult with the owners or operators to ensure that all appropriate safety measures have been implemented. These measures would address aspects of construction such as the distance from the lines, the equipment used, and the methods of moving pipe segments. Implementation of these measures would avoid disruption of service, damage to the utilities, and worker injuries. With these measures in place, impacts on and from overhead electrical transmission lines are expected to be temporary and, at most, negligible.

Because the Thief River Falls Airport is within 20,000 feet of the Applicant's preferred route (in the area between the North Dakota/Minnesota Border and Clearbrook), the Applicant may be required to notify the FAA of the planned construction (Section 6.2.5.1.1). If notification is required, the Applicant would then be required to comply with FAA regulations for construction of facilities near airports. Through compliance with FAA regulations, no impacts on the Thief River Falls Airport would occur due to construction of the Applicant's preferred route.

Emergency Services

A variety of police and fire services are available in each county within the ROI. For larger counties that have high population centers, the number of these available services are higher, while the more rural counties generally have fewer services available. Potential Project-related impacts on these services include an increased need for police services to assist with traffic control at road crossings and to provide help or consultation regarding security, as well as an overall increased need for police services because of the increased population from the construction workforce. In some counties with fewer police departments and fewer officers available, the need for additional police to aid in traffic control during road closures may cause a minor and temporary impact on the departments. For emergency services, such as fire and medical, impacts would be associated with a general increased need due to the increase in overall population from the workforce in addition to potential injuries or accidents from construction. The number of emergency services departments in each county crossed by the Applicant's preferred route appears to be sufficient to absorb the potential increased need for their services (Table 6.2.5-3). Although Red Lake County does not have a hospital, workers with injuries resulting from construction in this county could travel to surrounding hospitals in nearby counties. Overall, the temporary influx of workers to the Project area and the normal operations of day-to-day activities associated with construction would cause a temporary and negligible to minor impact on emergency services in the ROI.

Operations Impacts

Roads and Highways

The proposed pipeline would be underground, and normal pipeline operation would not affect the local transportation systems. Maintenance of the pipeline would require few additional workers, and those workers would be located at the Applicant's existing regional maintenance facilities and operations centers. Therefore, traffic along roads and highways in the counties crossed by the Applicant's preferred route would experience little increases in traffic due to operation and would not be measurably affected.

Maintenance activities would primarily consist of routine vegetation maintenance along the permanent right-of-way. Maintenance equipment and vehicles may briefly use local roads for access and egress to and from the right-of-way; this would have little effect on traffic.

During operation, the Applicant would implement its Integrity Management Program, which may require excavation to repair or replace segments of pipe at roadway crossings. In some cases, it could require removal of pipe that was installed under roadways crossed using the guided bore or HDD method. The impacts of those activities would be similar to those of constructing the crossings, and the Applicant would restore the roadways to their original condition if damaged. Therefore, impacts on roads and highways as a result of these maintenance activities would be temporary and negligible but would occur periodically over the life of the Project.

Railroads, Utilities, and Airports

No impacts on railroads would be expected during operation and maintenance of the pipeline. If a segment of pipe under the rail bed needs to be repaired or replaced it would be accomplished by excavating a pit to remove the pipe that was installed using the guided bore or HDD method and would not affect operation of the railroad.

If integrity digs are required along the route, the Applicant would consult with utility companies and use the Minnesota GSOC system to ensure that all adjacent pipelines and underground utilities are properly marked. As for construction of the pipeline, disruption of service is not expected, and no impact on utilities during maintenance is expected. However, if an unmarked utility line is damaged during maintenance excavations, the Applicant would repair the damage and to allow the provider to restore service. In the event of a disruption, the impact on local users of the utility would be temporary and major.

Operation of the Project would not affect the Thief River Falls Airport.

Emergency Services

Operation would require a small number of new hires since the pipeline system could be operated and maintained primarily by the existing staff that operates and maintains the Line 3 pipeline. Therefore, there would not be a measurable impact on emergency services.

Impacts on emergency services in the event of an accidental release of crude oil are addressed in Chapter 10.

6.2.5.3.2 Route Alternatives (Clearbrook to Carlton)

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the transportation and public services ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Roads and Highways

Between Clearbrook and Carlton, RA-03AM would require the most road and highway crossings (329 crossings). Similar to construction of the Applicant's preferred route, paved roads would likely be crossed using the guided bore method, resulting in no road closures. Although presence of the construction crews and vehicles in the areas adjacent to the crossings may cause some drivers to reduce their speed, the resultant impacts on transportation on paved roads due to pipeline crossings would be temporary and negligible.

Construction across unpaved roads would require temporary road closures since they would be crossed using the open-cut method, similar to construction of the main portion of the route across land. Where open-cut methods are used, crossings would typically be completed in 1 day. With the Applicant-proposed measures of detours, warnings, traffic control, and safety signs, the impacts on local traffic would be minimized. Because most unpaved roads along RA-03AM are in rural areas, detours and delays during temporary closures could result in longer driving times, causing a temporary minor impact on road users. Impacts on local access from road closures along RA-03AM are addressed in Section 6.2.4.3.

Traffic along roads within the ROI may also be affected by the increased traffic volume from construction workers and construction equipment vehicles. Construction of RA-03AM would most likely be conducted along five construction spreads between Clearbrook and Carlton. Similar to construction of the Applicant's preferred route, there could be a maximum of approximately 590 total vehicle trips per day per construction spread during peak construction. Most workers would use major roadways to travel to and from the construction area, as well as some county and local roads to access the right-of-way. However, not all roads crossed by the route would be used as access points for workers. For major roads crossed by the route, AADT ranges from 295 to 16,400 vehicle per day (Table 6.2.5-4). Since workers would be distributed among individual construction spreads, it is unlikely that any single road would be subject to an increase of 590 vehicle trips at a given time. For roads with low traffic counts, users may notice the increase in the number of vehicles; however, the impact on traffic is likely to be temporary and minor.

During construction of the six pump stations that would be needed for RA-03AM, approximately 81 to 86 total vehicle trips per day would be added to roads and highways used for access. Since the locations of pump stations have not been determined for RA-03AM, the impacts on local traffic during construction of the six pump stations cannot be quantitatively assessed. However, it is anticipated that most roads could accommodate the increase of 86 total vehicle trips per day without causing substantial impacts on traffic. As noted above for the Applicant's preferred route, the typical base saturation flow rate (or maximum capacity) for a highway is 1,900 cars per hour per lane (TRB 2000). Even if the 81 to 86 vehicle trips were to occur in the same peak hour, which is not likely, this would only represent a small percentage of the capacity of most roadways along the route. Therefore, impacts on traffic during construction of pump stations for RA-03AM are expected to be temporary and minor.

Construction may cause deterioration of road surfaces from the increased worker vehicle traffic and construction vehicles with heavy loads. Construction vehicles also could track dirt and debris onto the road surface. The Applicant would implement measures to minimize debris tracking, including requiring contractors to remove the debris within 24 hours. The Applicant also committed to restoring all road surfaces to preexisting conditions. Therefore, the impact on road surfaces due to construction of RA-03AM would be temporary and minor.

Railroads, Utilities, and Airports

Between Clearbrook and Carlton, RA-03AM would require the most railroad crossings (11). All active railroads would be crossed using either the guided bore or HDD method. As noted above, both methods require an excavated pit on each side of the crossing; the crossings would be bored or drilled under the rail bed from one pit to the other. The use of either method would result in no impacts on the railroad or its uses.

The RA-03AM route would require constructing 47 pipeline crossings, 59 electrical transmission line crossings, and other local utility crossings. The Applicant would consult with all underground utility companies prior to construction and use the GSOC system prior to excavation to ensure that utility owners or operators are informed of the planned construction and that potentially affected pipelines and underground utilities are properly marked. With these safeguards in place, accidental damage to the utilities is not likely and disruption of service is not expected; therefore, impacts on utilities are not expected. However, it is possible that not all of the locations of local utility lines are known by the local communities or counties. If utility lines are accidentally damaged, disruption to service could result. The Applicant would be required to repair damaged utilities to allow the provider to restore service. In the event of a disruption, impacts on local residents would be temporary and major.

Before initiating crossings under overhead electrical transmission lines, the Applicant would consult with the owners or operators to ensure that all appropriate safety measures have been implemented. These measures would address aspects of construction such as the distance from the lines, equipment used, and methods of moving pipe segments. Implementation of these measures would avoid disruption of service, damage to the utilities, and worker injuries. With these measures in place, impacts on and from overhead electrical transmission lines are expected to be temporary and, at most, negligible.

Because no airports are within 20,000 feet of RA-03AM, construction of this route alternative would not affect airports.

Emergency Services

Multiple law enforcement agencies and fire departments are present in each county crossed by RA-03AM. Impacts on emergency services for the route alternatives would be similar to those described for the Applicant's preferred route, including an increased need for police services to assist with traffic control at road crossings and to provide help or consultation regarding security, as well as a general increased need for police services because of the increased population from the construction workforce. For emergency services, such as fire and medical, impacts would be associated with an increased need due to the increase in overall population from the workforce in addition to potential injuries or accidents from construction. The number of emergency services departments in each county crossed by RA-03AM appears to be sufficient to absorb the potential increased need for these services (Table 6.2.5-5). Although Benton County does not have a hospital, workers with injuries resulting from construction in this county could travel to nearby hospitals in surrounding counties. Overall, the temporary influx of workers during construction of RA-03AM would result in a temporary and minor impact on emergency services in the ROI.

<u>Operations Impacts</u>

Roads and Highways

Maintenance activities would primarily consist of routine vegetation maintenance along the permanent right-of-way of RA-03AM. Maintenance equipment and vehicles may briefly use local roads for access and egress to and from the right-of-way; this would have little effect on traffic and would therefore not affect traffic.

During operation, the Applicant would implement its Integrity Management Program, which may require excavation to repair or replace segments of pipe at roadway crossings. In some cases, it could require removal of pipe that was installed under roadways crossed using the guided bore or HDD method. The impacts of those activities would be similar to those of constructing the crossings, and the Applicant would restore the roadways to their original condition. Therefore, impacts on roads and highways as a result of these maintenance activities for RA-03AM would be temporary and negligible but would occur periodically over the life of the Project.

Railroads, Utilities, and Airports

No impacts on railroads would be expected during operation and maintenance of the pipeline. If a segment of pipe under the rail bed needs to be repaired or replaced it would be accomplished by excavating a pit to remove the pipe that was installed using the guided bore or HDD method and would not affect operation of the railroad.

If integrity digs are required along the route, the Applicant would consult with utility companies and use the Minnesota GSOC system to ensure that all adjacent pipelines and underground utilities are properly marked. As for construction of the pipeline, disruption of service is not expected, and no impact on utilities during maintenance is expected. However, if an unmarked utility line is damaged during maintenance excavations, the Applicant would repair the damage and allow the provider to restore service. In the event of a disruption, the impact on local users of the utility would be temporary and major.

Because no airports are within 20,000 feet of RA-03AM, operation and maintenance of this route alternative would not affect any airports.

Emergency Services

Operation would require a small number of new hires since the pipeline system could be operated and maintained primarily by the existing staff that operates and maintains the Line 3 pipeline. Therefore, there would not be a measurable impact on emergency services.

Impacts on emergency services in the event of an accidental release of crude oil are addressed in Chapter 10.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the transporation and public services ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Roads and Highways

Between Clearbrook and Carlton, RA-06 would require the fewest road and highway crossings (112 crossings). Similar to construction of the Applicant's preferred route, paved roads would be crossed using either the guided bore or HDD method, resulting in no road closures. Although presence of the construction crews and vehicles in the areas adjacent to the crossings may cause some drivers to reduce their speed, the resultant impacts on transportation on paved roads due to pipeline crossings would be temporary and negligible.

Construction across unpaved roads would require temporary road closures since they would be crossed using the open-cut method, similar to construction of the main portion of RA-06 across land. Where open-cut methods are used, crossings would typically be completed in 1 day. With the Applicant-proposed measures of detours, warnings, traffic control, and safety signs, impacts on local traffic patterns would be minimized. Because most unpaved roads along RA-06 are in rural areas, detours and delays during temporary closures could result in longer driving times, causing a temporary minor impact on road users. Impacts on local access from road closures along RA-06 are addressed in Section 6.2.4.3.

Traffic along roads within the ROI may also be affected by the increased traffic volume from construction workers and construction equipment vehicles. Construction of RA-06 would most likely be conducted along four construction spreads between Clearbrook and Carlton. Similar to construction of the Applicant's preferred route, there could be a maximum of approximately 590 daily vehicle trips per construction spread during peak construction. Most workers would use major roadways to travel to and from the construction area, as well as some county and local roads to access the right-of-way. However, not all roads crossed by the route would be used as access points for workers. For major roads crossed by the route, AADT ranges from 330 to 16,400 vehicle per day (Table 6.2.5-6). Since workers would be distributed among individual construction spreads, it is unlikely that any single road would be subject to an increase of 590 trips at a given time. For roads with low traffic counts, users may notice the increase in the number of vehicles; however, the impact on traffic is likely to be temporary and minor.

During construction of the four pump stations that would be needed for RA-06, approximately 81 to 86 vehicle trips per day would be added to roads and highways used for access. Since the locations of pump stations have not been determined for RA-06, the impacts on local traffic during construction of the four pump stations cannot be qualitatively assessed. However, it is anticipated that most roads could accommodate the increase of 86 total vehicle trips per day without causing substantial impacts on traffic. As noted above for the Applicant's preferred route, the typical base saturation flow rate (or maximum capacity) for a highway is 1,900 cars per hour per lane (TRB 2000). Even if the 81 to 86 vehicle trips were to occur in the same peak hour, which is not likely, this would only represent a small percentage of the capacity of most roadways along the route. Therefore, impacts on traffic during construction of pump stations for RA-06 are expected to be temporary and minor.

Construction may cause deterioration of road surfaces from the increased worker vehicle traffic and construction vehicles with heavy loads. Construction vehicles could also track dirt and debris onto the road surface. The Applicant would implement measures to minimize debris tracking, including requiring contractors to remove the debris within 24 hours. The Applicant also committed to restoring all road surfaces to preexisting conditions. Therefore, the impact on road surfaces due to construction of RA-06 would be temporary and minor.

Railroads, Utilities, and Airports

Between Clearbrook and Carlton, RA-06 would require the fewest railroad crossings (four). All active railroads would be crossed using either the guided bore or HDD method. As noted above, both methods require an excavated pit on each side of the crossing; the crossings would be bored or drilled under the rail bed from one pit to the other. The use of either method would result in no impacts on the railroad or its uses.

The RA-06 route would require constructing 29 pipeline crossings, 22 electrical transmission line crossings, and other local utility crossings. The Applicant would consult with all underground utility companies prior to construction and use the GSOC system prior to excavation to ensure that utility owners or operators are informed of the planned construction and that potentially affected pipelines and underground utilities are properly marked. With these safeguards in place, accidental damage to the utilities is not likely and disruption of service is not expected; therefore, impacts on utilities are not expected. However, it is possible that not all of the locations of local utility lines are known by the local communities or counties. If utility lines are accidentally damaged, disruption to service could result. The Applicant would be required to repair damaged utilities to allow the provider to restore service. In the event of a disruption, impacts on local residents would be temporary and major.

Before initiating crossings under overhead electrical transmission lines, the Applicant would consult with the owners or operators to ensure that all appropriate safety measures have been implemented. These measures would address aspects of construction such as the distance from the lines, the equipment used, and the methods of moving pipe segments. Implementation of these measures would avoid disruption of service, damage to the utilities, and worker injuries. With these measures in place, impacts on and from overhead electrical transmission lines are expected to be temporary and, at most, negligible.

Because no airports are within 20,000 feet of RA-06, construction of this route alternative would not affect airports.

Emergency Services

Multiple law enforcement agencies and fire departments are present in each county crossed by RA-06. Impacts on emergency services due to construction of this route alternative would be similar to those described for the Applicant's preferred route, including an increased need for police services to assist with traffic control at road crossings and to provide help or consultation regarding security, as well as a general increased need for police services because of the increased population from the construction workforce. For emergency services, such as fire and medical, impacts would be associated with an increased need due to the increase in population from the workforce in addition to potential injuries or accidents from construction. The number of emergency services departments in each county crossed by RA-06 appear to be sufficient to absorb the potential increased need for their services (Table 6.2.5-7). Overall, the temporary influx of workers during construction of RA-06 would result in a temporary and minor impact on emergency services in the ROI.

<u>Operations Impacts</u>

Roads and Highways

Maintenance activities would primarily consist of routine vegetation maintenance along the permanent right-of-way of RA-06. Maintenance equipment and vehicles may briefly use local roads for access and egress to and from the right-of-way; this would have little effect and thus no impact on traffic.

During operation, the Applicant would implement its Integrity Management Program, which may require excavation to repair or replace segments of pipe at roadway crossings. In some cases, it could require removal of pipe that was installed under roadways crossed using the guided bore or HDD method. The impacts of those activities would be similar to those of constructing the crossings, and the Applicant would restore the roadways to their original condition. Therefore, impacts on roads and highways as a result of these maintenance activities for RA-06 would be temporary and negligible but would occur periodically over the life of the Project.

Railroads, Utilities, and Airports

No impacts on railroads would be expected during operation and maintenance of the pipeline. If a segment of pipe under the rail bed needs to be repaired or replaced it would be accomplished by excavating a pit to remove the pipe that was installed using the guided bore or HDD method and would not affect operation of the railroad.

If integrity digs are required along the route, the Applicant would consult with utility companies and use the Minnesota GSOC system to ensure that all adjacent pipelines and underground utilities are properly marked. As for construction of the pipeline, disruption of service is not expected, and no impact on utilities during maintenance is expected. However, if an unmarked utility line is damaged during maintenance excavations, the Applicant would repair the damage and to allow the provider to restore service. In the event of a disruption, the impact on local users of the utility would be temporary and major.

Because no airports are within 20,000 feet of RA-06, operation and maintenance of this route alternative would not affect any airports.

Emergency Services

Operation would require a small number of new hires since the pipeline system could be operated and maintained primarily by the existing staff that operates and maintains the Line 3 pipeline. Therefore, there would not be a measurable impact on emergency services.

Impacts on emergency services in the event of an accidental release of crude oil are addressed in Chapter 10.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the transportation and public services ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Roads and Highways

Between Clearbrook and Carlton, RA-07 would require 185 road and highway crossings. Similar to construction of the Applicant's preferred route, paved roads would be crossed using the guided bore or HDD method, resulting in no road closures. Although presence of the construction crews and vehicles in the areas adjacent to the crossings may cause some drivers to reduce their speed, the resultant impacts on transportation on paved roads due to pipeline crossings would be temporary and negligible.

Construction across unpaved roads would require temporary road closures since they would be crossed using the open-cut method, similar to construction of the main portion of the route across land. Where open-cut methods are used, crossings would typically be completed in 1 day. With the Applicant-proposed measures of detours, warnings, traffic control, and safety signs, impacts on local traffic patterns would be minimized. Because most unpaved roads along RA-07 are in rural areas, detours and delays during temporary closures could result in longer driving times, causing a temporary minor impact on road users. Impacts on local access from road closures along RA-07 are addressed in Section 6.2.4.3.

Traffic along roads within the ROI may also be affected by the increased traffic volume from construction workers and construction equipment vehicles. Construction of RA-07 would most likely be conducted along four construction spreads between Clearbrook and Carlton. Similar to construction of the Applicant's preferred route, there could be a maximum of approximately 590 daily vehicle trips per construction spread during peak construction. Most workers would use major roadways to travel to and from the construction area, as well as some county and local roads to access the right-of-way. However, not all roads crossed by the route would be used as access points for workers. For major roads crossed by the route, AADT ranges from 295 to 16,400 vehicle per day (Table 6.2.5-8). Since workers would be distributed among individual construction spreads, it is unlikely that any single road would be subject to an increase of 590 trips at a given time. For roads with low traffic counts, users may notice the increase in the number of vehicles; however, the impact on traffic is likely to be temporary and minor.

Because construction of RA-07 would require upgrading existing pump stations rather than constructing new pump stations, the estimated number of construction workers required and the associated number of vehicle trips per day that would be added to roads and highways has not been determined. In addition, the location of pump stations has not been determined for RA-07, so the impacts on local traffic during construction of the pump station upgrades cannot be quantitatively assessed. However, even if the upgrades require the same number of construction workers as the new pump stations noted above, it is anticipated that most roads could accommodate the increase of 86 total vehicle trips per day without causing substantial impacts on traffic. As noted above for the Applicant's preferred route, the typical base saturation flow rate (or maximum capacity) for a highway is 1,900 cars per hour per lane (TRB 2000). Even if the 81 to 86 vehicle trips were to occur in the same peak hour, which is not likely, this would only represent a small percentage of the capacity of most roadways along the route. Therefore, impacts on traffic during construction of pump stations for RA-07 are expected to be temporary and minor.

Construction may cause deterioration of road surfaces from the increased worker vehicle traffic and construction vehicles with heavy loads. Construction vehicles also could track dirt and debris onto the road surface. The Applicant would implement measures to minimize debris tracking, including requiring contractors to remove the debris within 24 hours. The Applicant also committed to restoring all road surfaces to preexisting conditions. Therefore, the impact on road surfaces due to construction of RA-07 would be temporary and minor.

Railroads, Utilities, and Airports

Between Clearbrook and Carlton, RA-07 would require the seven railroad crossings. All active railroads would be crossed using either the guided bore or HDD method. As noted above, both methods require an excavated pit on each side of the crossing; the crossings would be bored or drilled under the rail bed from one pit to the other. The use of either method would result in no impacts on the railroad or its uses.

RA-07 would require constructing 42 pipeline crossings, 43 electrical transmission line crossings, and other local utility crossings. The Applicant would consult with all underground utility companies prior to construction and use the GSOC system prior to excavation to ensure that utility owners or operators are informed of the planned construction and that potentially affected pipelines and underground utilities are properly marked. With these safeguards in place, accidental damage to the utilities is not likely and disruption of service is not expected; therefore, impacts on utilities are not expected. However, it is possible that not all of the locations of local utility lines are known by the local communities or counties. If utility lines are accidentally damaged, disruption to service could result. The Applicant would be required to repair damaged utilities to allow the provider to restore service. In the event of a disruption, impacts on local residents would be temporary and major.

Before initiating crossings under overhead electrical transmission lines, the Applicant would consult with the owners or operators to ensure that all appropriate safety measures have been implemented. These measures would address aspects of construction such as the distance from the lines, the equipment used, and the methods of moving pipe segments. Implementation of these measures would avoid disruption of service, damage to the utilities, and worker injuries. With these measures in place, impacts on and from overhead electrical transmission lines are expected to be temporary and, at most, negligible.

Because the Bemidji Regional Airport is within 20,000 feet of the RA-07 route, the Applicant may be required to notify the FAA of the planned construction (Section 6.2.5.1.1). If notification is required, the Applicant would then be required to comply with FAA regulations for construction of facilities near airports; as a result, no impacts on the Bemidji Regional Airport are expected due to construction of RA-07.

Emergency Services

Multiple law enforcement agencies and fire departments are present in each county crossed by RA-07. Impacts on emergency services for the route alternatives would be similar to those described for the Applicant's preferred route, including an increased need for police services to assist with traffic control at road crossings and to provide help or consultation regarding security, as well as a general increased need for police services because of the increased population from the construction workforce. For emergency services, such as fire and medical, impacts would be associated with an increased need due to the increase in overall population from the workforce in addition to potential injuries or accidents from construction. The number of emergency services departments in each county crossed by RA-07 appear to be sufficient to absorb the potential increased need for their services (Table 6.2.5-9). Overall, the temporary influx of workers during construction of RA-07 would result in a temporary and minor impact on emergency services in the ROI.

Operations Impacts

Roads and Highways

Maintenance activities would primarily consist of routine vegetation maintenance along the permanent right-of-way of RA-07. Maintenance equipment and vehicles may briefly use local roads for access and egress to and from the right-of-way; this would have little effect on traffic and would therefore not affect traffic.

During operation, the Applicant would implement its Integrity Management Program, which may require excavation to repair or replace segments of pipe at roadway crossings. In some cases, it could require removal of pipe that was installed under roadways crossed using the guided bore or HDD method. The impacts of those activities would be similar to those of constructing the crossings, and the Applicant would restore the roadways to their original condition. Therefore, impacts on roads and highways as a result of these maintenance activities for RA-07 would be temporary and negligible but would occur periodically over the life of the Project.

Railroads, Utilities, and Airports

No impacts on railroads would be expected during operation and maintenance of the pipeline. If a segment of pipe under the rail bed needs to be repaired or replaced it would be accomplished by excavating a pit to remove the pipe that was installed using the guided bore or HDD method and would not affect operation of the railroad.

If integrity digs are required along the route, the Applicant would consult with utility companies and use the Minnesota GSOC system to ensure that all adjacent pipelines and underground utilities are properly marked. As for construction of the pipeline, disruption of service is not expected, and no impact on utilities during maintenance is expected. However, if an unmarked utility line is damaged during maintenance excavations, the Applicant would repair the damage and to allow the provider to restore service. In the event of a disruption, the impact on local users of the utility would be temporary and major.

Operation of the RA-07 pipeline would not affect the Bemidji Regional Airport.

Emergency Services

Operation would require a small number of new hires since the pipeline system could be operated and maintained primarily by the existing staff that operates and maintains the Line 3 pipeline. Therefore, there would not be a measurable impact on emergency services.

Impacts on emergency services in the event of an accidental release of crude oil are addressed in Chapter 10.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the transporation and public services ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this Project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Roads and Highways

Between Clearbrook and Carlton, RA-08 would require 162 road and highway crossings. Similar to construction of the Applicant's preferred route, paved roads would be crossed using the guided bore method, resulting in no road closures. Although presence of the construction crews and vehicles in the areas adjacent to the crossings may cause some drivers to reduce their speed, the resultant impacts on transportation on paved roads due to pipeline crossings would be temporary and negligible.

Construction across unpaved roads would require temporary road closures since they would be crossed using the open-cut method, similar to construction of the main portion of the route across land. Where open-cut methods are used, crossings would typically be completed in 1 day. With the Applicant-proposed measures of detours, warnings, traffic control, and safety signs, impacts on local traffic patterns would be minimized. Because most unpaved roads along RA-08 are in rural areas, detours and delays during temporary closures could result in longer driving times, causing a temporary minor impact on road users. Impacts on local access from road closures along RA-08 are addressed in Section 6.2.4.3.

Traffic along roads within the ROI may also be affected by the increased traffic volume from construction workers and construction equipment vehicles. Construction of RA-08 would most likely be conducted along four construction spreads between Clearbrook and Carlton. Similar to construction of the Applicant's preferred route, there could be a maximum of approximately 590 daily vehicle trips per construction spread during peak construction. Most workers would use major roadways to travel to and from the construction area, as well as some county and local roads to access the right-of-way. However, not all roads crossed by the route would be used as access points for workers. For major roads crossed by the route, AADT ranges from 295 to 16,400 vehicle per day (Table 6.2.5-10). Since workers would be distributed among individual construction spreads, it is unlikely that any single road would be subject to an increase of 590 trips at a given time. For roads with low traffic counts, users may notice the increase in the number of vehicles; however, the impact on traffic is likely to be temporary and minor.

During construction of the four pump stations that would be needed for RA-08, approximately 81 to 86 vehicle trips per day would be added to roads and highways used for access. Since the locations of pump stations have not been determined for RA-08, the impacts on local traffic during construction of the four pump stations cannot be quantitatively assessed. However, it is anticipated that most roads could accommodate the increase of 86 total vehicle trips per day without causing substantial impacts on traffic. As noted above for the Applicant's preferred route, the typical base saturation flow rate (or maximum capacity) for a highway is 1,900 cars per hour per lane (TRB 2000). Even if the 81 to 86 vehicle trips were to occur in the same peak hour, which is not likely, this would only represent a small percentage of the capacity of most roadways along the route. Therefore, impacts on traffic during construction of pump stations for RA-08 are expected to be temporary and minor.

Construction may cause deterioration of road surfaces from the increased worker vehicle traffic and construction vehicles with heavy loads. Construction vehicles also could track dirt and debris onto the road surface. The Applicant would implement measures to minimize debris tracking, including requiring contractors to remove the debris within 24 hours. The Applicant also committed to restoring all road surfaces to preexisting conditions. Therefore, the impact on road surfaces due to construction of RA-08 would be temporary and minor.

Railroads, Utilities, and Airports

Between Clearbrook and Carlton, RA-08 would require five railroad crossings. All active railroads would be crossed using either the guided bore or HDD method. As noted above, both methods require an excavated pit on each side of the crossing; the crossings would be bored or drilled under the rail bed from one pit to the other. The use of either method would result in no impacts on the railroad or its uses.

RA-08 would require constructing 41 pipeline crossings, 36 electrical transmission line crossings, and other local utility crossings. The Applicant would consult with all underground utility companies prior to construction and use the GSOC system prior to excavation to ensure that utility owners or operators are informed of the planned construction and that potentially affected pipelines and underground utilities are properly marked. With these safeguards in place, accidental damage to the utilities is not likely and disruption of service is not expected; therefore, impacts on utilities are not expected. However, it is possible that not all of the locations of local utility lines are known by the local communities or counties. If utility lines are accidentally damaged, disruption to service could result. The Applicant would be required to repair damaged utilities to allow the provider to restore service. In the event of a disruption, impacts on local residents would be temporary and major.

Before initiating crossings under overhead electrical transmission lines, the Applicant would consult with the owners or operators to ensure that all appropriate safety measures have been implemented. These measures would address aspects of construction such as the distance from the lines, the equipment used, and the methods of moving pipe segments. Implementation of these measures would avoid disruption of service, damage to the utilities, and worker injuries. With these measures in place, impacts on and from overhead electrical transmission lines are expected to be temporary and, at most, negligible.

Because the Bemidji Regional Airport is within 20,000 feet of the RA-08 route, the Applicant may be required to notify the FAA of the planned construction (Section 6.2.5.1.1). If notification is required, the Applicant would then be required to comply with FAA regulations for construction of facilities near airports; as a result, no impacts on the Bemidji Regional Airport are expected due to construction of RA-08.

Emergency Services

Multiple law enforcement agencies and fire departments are present in each county crossed by RA-08. Impacts on emergency services for the route alternatives would be similar to those described for the Applicant’s preferred route, including an increased need for police services to assist with traffic control at road crossings and to provide help or consultation regarding security, as well as a general increased need for police services because of the increased population from the construction workforce. For emergency services, such as fire and medical, impacts would be associated with an increased need due to the increase in overall population from the workforce in addition to potential injuries or accidents from construction. The number of emergency services departments in each county crossed by RA-08 appear to be sufficient to absorb the potential increased need for their services (Table 6.2.5-11). Overall, the temporary influx of workers during construction of RA-08 would result in a temporary and minor impact on emergency services in the ROI.

Operations Impacts

Roads and Highways

Maintenance activities would primarily consist of routine vegetation maintenance along the permanent right-of-way of RA-08. Maintenance equipment and vehicles may briefly use local roads for access and egress to and from the right-of-way; this would have little effect on traffic and would therefore not affect traffic.

During operation, the Applicant would implement its Integrity Management Program, which may require excavation to repair or replace segments of pipe at roadway crossings. In some cases, it could require removal of pipe that was installed under roadways crossed using the guided bore or HDD method. The impacts of those activities would be similar to those of constructing the crossings, and the Applicant would restore the roadways to their original condition. Therefore, impacts on roads and highways as a result of these maintenance activities for RA-08 would be temporary and negligible but would occur periodically over the life of the Project.

Railroads, Utilities, and Airports

No impacts on railroads would be expected during operation and maintenance of the pipeline. If a segment of pipe under the rail bed needs to be repaired or replaced it would be accomplished by excavating a pit to remove the pipe that was installed using the guided bore or HDD method and would not affect operation of the railroad.

If integrity digs are required along the route, the Applicant would to consult with utility companies and use the Minnesota GSOC system to ensure that all adjacent pipelines and underground utilities are properly marked. As for construction of the pipeline, disruption of service is not expected, and no impact on utilities during maintenance is expected. However, if an unmarked utility line is damaged during maintenance excavations, the Applicant would repair the damage and to allow the provider to restore service. In the event of a disruption, the impact on local users of the utility would be temporary and major.

Operation of the Project would not affect the Bemidji Regional Airport.

Emergency Services

Operation would require a small number of new hires since the pipeline system could be operated and maintained primarily by the existing staff that operates and maintains the Line 3 pipeline. Therefore, there would not be a measurable impact on emergency services.

Impacts on emergency services in the event of an accidental release of crude oil are addressed in Chapter 10.

6.2.5.4 Summary and Mitigation

6.2.5.4.1 Summary

Table 6.5.2-12 summarizes the potential construction- and operations-related impacts on transportation and public services for the Applicant's preferred route and route alternatives. The types of impacts on transportation would be comparable across route options; the primary differences are the number of crossings (i.e., of roads, railroads, and utilities) for each route option.

Construction Impacts

<u>Roads and Highways</u>

Although impacts on individual unpaved roads are expected to be temporary and minor, the number of roads affected would be different among the route options. RA-03AM would affect the most roads (a total of 329, with some of those paved), followed by RA-07 (185 total road crossings), the Applicant's preferred route and RA-08 (164 and 162 total crossings, respectively), and RA-06 (112 total crossings). In addition, traffic impacts would occur along an additional area for RA-03AM because it would require five construction work spreads between Clearbrook and Carlton compared to four spreads for the other alternatives.

<u>Railroads, Utilities, and Airports</u>

All railroads would be crossed using either the guided bore or HDD method. The use of either method would result in no impacts on railroad bed or rail traffic.

Although impacts on utilities are not expected, the more utilities crossed, the greater the potential for accidental damage. RA-03AM would cross the most utilities (106), followed by RA-07 (85), RA-08 (77), the Applicant's preferred route (67), and RA-06 (51).

<u>Emergency Services</u>

Overall, the temporary influx of workers during construction would result in temporary and minor impacts on emergency services in the ROI for all route options, although the increase in service needs may be slightly higher for RA-03AM, with about 3,000 workers along the route compared to the 2,400 workers for the other route options.

Operations Impacts

<u>Roads and Highways</u>

The number of roads affected by construction would be different among the route options, with RA-03AM having the most road crossings and RA-06 the least.

<u>Railroads, Utilities, and Airports</u>

No impacts on railroads, utilities or airports would be expected during operation and maintenance, regardless of route.

<u>Emergency Services</u>

Emergency services would not be affected, regardless of route.

6.2.5.4.2 Mitigation

The following mitigation measures could be implemented by the Applicant to minimize impacts on transportation:

- Where temporary road closures are required to construct a road crossing, maintain at least one open lane during peak-traffic periods; and
- If roadway congestion occurs on roadways used to access the sites of pump stations or to access the work sites of the pipeline route, provide traffic control by police or sheriff departments.

Table 6.2.5-12. Summary of Potential Impacts on Transportation and Public Services for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Road closures, increased traffic, and road damage caused by construction	Temporary/minor impacts • 164 road crossings • 4 construction spreads	Temporary/minor impacts • 329 road crossings • 5 construction spreads	Temporary/minor impacts • 112 road crossings • 4 construction spreads	Temporary/minor impacts • 185 road crossings • 4 construction spreads	Temporary/minor impacts • 162 road crossings • 4 construction spreads
Disruption of rail or airport travel during construction Disruption of utility service during construction	Temporary/negligible to major impacts • 25 pipeline crossings Temporary/negligible impacts • 42 transmission line crossings Temporary/negligible impacts • 1 airport within 20,000 feet	Temporary/negligible to major impacts • 47 pipeline crossings Temporary/negligible impacts • 59 transmission line crossings	Temporary/negligible to major impacts • 29 pipeline crossings Temporary/negligible impacts • 22 transmission line crossings	Temporary/negligible to major impacts • 42 pipeline crossings, Temporary/negligible impacts • 43 transmission line crossings Temporary/negligible impacts • 1 airport within 20,000 feet	Temporary/negligible to major impacts • 41 pipeline crossings Temporary/negligible impacts • 36 transmission line crossings Temporary/negligible impacts • 1 airport within 20,000 feet
Increased need for emergency services (police, fire, and hospitals) during construction	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts
Operations Impacts					
Roads and highways	Temporary/negligible impacts	Temporary/negligible impacts	Temporary/negligible impacts	Temporary/negligible impacts	Temporary/negligible impacts
Utilities	No impact	No impact	No impact	No impact	No impact
Railroads and airports	No impact	No impact	No impact	No impact	No impacts
Impacts on emergency services (police, fire, and hospitals)	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts

Table 6.2.5-12. Summary of Potential Impacts on Transportation and Public Services for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

a No single dataset in this summary table provides a complete indication of all relevant impacts to transportation and public services. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, road crossing information allows an assessment of potential traffic congestion issues, but information about other utility crossings is necessary to understand impacts to other utilities, which is also an important component of transportation and public service related effects. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.

b Quantitative information in the tables should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-148 to 6-163. The table above, for example, provides counts of the number of roadways/utility lines crossed within the ROI and and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to transportation and public services is contained in the impacts discussion in the text (terms defined in Section 6.1.3).

c Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-148 to 6-152. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

d Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-152 to 6-155. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

e Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-155 to 6-157. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

f As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-158 to 6-160. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

g RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-161 to 6-163. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.2.5.5 References

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6.3 NATURAL RESOURCES

Project actions have the potential to affect the natural environment. This section describes the existing conditions for the Applicant's preferred route and the route alternatives, and assesses their potential impacts on water resources, geology and soils, flora and fauna, and air quality.

6.3.1 Water Resources

This section describes water resources, including groundwater, surface water, wetlands, and floodplains, located along the Applicant's preferred route and route alternatives in Minnesota. The analysis focuses on major groundwater aquifers and wells; surface waterbodies, including streams, rivers, and lakes, and their designations; publically available wetland data, public waters wetlands; wild rice lakes; calcareous fens; wetland reserve programs; and floodplains designated by FEMA. The potential impacts of pipeline construction and operation are described, and comparisons are provided between the Applicant's preferred route and the four route alternatives (RA-03AM, RA-06, RA-07, and RA-08) between Clearbrook and Carlton.

6.3.1.1 Groundwater

Groundwater resources are relied on as sources for drinking water, irrigation, and industrial use (USGS 1992). Groundwater can be sourced from shallow surficial aquifers or from deeper confined aquifers. Activities that reduce the quantity of available water or introduce contaminants into these aquifers can affect groundwater resources and the people and industries that rely on them. The analysis of potential impacts on groundwater resources during construction of the Applicant's preferred route and route alternatives considered the following:

- Changes in groundwater availability (from withdrawals for hydrostatic testing and other construction activities including "French drain" effects of the pipeline);
- Increases in total suspended solid (TSS) concentrations during trenching and excavation activities in shallow aquifers;
- Degradation of shallow groundwater quality from blasting, spills, or contamination;
- Degradation of groundwater quality in potable supply wells, sole source aquifers, or other designated groundwater protection areas; and
- Degradation of water quality from drilling mud releases during HDD crossings.

Potential operations-related impacts on groundwater addressed in this section include:

- The potential for groundwater availability changes due to repair and maintenance activities and the risk of French drain effects; and
- Contamination resulting from small fuel and lubricant leaks and spills from maintenance and inspection vehicles.

This section first describes the existing conditions for groundwater resources within an area along the Applicant's preferred route and each of the route alternatives where groundwater could be affected by construction and operation activities. The potential impacts on groundwater resources from construction and operation of the Applicant's preferred route are considered next. Potential impacts on groundwater resources for each route alternative are assessed and then compared to each other and to the Applicant's preferred route between Clearbrook and Carlton as the impacts from North Dakota to Clearbrook and from Carlton to Wisconsin will be the same for all route alternatives. A summary and comparison of the impacts for the five route options (the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08) are included at the end of the section. Chapter 10 addresses the impacts on groundwater resources resulting from an unanticipated release of crude oil.

6.3.1.1.1 Regulatory Context and Methodology

Regulatory Context

A number of regulatory programs in Minnesota control activities with the potential to affect the quantity or quality of groundwater resources. These programs and their relevance to the construction and operation of a pipeline are summarized in Table 6.3.1.1-1. They also are described in greater detail below.

Table 6.3.1.1-1. Minnesota Regulatory Requirements for Protection of Groundwater

Unit of Government	Type of Application	Reason Required
Minnesota Department of Natural Resources	Water Appropriation Permit for withdrawals exceeding 10,000 gpd or 1 million gallons/year	Authorizes withdrawal and use of groundwater from private or municipal wells for hydrostatic testing, dust control, horizontal directional drilling, and trench dewatering.
	Calcareous Fen Management Plans	Impacts on calcareous fens are managed by the Minnesota Department of Natural Resources under approved calcareous fen management plans.[a]
Minnesota Department of Health	Drinking water supply management area – wellhead protection area consultation	Ensures that pipeline construction and operation are compatible with goals of relevant drinking water supply management area and wellhead protection area plans.
Minnesota Pollution Control Agency	National Pollutant Discharge Elimination System/State Disposal System Permit 401 Certification for 404 USACE permit	Groundwater discharge/construction dewatering to groundwater interface

Sources: Minnesota DNR 2017a; MDH 2014; Minnesota PCA n.d.[a].

[a] Calcareous fens are discussed in Wetlands, Section 5.2.1.3.

gpd = gallons per day, USACE = U.S. Army Corps of Engineers

Minnesota Statutes Chapter 103G addresses management of groundwater quantity and groundwater withdrawals. Based on this authority, Minnesota DNR requires all water users withdrawing more than 10,000 gallons per day or 1 million gallons per year to apply for a Water Appropriations Permit. In its review of applications and issuance of permits, Minnesota DNR may consider the potential impact of the proposed withdrawal on the quantity of local groundwater resources and on unique ecosystems, like fens, which are sensitive to even minor changes in local hydrology.[5] In the case of pipeline projects like the Line 3 Project, Water Appropriations Permits are necessary because large volumes of water are

[5] Minnesota Administrative Rules Part 6115.0670.

needed for hydrostatic testing of the pipeline (see Section 2.7.1.13 for a description of hydrostatic testing).

Minnesota Statutes Chapter 103H addresses groundwater quality by establishing that the goal of the state is to maintain groundwater in its natural condition, free from any degradation caused by human activities. Minnesota Administrative Rules Part 7850.0221 establishes the water quality standards for domestic consumption, which are applicable to all groundwater resources in the state. The Minnesota Pollution Control Agency (Minnesota PCA) monitors groundwater quality; the agency has various programs in place to prevent pollution of groundwater and to remediate where groundwater has been contaminated. In addition, the Minnesota Department of Health (MDH) has authority under Minnesota Statutes § 103I, Subdivision 5, and Minnesota Administrative Rules Parts 4720.5100 to 4720.5590 to implement wellhead protection programs. These programs prevent contamination of public and non-public community water supply wells by effectively managing potential contaminant sources in the areas that contribute water to the public water supply well (wellhead protection areas). Drinking water supply management areas (DWSMAs) are delineated around these wellhead protection areas. Within a DWSMA, the water-supply provider conducts an inventory of potential contamination sources and develops management practices and monitoring strategies to mitigate well contamination. MDH consults with other agencies during environmental review and permitting of activities in these wellhead protection areas to ensure that risks are considered and minimized during environmental review and are managed through permit conditions.

Methodology

The ROI for groundwater analysis consists of the pipeline corridor and a 1,000-foot buffer on either side of the centerline of the Applicant's preferred route and route alternatives. Operations impacts for the Applicant's preferred route were estimated based on the footprint for the permanent right-of-way provided by the Applicant. Operations impacts for the route alternatives were estimated by overlaying a standardized 50-foot-wide permanent right-of-way centered on the route.

Impacts on groundwater resources were identified based on common pipeline construction methods; peer-reviewed literature; agency documents, including permit requirements and guidance manuals; Applicant-submitted documents, including the November 2016 EAW and associated construction BMP plans (Enbridge 2016a); and the experience and professional judgment of the hydrogeologists involved in developing this analysis.

Identification of groundwater resources potentially affected by the Project was completed by reviewing reports and data from USGS, Minnesota Geological Survey (MGS), Minnesota DNR, Minnesota PCA, MDH, Minnesota Department of Agriculture (Minnesota DA), and the U.S. Environmental Protection Agency (EPA). MDH, Minnesota DNR, and Minnesota PCA provided data and guidance for these analyses.

Impacts related to groundwater resources were evaluated by overlaying the ROI for the Applicant's preferred route and the route alternatives with the following Minnesota data sources:

- Aquifer locations and type, including sole source aquifers;
- Wellhead protection areas;[6] and
- Domestic and public water supply wells.

  A Public Water Supply (PWS) in Minnesota by definition must serve 25 or more people for at least 60 days of the year as defined by the Federal Safe Drinking Water Act. PWSs are broken down into community and noncommunity:

  – Community PWS (Municipal and Non-Municipal). Provides water to the public in their primary living space—where people live and sleep—(e.g., homes, apartments, nursing homes, prisons, mobile home parks).
  – Noncommunity PWS. Provides water to the public in places other than their homes—where people work, gather, and play.

    Two types are:

    ▪ Transient Noncomm PWS. Facilities that serve at least 25 people at least 60 days of the year, but do not serve the same 25 people over 6 months of the year (e.g., restaurants, campgrounds, hotels, and churches).
    ▪ Nontransient Noncomm PWS. Facilities that serve at least 25 of the same people over 6 months of the year (e.g., schools, offices, factories, and daycare centers).

- Minnesota DA's Water Table Aquifer Vulnerability.
- Minnesota DNR's Watershed Health Assessment Framework (WHAF) groundwater contamination susceptibility index.
- Minnesota PCA's and Minnesota DA's "What's in My Neighborhood?" (WIMN) databases and EPA's Facility Registry Service (EPA-listed contaminated sites).
- DWSMAs.[7]
- Minnesota DNR's Minnesota pollution sensitivity of near-surface materials.
- Minnesota DNR's Minnesota pollution sensitivity of bedrock surface.

No single one of the datasets listed above provides a complete indication of all relevant impacts to groundwater. Together, though, these datasets provide a reasonably comprehensive indication of the potential impacts. For example, public water supply well counts do not consider the influence that overlying geology may have on the susceptibility of public water supply wells to impacts. However,

[6] A wellhead protection area is the surface and subsurface area surrounding a public water supply well or well-field that is regulated to prevent contamination; any potential contaminants are likely to move toward this area and reach the well or well-field capture zone.

[7] A DWSMAs is the surface and subsurface area surrounding a public water supply well that is approved by MDH and completely contains the scientifically calculated wellhead protection area; these areas are managed by the entity identified in a Wellhead Protection Plan.

data from the aquifer vulnerability dataset can aid the reader in understanding the influence that overlying geology may have on the susceptibility of groundwater along the route to impacts.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. The summary table at the end of the groundwater section provides counts, for example, of DWSMAs and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to DWSMAs is contained in the text of this section.

6.3.1.1.2 Existing Conditions

The following discussion details the existing groundwater conditions in the vicinity of the Applicant's preferred route and the route alternatives, including aquifer types, characteristics of the materials that make up the aquifers, water yield, and water quality.

Aquifers are underground layers of permeable rock, sediment, or soil that yield usable amounts of water. Two types of aquifers provide water: unconfined and confined aquifers. When the top of the aquifer is not overlain by impermeable layers that restrict the vertical movement of water, the aquifer is unconfined. The upper surface of groundwater in this type of aquifer is referred to as the "water table." When there is a layer of low-permeability material between the top of the aquifer and overlying sediments, that restricts vertical movement of water, the aquifer is confined. The low-permeability layers are called confining units, or aquitards, and are mainly composed of silt and clay. Confined and unconfined aquifers occur beneath the Applicant's preferred route and the route alternatives.

Confined and unconfined aquifers occur in both glacial and bedrock materials. Glacial aquifers consist of unconsolidated sediments deposited and reworked by glaciers that range in depth from just below to several hundred feet below the land surface. Bedrock aquifers underlie the glacial materials and consist of deeper consolidated bedrock layers such as limestone or sandstone.

Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the groundwater ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

<u>Glacial Aquifers</u>

A general description of glacial aquifers as well as those crossed by the Applicant's preferred route is included in Section 5.2.1.1.2.

<u>Bedrock Aquifers</u>

There are generally two types of bedrock aquifers that occur beneath the surficial glacial-type aquifers along the Applicant's preferred route. The first type are aquifers that consist of hard and very old igneous and metamorphic rocks, where groundwater occurs mostly in fractures that may not yield usable quantities of water.

The second type of bedrock aquifer consists of thick, laterally extensive sequences of sandstone, limestone, and dolostone of sedimentary origin. This type of bedrock aquifer tends to be more productive than the first type. Similar to confined glacial aquifers, the majority of this type of bedrock aquifer often is isolated from overlying surficial aquifers by confining units, which decreases it vulnerability to contamination from land surface activities. The exception to this is karst aquifers, which are vulnerable to contamination. A karst aquifer is a type of bedrock aquifer that usually consists of limestone but can consist of dolostone or sandstone. Aquifers composed of these pH basic rock types are prone to chemical weathering and dissolution from the slight acidity of precipitation and groundwater, which can result in the formation of fractures, joints, sinkholes, cavities, caves, and void spaces that allow movement of large volumes of surface water into and through the aquifer. These aquifers often are the source of abundant springs and seeps. These characteristics also allow contamination to spread rapidly within the aquifer. Karst aquifers are susceptible to collapse of the aquifer matrix, which can be triggered by construction activities on the land surface and can lead to formation of sinkholes in unconsolidated sediments that overlie the bedrock. Paleozoic limestones and some Precambrian sandstones found in southeastern and eastern Minnesota are susceptible to dissolution and result in karst topography. Bedrock in these areas is often less than 50 feet deep and is considered vulnerable to contamination (Minnesota DNR 2016). No karst aquifers are believed to be present along the Applicant's preferred route.

With the exception of shallow bedrock (either igneous/metamorphic or sedimentary, which is not common along the Applicant's preferred route) and karst bedrock, bedrock aquifers are not expected to be affected by pipeline construction and operation because they exist at depths averaging from 300 to 400 feet, which is well below pipeline construction depths. These deeper bedrock aquifers often are overlain by thick confining layers, which protect them from disturbance by human activities on the land surface. There are a few areas in Carlton and Pine counties where Precambrian fractured bedrock depth is less than 50 feet and therefore these aquifers are more susceptible to pipeline construction and operation. The bedrock aquifers crossed by the Applicant's preferred route are listed in Table 5.2.1.1-2.

Sole Source Aquifers

A sole source aquifer is an underground water supply designated by the EPA as the "sole or principal source" of drinking water for an area. The Applicant's preferred route would not cross any aquifers designated by EPA as sole source aquifers.

Domestic Wells, Public Wells, Wellhead Protection Areas, and DWSMAs

Domestic (private) drinking water wells and their sensitivity were identified within an established 1,000-foot-wide buffer of the centerline for the Applicant's preferred route (Table 6.3.1.1-2). The method of determining low, moderate, high, or very high geologic sensitivity for a well considers the thickness of fine-grained geologic material (clay or shale) overlying an aquifer that is penetrated by a well. Hydrogeologic sensitivity is a qualitative measure of the ability of near-surface materials to transmit contaminants vertically to the water table and is ranked as follows by MDH:

- Low – fine-grained materials such as clays and clay-silt mixtures;
- Moderate – clay-silt-sand mixtures, sandy or silty tills, and colluvium;

- High – sands and sandy mixtures; and
- Very high – gravels or coarse sands mixed with gravel.

From Clearbrook to Carlton, 164 domestic supply wells are within the within the ROI for the Applicant's preferred route, and 42 of these wells have a high or very high geological sensitivity rating. Two unverified and three verified locations for public supply/non community transient wells are located in the ROI for the Applicant's preferred route. Two public supply wellhead protection areas are located in the ROI, and have different geological sensitivity ratings (Table 6.3.1.1-2 and Figure 6.3.1.1-1). None of the wells are located within the construction work area or permanent right-of-way.

From Clearbrook to Carlton, the Applicant's preferred route would cross 0.6 acre of wellhead protection areas and 172 acres of DWSMAs (Table 6.3.1.1-2 and Figure 6.3.1.1-2).

<u>Minnesota Water Table Aquifer Vulnerability, Groundwater Contamination Susceptibility, and Pollution Sensitivity of Near-Surface Materials</u>

Water table aquifers are most vulnerable to contamination because they lack confining layers and directly interact with the land surface. Minnesota ranks water table aquifer vulnerability based on the overlapping time of water travel from the landsurface to groundwater. The vulnerability of the aquifer is inversely proportional to the time of travel. In areas of higher sensitivity, contaminants may reach the groundwater within hours to months; in areas of lower sensitivity, surface contamination may take months to years to travel into groundwater.

Table 6.3.1.1-2. Wells, Wellhead Protection Areas, and Drinking Water Supply Management Areas Crossed by the Applicant's Preferred Route

Segment	Domestic Wells and Sensitivity (number)					Wellhead Protection Areas and Sensitivity (number)					Wellhead Protection Area (acres)	DWSMA (acres)
	Low	Moderate	High	Very High	Total	Low	Moderate	High	Very High	Total	Low	Moderate
North Dakota-Minnesota border to Clearbrook (for APR and all route alternatives)	12	1	1	--	North Dakota-Minnesota border to Clearbrook	12	1	1	--	North Dakota-Minnesota border to Clearbrook	12	1
Clearbrook to Carlton (APR only)	87	35	25	17	Clearbrook to Carlton	87	35	25	17	Clearbrook to Carlton	87	35
Carlton to Minnesota-Wisconsin border (for APR and all route alternatives)	16	1	3	1	Carlton to Minnesota-Wisconsin border	16	1	3	1	Carlton to Minnesota-Wisconsin border	16	1
TOTAL	**115**	**37**	**29**	**18**	**TOTAL**	**115**	**37**	**29**	**18**	**TOTAL**	**115**	**37**

Sources: MDH n.d. 2014, 2016.

Notes:

Number of wells and acres of wellhead protection areas and drinking water supply management areas (DWSMAs) within a 1,000-foot buffer on either side of the route centerline.

APR = Applicant's preferred route.

"--" = no occurrence.

Figure 6.3.1.1-1. Public Wells in the Region of Interest for the Applicant's Preferred Route and Route Alternatives

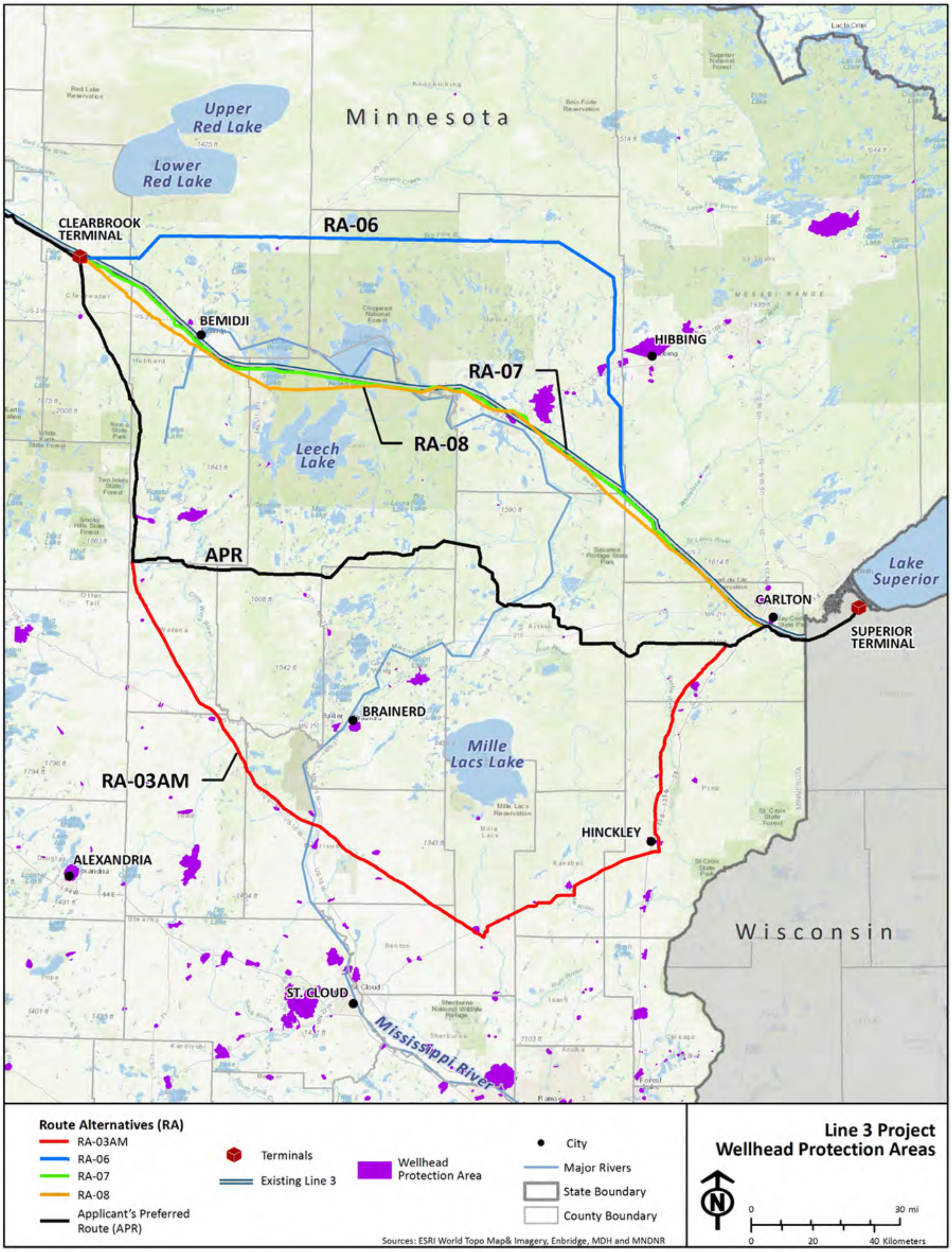

Figure 6.3.1.1-2. Wellhead Protection Areas near the Applicant's Preferred Route and Route Alternatives

Minnesota also evaluates the vulnerability of groundwater based on the shape, type, and relative position of surface and subsurface geology (i.e., the geomorphic setting), which controls the flow paths of water and dissolved elements above and below the surface. Sandiness, permeability, depth to rock outcrops, fracturing and permeability of bedrock, flow-restricting layers, and surface and subsurface connections all affect how vulnerable groundwater is to contamination. Areas of highest ground water contamination susceptibility are in central, north-central, and east-central Minnesota and the southeastern corner of the state, in areas dominated by sand and gravel aquifers or in areas with karstic bedrock. Additionally, Minnesota DNR classifies the sensitivity to pollution of near-surface materials, which is an estimate of the time it takes for water to travel through the unsaturated zone to reach the water table, which is assumed to be 10 feet below land surface. Transmission rates are based on soil type and the texture of surficial geologic units. Generally, areas of coarse-grained material are modeled as higher sensitivity to pollution compared to areas of fine-grained material. As with water table aquifer vulnerability rankings, transmission time in areas of high pollution sensitivity may be hours to months; in areas of low pollution sensitivity, transmission time may be months to years.

There is one area in Carlton County with shallow Precambrian bedrock that is fractured and used for domestic well supply. Minnesota DNR (2016, Minnesota Hydrogeology Atlas series HG-01) has classified the pollution sensitivity of the bedrock surface of parts of Minnesota and this includes these aquifers. The pollution sensitivity of the bedrock surface characterizes the relative rate of vertical travel time of a contaminant that moves conservatively with or within water from the land surface to the buried bedrock surface. The classification includes very high, high, moderate, low, and very low sensitivity. The Applicant's preferred route crosses 753 acres of high vulnerability bedrock surface and 947 acres of very high vulnerability bedrock surfaces in Carlton County.

From North Dakota to Carlton, the Applicant's preferred route would cross 25,751 acres of high vulnerability water table aquifers, 26,382 acres of high groundwater contamination susceptibility, 16,290 acres of high pollution sensitivity, and 1,700 acres of high to very high sensitivity Precambrian bedrock aquifers (Table 6.3.1.1-3). No karst topography would be crossed by the Applicant's preferred route within the ROI from Clearbrook to Carlton.

Table 6.3.1.1-3. Groundwater Sensitivity beneath the Applicant's Preferred Route (acres)

Segment	High Water Table Aquifer Vulnerability	High Groundwater Contamination Susceptibility	High Pollution Sensitivity	Precambrian Bedrock Aquifers with High to Very High Sensitivity
North Dakota-Minnesota border to Clearbrook	7,026.8	--	637.6	--
Clearbrook to Carlton	18,215.1	26,381.5	15,474.9	1,700
Carlton to Minnesota-Wisconsin border	508.7	--	177.9	
TOTAL	**25,750.6**	**26,381.5**	**16,290.4**	**1,700**

Sources: Minnesota DA 2015; Minnesota DNR 2016, 2017b.

Note:

Acres are within a 1,000-foot buffer on either side of the route centerline.

"--" = no occurrence.

Contaminated Sites

Between Clearbrook and Carlton, four EPA-listed contaminated sites and 62 WIMN sites are within the ROI for the Applicant's preferred route (Table 6.3.1.1-4).

Table 6.3.1.1-4. Contaminated Sites within the Region of Interest for the Applicant's Preferred Route

Segment	Minnesota PCA "What's in My Neighborhood" Sites	Minnesota DA "What's in My Neighborhood" Sites[a]
North Dakota-Minnesota border to Clearbrook	36	9
Clearbrook to Carlton	62	4
Carlton to Minnesota-Wisconsin border	3	--
TOTAL	**101**	**13**

Source: Minnesota PCA n.d.[b].

[a] Does not include Minnesota DA contingency clean-up sites.

Note:

Sites within a 1,000-foot buffer on either side of the route centerline.

"--" = no occurrence.

Route Alternatives

Glacial Aquifers

A general description of glacial aquifers, as well as those crossed by route alternatives, is included in Section 5.2.1.1.2.

Bedrock Aquifers

The bedrock aquifers crossed by the route alternatives are listed in Table 5.2.1.1-2. In addition to these aquifers, RA-06, RA-07, and RA-08 cross the Biwabik Iron-Formation aquifer. This Precambrian-age aquifer is composed of chert and iron materials, and it generally underlies glacial materials. However, it outcrops[8] above the land surface in north-central Minnesota. The yields of this aquifer ranges from 250 to 1,000 gallons per minute (gpm). This aquifer is one of the most productive aquifers for the Mesabi Iron Range and is a primary source of drinking water for many municipalities. Dissolved solids range from 100 to 300 milligrams per liter (mg/L), and the water can contain high concentrations of iron, manganese, and silica. This aquifer is susceptible to contamination where surficial materials are thin, at outcrops, and in mine pits. Groundwater flow in this aquifer occurs as regional flow along bedding planes and large fracture networks, as localized flow in discrete fractures near wells, or as a combination of both.

Similar to the Applicant's preferred route, shallow bedrock is not common along the route alternatives. Depths of bedrock along these alignments average from 300 to 400 feet with the exception of some areas of shallow fractured Precambrian bedrock aquifers in parts of Pine and Carlton Counties. Bedrock aquifers crossed by the route alternatives include the Red River-Winnipeg aquifer, Cretaceous aquifer,

[8] An outcrop is a visible exposure of bedrock on the land surface.

Precambrian Undifferentiated aquifer, and Proterozoic aquifer. These aquifers are generally described in Section 5.2.1.1.2.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1mile length (see Section 6.7). Descriptions of existing conditions within the groundwater ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Sole Source Aquifers

The RA-03AM route would not cross any aquifers designated by EPA as a sole source aquifer.

Domestic Wells, Public Wells, Wellhead Protection Areas, and DWSMAs

From Clearbrook to Carlton, 396 domestic supply wells are within the ROI for the RA-03AM route; 55 of these have a high or very high geological sensitivity rating. Of the 10 public supply wells, 4 have a high or very high geological sensitivity rating (Table 6.3.1.1-5 and Figure 6.3.1.1-1). Five of these domestic wells are within the construction work area, and two are within the permanent right-of-way for the RA-03AM route.

The RA-03AM route would cross 329.5 acres of wellhead protection area acres and 849 acres of DWSMAs between Clearbrook and Carlton (Table 6.3.1.1-5 and Figure 6.3.1.1-2).

Table 6.3.1.1-5. Wells, Wellhead Protection Areas, and Drinking Water Supply Management Areas Crossed by Route Alternative RA-03AM

Domestic Wells and Sensitivity (number)					Public Wellhead Protection Areas and Sensitivity (number)					Wellhead Protection Area (acres)	DWSMA (acres)
Low	Moderate	High	Very High	Total	Low	Moderate	High	Very High	Total		
242	99	24	31	396	1	2	2	--	5	329.5	849

Sources: MDH n.d. 2014, 2016.

Notes:

Number of wells and acres of wellhead protection areas and drinking water supply management areas (DWSMAs) within a 1,000-foot buffer on either side of the route centerline.

Counts for the North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border segments are the same as those presented for the Applicant’s preferred route in Table 6.3.1.1-2.

“--” = no occurrence.

Minnesota Water Table Aquifer Vulnerability, Groundwater Contamination Susceptibility, and Pollution Sensitivity of Near-Surface Materials

From Clearbrook to Carlton, the RA-03AM route would cross 25,928 acres of high vulnerability water table aquifers; 25,152 acres of high groundwater contamination susceptibility; and 25,588 acres of high pollution sensitivity. The RA-03AM route also would cross 2,917 acres of karst topography and 2,547 acres of very high to high sensitivity Precambrian shallow fractured bedrock aquifers within the ROI (Table 6.3.1.1-6).

Table 6.3.1.1-6. Groundwater Sensitivity beneath Route Alternative RA-03AM (acres)

High Aquifer Vulnerability	High Groundwater Contamination Susceptibility	High Pollution Sensitivity	Karst Topography	Bedrock Aquifers with High to Very High Sensitivity
25,927.6	25,152.3	25,587.7	2,916.6	5,463.7

Sources: Minnesota DA 2015; Minnesota DNR 2016, 2017b.

Notes:

Acres within a 1,000-foot buffer on either side of the route centerline.

Acres for the North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border segments of the route are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-3.

Contaminated Sites

Between Clearbrook and Carlton, 70 EPA-listed contaminated sites and 182 WIMN sites (179 Minnesota PCA and 3 Minnesota DA) are within the ROI for RA-03AM.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the groundwater ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Sole Source Aquifers

The RA-06 route would not cross any aquifers designated by EPA as a sole source aquifer.

Domestic Wells, Public Wells, Wellhead Protection Areas, and DWSMAs

From Clearbrook to Carlton, 40 domestic supply wells are within the ROI for the RA-06 route; 4 of these have a high or very high geological sensitivity rating. No public supply wells are within the RA-06 ROI (Figure 6.3.1.1-1). Three domestic wells are within the construction work area, and two are within the permanent right-of-way for the RA-06 route. The RA-06 route would cross 56 acres of wellhead protection areas and 131 acres of DWSMAs (Table 6.3.1.1-7 and Figure 6.3.1.1-2).

Table 6.3.1.1-7. Wells, Wellhead Protection Areas, and Drinking Water Supply Management Areas Crossed by Route Alternative RA-06

Domestic Wells and Sensitivity (number)					Public Wellhead Protection Area and Sensitivity (number)					Wellhead Protection Area (acres)	DWSMA (acres)
Low	Moderate	High	Very High	Total	Low	Moderate	High	Very High	Total		
33	3	1	3	40	--	--	--	1	1	55.9	130.9

Sources: MDH n.d., 2014, 2016.
Notes:
Number of wells and acres of wellhead protection areas and drinking water supply water management areas (DWSMAs) within a 1,000-foot buffer on either side of the route centerline.
Counts for the North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border segments are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-2.
"--" = no occurrence.

Minnesota Water Table Aquifer Vulnerability, Groundwater Contamination Susceptibility, and Pollution Sensitivity of Near-Surface Materials

From Clearbrook to Carlton, the RA-06 route would cross 5,806 acres of high vulnerability water table aquifers; 305 acres of high groundwater contamination susceptibility, and 3,134 acres of high pollution sensitivity. The RA-06 route also would cross 512 acres of very high to high sensitivity Precambrian shallow fractured bedrock aquifers within the ROI. The RA-06 route would not cross any areas of known karst topography (Table 6.3.1.1-8).

Table 6.3.1.1-8. Groundwater Sensitivity beneath Route Alternative RA-06 (acres)

High Aquifer Vulnerability	High Groundwater Contamination Susceptibility	High Pollution Sensitivity	Bedrock Aquifers with High to Very High Sensitivity
5,806.2	304.6	3,134.0	511.5

Sources: Minnesota DA 2015; Minnesota DNR 2016, 2017b.

Notes:

Acres within a 1,000-foot buffer on either side of the route centerline.

Acres for the North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border segments of the route are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-3.

Contaminated Sites

Between Clearbrook and Carlton, 13 EPA-listed contaminated sites and 72 WIMN sites (71 Minnesota PCA and 1 Minnesota DA) are within the ROI for RA-06.

<u>Route Alternative RA-07</u>

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the groundwater ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Sole Source Aquifers

The RA-07 route would not cross any aquifers designated by EPA as a sole source aquifer.

Domestic Wells, Public Wells, Wellhead Protection Areas, and DWSMAs

From Clearbrook to Carlton, 183 domestic supply wells are within the ROI for the RA-07 route; 19 of these have a high or very high geological sensitivity rating. Of the 23 public supply wells, 8 have a high or very high geological sensitivity rating (Figure 6.3.1.1-1). Two of these domestic wells are within the construction work area, and one is within the permanent right-of-way for the RA-07 route. The RA-07 route would cross 536 acres of wellhead protection areas and 754 acres of DWSMAs (Table 6.3.1.1-9 and Figure 6.3.1.1-2).

Table 6.3.1.1-9. Wells, Wellhead Protection Areas, and Drinking Water Supply Management Areas Crossed by Route Alternative RA-07

Domestic Wells and Sensitivity (number)					Public Wellhead Protection Areas and Sensitivity (number)					Wellhead Protection Area (acres)	DWSMA (acres)
Low	Moderate	High	Very High	Total	Low	Moderate	High	Very High	Total		
118	46	10	9	183	1	2	1	--	4	4,426	5,155

Sources: MDH n.d., 2014, 2016.

Notes:

Number of wells and acres of wellhead protection areas and drinking water supply management area (DWSMAs) within a 1,000-foot buffer on either side of the route centerline.

Counts for North Dakota-Minnesota border to Clearbrook and Carlton to Minnesota-Wisconsin border are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-2.

"--" = no occurrence.

Minnesota Water Table Aquifer Vulnerability, Groundwater Contamination Susceptibility, and Pollution Sensitivity of Near-Surface Materials

From Clearbrook to Carlton, the RA-07 route would cross 21,141 acres of high vulnerability water table aquifers, 19,833 acres of high groundwater contamination susceptibility, and 15,355 acres of high pollution sensitivity. The RA-07 route also would cross 512 acres of very high to high sensitivity Precambrian shallow fractured bedrock aquifers within the ROI. The RA-07 route would not cross any areas of known karst topography (Table 6.3.1.1-10).

Table 6.3.1.1-10. Groundwater Sensitivity beneath Route Alternative RA-07 (acres)

High Aquifer Vulnerability	High Groundwater Contamination Susceptibility	High Pollution Sensitivity	Bedrock Aquifers with High to Very High Sensitivity
21,141.1	19,832.6	15,354.6	512

Sources: Minnesota DA 2015; Minnesota DNR 2016, 2017b.

Notes:

Acres within a 1,000-foot buffer on either side of the route centerline.

Acres for the North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border segments of the route are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-3.

"--" = no occurrence.

Contaminated Sites

Between Clearbrook and Carlton, 92 EPA-listed contaminated sites and 120 WIMN sites (119 Minnesota PCA and 1 Minnesota DA) are within the ROI for RA-07.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the groundwater ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Sole Source Aquifers

The RA-08 route would not cross any aquifers designated by EPA as a sole source aquifer.

Domestic Wells, Public Wells, Wellhead Protection Areas, and DWSMAs

From Clearbrook to Carlton, 162 domestic supply wells are within the ROI for the RA-08 route; 11 of these have a high or very high geological sensitivity rating. There are seven public supply wells, of which six have a high or very high geological sensitivity rating (Table 6.3.1.1-11 and Figure 6.3.1.1-1). One of these domestic wells is within the construction work area, and one is within the permanent right-of-way for the RA-08 route. The RA-08 route would cross 672 acres of wellhead protection areas and 810 acres of DWSMAs (Table 6.3.1.1-11 and Figure 6.3.1.1-2).

Table 6.3.1.1-11. Wells, Wellhead Protection Areas, and Drinking Water Supply Management Areas Crossed by Route Alternative RA-08

Domestic Wells and Sensitivity (number)					Public Wellhead Protection Areas and Sensitivity (number)					Wellhead Protection Area (acres)	DWSMA (acres)
Low	Moderate	High	Very High	Total	Low	Moderate	High	Very High	Total		
105	46	5	6	162	--	1	1	--	2	672	810

Sources: MDH n.d., 2014, 2016.

Notes:

Number of wells and acres of wellhead protection areas and drinking water supply management areas (DWSMAs) within a 1,000-foot buffer on either side of the route centerline.

Counts for North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-2.

"--" = no occurrence.

Minnesota Water Table Aquifer Vulnerability, Groundwater Contamination Susceptibility, and Pollution Sensitivity of Near-Surface Materials

From Clearbrook to Carlton, the RA-08 route would cross 16,889 acres of high vulnerability water table aquifers, 20,012 acres of high groundwater contamination susceptibility, and 11,699 acres of high pollution sensitivity. The RA-08 route also would cross 512 acres of very high to high sensitivity Precambrian shallow fractured bedrock aquifers within the ROI. The RA-08 route would not cross any areas of known karst topography (Table 6.3.1.1-12).

Table 6.3.1.1-12. Groundwater Sensitivity Beneath Route Alternative RA-08 (acres)

High Aquifer Vulnerability	High Groundwater Contamination Susceptibility	High Pollution Sensitivity	Bedrock Aquifers with High to Very High Sensitivity
16,888.9	20,012.4	11,699.1	512

Sources: Minnesota DA 2015; Minnesota DNR 2016, 2017b.

Notes:

Acres within a 1,000-foot buffer on either side of the route centerline.

Acres for the North Dakota-Minnesota border-to-Clearbrook and the Carlton-to-Minnesota-Wisconsin border segments of the route are the same as those presented for the Applicant's preferred route in Table 6.3.1.1-3.

"--" = no occurrence.

Contaminated Sites

Between Clearbrook and Carlton, 50 EPA-listed contaminated sites and 101 WIMN sites (99 Minnesota PCA and 2 Minnesota DA) are within the ROI for RA-08.

6.3.1.1.3 Impact Assessment

This section contains the impact analysis conducted for the Applicant's preferred route and the route alternatives. The analysis assessed potential impacts on groundwater resources in the ROI for the route options, as described in Section 6.3.1.2.1, related to the following concerns:

- Changes in groundwater availability (from withdrawals for hydrostatic testing and other construction activities, including French drain effects of the pipeline);
- Increases in TSS concentrations during trenching and excavation activities in shallow aquifers;
- Degradation of shallow groundwater quality from blasting, spills, or contamination;
- Degradation of groundwater quality in potable supply wells, sole source aquifers, or other designated groundwater protection areas; and
- Degradation of water quality from drilling mud releases during HDD crossings.

Potential operations-related impacts on groundwater addressed in this section include:

- The potential for groundwater availability changes due to maintenance and repair activities and the risk of French drain effects, and
- Contamination resulting from small fuel and lubricant leaks and spills from maintenance and inspection vehicles.

Many pipeline construction activities have the potential to affect groundwater quantity and quality. These activities include water withdrawals and discharges (e.g., for hydrostatic test water), dewatering and trenching, blasting, access road construction, waterbody crossings, and fueling and use of hazardous materials. The following sections address potential impacts on groundwater from these activities for the Applicant's preferred route and route alternatives. After the discussion of construction impacts, the potential impacts of operations on groundwater resources are addressed for the Applicant's preferred route and each route alternative.

The construction and operations activities that may affect groundwater resources are the same for the Applicant's preferred route and each of the route alternatives. The impacts vary with the length of the alternatives and the groundwater resources present along each specific route.

As noted in Section 6.1, impacts have been assessed for the entire length of the Applicant's preferred route in Minnesota and for the portion of the route from Clearbrook to Carlton. Impacts have been assessed for each of the route alternatives between Clearbrook and Carlton.

Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the groundwater ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions

have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Changes in Groundwater Availability from Withdrawals

The Applicant would withdraw water for construction activities such as dust control, HDD installation, and hydrostatic testing of the pipeline. Approximately 120 million gallons of water would be requested through water appropriation permits submitted to Minnesota DNR for hydrostatic testing of the 340 miles of the Applicant's preferred route in Minnesota. Approximately 78 million gallons of this total would be requested for hydrostatic testing of the 221 miles of the route in Minnesota between Clearbrook and Carlton (Enbridge 2016b). The Applicant would source water from surface water and private and public wells; the proportion of water that would be obtained from groundwater versus surface water has not been determined. As stipulated in permit requirements, the Applicant would select appropriation sites that would meet Minnesota DNR's criteria of "doing no harm," and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. These permits would require identification of, and rationale for choosing, specific water sources, requested maximum pumping rates, and maximum annual volumes of water to be used; monitoring of pumping rates during appropriation with an approved device or method; and reporting of daily, monthly, and/or yearly appropriation amounts. The rate and total volumes of water withdrawn would be measured with a flow meter and would not exceed the rate and amount specified in the permits (Appendix E).

Dewatering of the pipeline trench may be required before the pipe is lowered into it. Dewatering also may be necessary at road boring sites adjacent to wetlands, in areas where excessive volumes of groundwater flow into the trench as a result of seepage or artesian flow, or at locations where increased visibility or physical access is necessary. Trench dewatering is considered a water appropriation permit activity by Minnesota DNR and must be included in permit applications. In areas where an aquifer that is under artesian conditions is exposed by the trench, the volume of inflowing water could cause rapid flooding of the trench and the bottom or sides to become unstable. In these areas, the pipeline trench may have a French drain effect, allowing water to migrate down the trench. Soil borings would be advanced to the design depth of the pipeline in these areas to determine whether a confining layer may be breached (Enbridge 2016). To protect against subsurface water flow along the pipe after the trench is backfilled, the Applicant would install trench breakers from the bottom of the trench to near the top of the trench, completely surrounding the pipe. The trench breakers would be constructed of bags filled with rock-free subsoil or sand; and their locations would be based on field conditions, including the degree and length of slope, presence of down-slope sensitive resource areas such as wetlands and waterbodies, and proximity to other features such as roads and railroads (Appendix E). Once construction in the area is completed and the trench was backfilled, groundwater levels likely would return to preconstruction levels because shallow aquifers readily receive recharge from precipitation and surface water inflow. With adherence to water appropriation permit conditions and implementation of Applicant-proposed measures, impacts on groundwater availability from water withdrawals would be temporary and minor.

Increases in Total Suspended Solid Concentrations in Groundwater

During trenching, excavation, and backfilling, the water table in surficial aquifers would be exposed in some areas. As a result, TSS concentrations in water in the trench or excavated area could increase. The Applicant would use temporary erosion and sediment controls, including, slope breakers, sediment barriers, stormwater diversions, trench breakers, and mulch, to minimize sedimentation in water resources during construction. The Applicant also would limit the amount of excavated open trench to a maximum of 3 days of anticipated welding production per spread, per pipe to minimize the potential for erosion and sedimentation (Appendix E). In addition, the relatively slow groundwater flow rate and fine-grained nature of glacial sediments would likely filter out TSS from infiltrating groundwater. Thus, impacts associated with increases in TSS concentrations in groundwater in aquifers near trenched and excavated areas would be temporary and minor.

Degradation of Shallow Groundwater Quality from Blasting, Spills, or Contamination

The quality of shallow groundwater may be degraded from blasting; small spills and leaks of lubricants, oil, or other hazardous chemicals used during construction; or disturbance of existing contamination. Blasting is likely to be necessary only in Carlton County, Minnesota, near the Wisconsin border where surface bedrock is present. The Applicant has identified one location at MP 354.6 where bedrock outcrops at the surface for approximately 0.3 mile; and four blasting events would be required to install the pipeline (Enbridge 2016b). This location is within the Clearbrook-to-Carlton segment of the Applicant's preferred route. Blasting has been carried out in this segment previously for installation of the existing pipelines in the Enbridge Mainline system corridor.

Where blasting would occur, rock would be removed to a depth of 7 feet, which may be above the elevation of the water table in many areas. If the water table is exposed by blasting, potential turbidity, sedimentation, or chemical contamination would be localized and likely would be diluted or attenuated before it could travel very far into the aquifer. Prior to construction, the Applicant would develop a site-specific Blasting Plan, which would include measures for transporting, storing, handling, detonating, and disposing of blasting materials to protect groundwater resources (see Section 6.3.2.1.1 for blasting regulations).

Groundwater may become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. Areas of high aquifer vulnerability, high groundwater contamination susceptibility, or high pollution sensitivity are inherently more susceptible to groundwater contamination during construction activities. To protect groundwater resources, the Applicant would store petroleum products, hazardous chemicals, and lubricating oils; conduct refueling, maintenance, and lubricating operations; and perform concrete coating activities in areas greater than 100 feet from water supply wells and would use secondary containment (Appendix E). Concrete wash water, grindings, and slurry disposal would be limited to a designated area. Rinse water, used in conjunction with a cleaning pig to remove any accumulated construction debris, dirt, and dust prior to hydrostatic testing, would be treated and disposed of or discharged in accordance with applicable National Pollutant Discharge Elimination System (NPDES) permit conditions. Excess HDD drilling mud would be disposed of offsite at an approved disposal facility. In addition to these prevention measures, the Applicant would be responsible for cleaning up small spills through procedures outlined in the Environmental Protection Plan (Appendix E), including notifying proper personnel (e.g., the onsite spill coordinator) and agencies, stopping work activity that caused the spill, using absorbent booms and pads to contain and recover released materials in water, and disposing of contaminated response materials at approved facilities. Prevention and response procedures for a large oil spill are discussed in Chapter 10.

If any contaminated soils or groundwater were encountered during construction, they would be handled and disposed of in accordance with applicable regulations, the Environmental Protection Plan, and a Contaminated Soils Management Plan, which the Applicant would develop prior to construction. This plan would describe site assessment and response actions that would be implemented to manage contaminated soils and groundwater (Enbridge 2016a). The Applicant would also follow Spill Prevention, Containment, and Control (SPCC) measures outlined in Appendix E to minimize the likelihood of spills and of contamination entering groundwater. With implementation of Applicant-proposed measures and adherence to the Blasting and Contaminated Soils Management plans, impacts on groundwater quality from small leaks and spills, blasting activities, and existing contamination would be temporary and minor.

Degradation of Groundwater Quality in Potable Supply Wells, Sole Source Aquifers, or Designated Protection Areas

Water supply wells, aquifers, and wellhead protection areas could be affected by construction activities, including groundwater withdrawals, minor spills of industrial chemicals and hazardous materials, and drilling mud releases during HDD installation—depending on how close the wells are to construction areas. No wells are located within the construction work area or permanent right-of-way for the Applicant's preferred route. However, if well interference occurred from pipeline construction, the Applicant would be required to participate in Minnesota DNR's well interference resolution process. Furthermore, the Applicant would work with landowners to develop site-specific plans for wells that could be affected by construction or request a variance from MDH. With adherence to the Applicant-proposed measures discussed above and below (e.g., water appropriation BMPs, erosion and sedimentation controls, SPCC measures, and HDD monitoring and clean-up procedures) construction impacts on groundwater in these sensitive areas and in wells would be temporary and minor.

The Applicant's preferred route would not cross any aquifers designated by EPA as a sole source aquifer. Therefore, there would be no construction impacts on any sole source aquifer.

Degradation of Water Quality from Drilling Mud Releases during HDD Crossings

HDD installation involves drilling under a waterbody and installing the pipeline without physical disturbance of the waterbody feature. This method would be used to cross environmentally sensitive areas such as certain wetlands, sensitive fishery resources, and impaired waters. Geotechnical surveys are conducted to determine which waterbodies exist in areas that are geologically suitable for HDD, based on properties such as depth to aquifer, aquifer flow properties, aquifer material type, strength, and deformational properties. Areas not conducive to HDD include soils containing cobbles, boulders, layers of gravel, or non-cohesive sands. The Applicant has proposed 19 HDD crossings along the entire length of the Applicant's preferred route in Minnesota and 12 crossings between Clearbrook and Carlton. During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent rupture of the bore hole or "frac-out" and release of the drilling fluid. Such events can occur when pressurization of the drill hole increases beyond the containment capability of the overburden soil material, which allows the drilling fluid to flow to the ground surface. The general risks to groundwater associated with HDD construction methods include loss of drilling mud into surficial aquifers, which could lead to turbidity in nearby aquifers and wells. Partial or full loss of drilling mud may occur as a result of encountering loose, unstable zones of soil, which could temporarily restrict water movement in shallow aquifers. Areas of karst are more prone to this occurrence. A large subsurface drilling fluid escape that does not reach the surface may fill subsurface voids and potentially cause the upward displacement of water and materials, creating a "doming" effect until the water in the dome reaches equilibrium with the surrounding hydrology.

Additives may be mixed with the drilling fluids/mud for viscosity or lubricating reasons. Only non-hazardous additives approved by the MPCA's 401 Water Quality Certification letter would be used, and a Material Safety Data Sheet for the drilling fluid would be maintained onsite. Construction personnel would monitor the crossing to detect releases of drilling mud and would implement containment, response, and clean-up procedures as outlined in the Applicant's Environmental Protection Plan (Appendix E) to minimize the potential for drilling mud to reach groundwater resources. If a frac-out occurred and went undetected or was not quickly contained, impacts on groundwater quality could be long-term and major. With implementation of the Applicant-proposed measures for drilling mud releases during HDD construction, impacts on groundwater quality would be temporary and minor.

Operations Impacts

Changes in Groundwater Availability

Ongoing French drain effects could occur during pipeline operations in areas of groundwater upwelling. These impacts would be prevented by proper installation of trench breakers during construction as described above and would be temporary and negligible.

Normal operation of the Applicant's preferred route would not require withdrawal or discharge of water. During the maintenance and repair activities over the duration of pipeline's operation, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control have not been developed. However, as described for pipeline construction, the Applicant would be required to obtain water appropriation permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permit conditions and implementation of Applicant-proposed measures as described for construction, impacts on groundwater from withdrawals would be temporary and negligible.

Degradation of Groundwater Quality

Small fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles. However, any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures in the Environmental Protection Plan (Appendix E). Further, the volume of such spills and leaks would be small, likely would remain on the land surface, and likely would not infiltrate into groundwater supplies. Therefore, any groundwater contamination from small leaks and spills during operation would be temporary and negligible to minor. The potential impacts on groundwater resources from a crude oil release are discussed in Chapter 10.

Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the groundwater ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Changes in Groundwater Availability from Withdrawals. Construction of RA-03AM would require approximately 11 to 17 million gallons of water for hydrostatic testing for each construction spread; construction of RA-03AM may require five construction spreads between Clearbrook and Carlton. Therefore, total water appropriation from groundwater or surface water sources would be approximately 55 to 85 million gallons. Water appropriation needs for dust control, trench dewatering, and HDD installation have not been determined. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources. Dewatering of the pipeline trench may be necessary during construction and also would require a water appropriation permit. The use of trench breakers avoid subsurface groundwater flow within the pipeline trench. If construction of RA-03AM adheres to water appropriation permit conditions and uses appropriate BMPs as described for the Applicant's preferred route, impacts on groundwater availability from water withdrawals would be temporary and minor.

Increases in Total Suspended Solid Concentrations in Groundwater. Temporary erosion controls as described for the Applicant's preferred route would need to be implemented during excavation, trenching, and backfilling to prevent sediment transport into groundwater during construction. If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-03AM, impacts from increases in TSS concentrations and increased sedimentation in groundwater would be temporary and minor.

Degradation of Shallow Groundwater Quality from Blasting, Spills, or Contamination. Shallow groundwater along RA-03AM may become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. Handling, treatment/disposal, and discharge measures as described for the Applicant's preferred route would be necessary for fuels and hazardous chemicals, concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing. In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-03AM through procedures outlined in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route.

The need for blasting along RA-03AM is not known but may be required for very limited areas of bedrock at or near the land surface along the route. If blasting is necessary, the Applicant would need to develop a site-specific Blasting Plan, which would include measures to protect groundwater resources.

Construction in contaminated sites can cause existing contaminants to be released and enter groundwater resources. If any contaminated soils or groundwater are encountered during construction, they would be handled and disposed of in accordance with applicable regulations, the Environmental Protection Plan, and a Contaminated Soils Management Plan, which the Applicant would develop prior to construction of RA-03AM. This plan would describe site assessment and response actions that would be implemented to manage contaminated soils and groundwater (Enbridge 2016a).

With use of appropriate BMPs as described for the Applicant's preferred route during construction of RA-03AM, impacts on shallow groundwater quality from blasting, small spills, or existing contamination during construction would be temporary and minor.

Degradation of Groundwater Quality in Potable Supply Wells, Sole Source Aquifers, or Designated Protection Areas. Water supply wells, aquifers, and wellhead protection areas could be affected by construction activities for RA-03AM. As noted above, five domestic wells are within the construction work area, and two are within the permanent right-of-way of the RA-03AM route. The Applicant would work with landowners to develop site-specific plans for wells that could be affected by construction, or request a variance from MDH. The Applicant also would be required to participate in Minnesota DNR's well interference resolution process if well interference occurred during pipeline construction. If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-03AM, construction impacts on drinking water wells and wellhead protection areas would be temporary and minor.

The RA-03AM route would not cross any aquifers designated by EPA as a sole source aquifer. Therefore, there would be no construction impacts on any sole source aquifer.

Degradation of Water Quality from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted to determine which waterbodies exist in areas along RA-03AM that are geologically suitable for HDD. If a route permit were to be issued for RA-03AM, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. If a frac-out occurred during construction of RA-03AM and went undetected or was not quickly contained, impacts on groundwater quality could be long-term and major. With implementation of measures described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-03AM, impacts on groundwater quality would be temporary and minor.

Operations Impacts

Changes in Groundwater Availability. Ongoing French drain effects could occur during pipeline operations in areas of groundwater upwelling. With proper installation of trench breakers and soil compaction during backfilling as described for the Applicant's preferred route, impacts on groundwater availability during pipeline operations would be temporary and negligible.

Normal operation of the RA-03AM route would not require withdrawal or discharge of water. During maintenance and repair activities over the duration of pipeline's operation, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control have not been developed. As described for pipeline construction, the Applicant would be required to obtain water appropriation permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permit conditions and implementation of Applicant-proposed measures as described for construction, impacts on groundwater from water withdrawals would be temporary and negligible.

Degradation of Groundwater Quality. Small fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles. Any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures set forth in the Environmental Protection Plan (Appendix E). Further, the volume of such spills and leaks would be small, likely would remain on the land surface, and likely would not infiltrate into groundwater supplies. Therefore, any groundwater contamination from small leaks and spills during operation would be temporary and negligible to minor. Potential impacts on groundwater resources from a crude oil release are discussed in Chapter 10.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the groundwater ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure

and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Changes in Groundwater Availability from Withdrawals. Approximately 44 to 68 million gallons of water (11 to 17 million gallons per construction spread) would be required for hydrostatic testing during construction of RA-06 between Clearbrook and Carlton. Water appropriation needs for dust control, trench dewatering, and HDD installation have not been determined. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR requiring that water withdrawals have a minimal potential for impacts on groundwater resources. Dewatering of the pipeline line trench also may be necessary during construction, and trench breakers would need to be used to avoid subsurface groundwater flow within the pipeline trench. If construction of RA-06 adheres to water appropriation permit conditions and implements appropriate BMPs as described for the Applicant's preferred route, impacts on groundwater availability from water withdrawals for RA-06 would be temporary and minor.

Increases in Total Suspended Solid Concentrations in Groundwater. Temporary erosion controls as described for the Applicant's preferred route would need to be implemented during excavation, trenching, and backfilling to prevent sediment transport into groundwater during construction. If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-06, impacts from increases in TSS concentrations and increased sedimentation in groundwater would be temporary and minor.

Degradation of Shallow Groundwater Quality from Blasting, Spills, or Contamination. Similar to the Applicant's preferred route, shallow groundwater that is present along RA-06 may become contaminated during construction from small spills or leaks. Handling, treatment/disposal, and discharge measures as described for the Applicant's preferred route would be necessary for activities associated with construction of RA-06. The Applicant would be responsible for cleaning up small spills during construction of RA-06 through procedures outlined in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route.

The need for blasting along RA-06 is not known but may be required where bedrock is present at or near the land surface. If blasting was necessary, the Applicant would need to develop a site-specific Blasting Plan, which would include measures to protect groundwater resources.

Construction in contaminated sites can cause existing contaminants to be released and enter groundwater resources. If any contaminated soils or groundwater were encountered during construction, they would be handled and disposed of in accordance with applicable regulations; the Environmental Protection Plan; and a Contaminated Soils Management Plan, which the Applicant would develop prior to construction of RA-06. The plan would describe site assessment and response actions that would be implemented to manage contaminated soils and groundwater (Enbridge 2016a).

If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-06, impacts on shallow groundwater quality from blasting, small spills, or existing contamination during construction would be temporary and minor.

Degradation of Groundwater Quality in Potable Supply Wells, Sole Source Aquifers, or Designated Protection Areas. Water supply wells, aquifers, and wellhead protection areas could be affected by construction activities of RA-06.

As noted above, three domestic wells are within the construction work area and two are within the permanent right-of-way for the RA-06 route. The Applicant would work with landowners to develop site-specific plans for wells that could be affected by construction, or request a variance from MDH. The Applicant also would be required to participate in Minnesota DNR's well interference resolution process if well interference occurred during pipeline construction.

If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-06, construction impacts on drinking water wells and wellhead protection areas would be temporary and minor.

The RA-06 route would not cross any aquifers designated by EPA as a sole source aquifer. Therefore, there would be no construction impacts on any sole source aquifer.

Degradation of Water Quality from Drilling Mud Releases during HDD Crossings. Specific locations for HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted to determine which waterbodies exist in areas along RA-06 that are geologically suitable for HDD. If a route permit is issued for RA-06, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. If a frac-out occurred during construction of RA-06 and went undetected or was not quickly contained, impacts on groundwater quality could be long-term and major. With implementation of measures described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-06, impacts on groundwater quality would be temporary and minor.

Operations Impacts

Changes in Groundwater Availability. Ongoing French drain effects could occur during pipeline operations in areas of groundwater upwelling. With proper installation of trench breakers and soil compaction during backfilling during construction as described for the Applicant's preferred route, impacts on groundwater availability during pipeline operations would be temporary and negligible.

Normal operation of the RA-06 route would not require withdrawal or discharge of water. However, during maintenance and repair activities over the duration of pipeline's operation, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control have not been developed. As described for pipeline construction, the Applicant would be required to obtain water appropriation permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permit conditions and implementation of Applicant-proposed measures as described for construction, impacts on groundwater from withdrawals would be temporary and negligible.

Degradation of Groundwater Quality. Small fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles. Any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures set forth in the Environmental Protection Plan (Appendix E). Further, the volume of such spills and leaks would be small, likely would remain on the land surface, and likely would not infiltrate into groundwater supplies. Consequently, any groundwater contamination from small leaks and spills during operation would be temporary and negligible to minor. Potential impacts on groundwater resources from a crude oil release are discussed in Chapter 10.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the groundwater ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Changes in Groundwater Availability from Withdrawals. Construction of RA-07 would require approximately 44 to 68 million gallons of water (11 to 17 million gallons per construction spread) for hydrostatic testing during construction between Clearbrook and Carlton. Water appropriation needs for dust control, trench dewatering, and HDD installation have not been determined. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources. Dewatering of the pipeline trench also may be necessary during construction and would require a water appropriation permit. Trench breakers would need to be used to avoid subsurface groundwater flow within the pipeline trench. If construction of RA-07 adheres to water appropriation permit conditions and uses appropriate BMPs as described for the Applicant's preferred route, impacts on groundwater availability from water withdrawals would be temporary and minor.

Increases in Total Suspended Solid Concentrations in Groundwater. Temporary erosion controls as described for the Applicant's preferred route would need to be implemented during excavation, trenching, and backfilling to prevent sediment transport into groundwater during construction. If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-07, impacts from increases in TSS concentrations and increased sedimentation in groundwater would be temporary and minor.

Degradation of Shallow Groundwater Quality from Blasting, Spills, or Contamination. Shallow groundwater along RA-07 may become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. Handling, treatment/disposal, and discharge measures as described for the Applicant's preferred route would be necessary for fuels and hazardous chemicals, concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing. In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-07 through procedures outlined in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route.

The need for blasting along RA-07 is not expected as it would entail removal and replacement of the pipeline in the same trench. If blasting were necessary, the Applicant would need to develop a site-specific Blasting Plan, which would include measures to protect groundwater resources.

Construction in contaminated sites can cause existing contaminants to be released and enter groundwater resources. If any contaminated soils or groundwater were encountered during construction, they would be handled and disposed of in accordance with applicable regulations; the Environmental Protection Plan; and a Contaminated Soils Management Plan, which the Applicant would develop prior to construction of RA-07. The plan would describe site assessment and response actions that would be implemented to manage contaminated soils and groundwater (Enbridge 2016a).

With use of appropriate BMPs as described for the Applicant's preferred route during construction of RA-07, impacts on shallow groundwater quality from blasting, small spills, or existing contamination during construction would be temporary and minor.

Degradation of Groundwater Quality in Potable Supply Wells, Sole Source Aquifers, or Designated Protection Areas. Water supply wells, aquifers, and wellhead protection areas could be affected by construction activities for RA-07. Two domestic wells are within the construction work area, and one is within the permanent right-of-way for the RA-07 route. The Applicant would work with landowners to develop site-specific plans for wells that could be affected by construction, or request a variance from MDH. The Applicant also would be required to participate in Minnesota DNR's well interference resolution process if well interference occurred during pipeline construction. If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-07, construction impacts on drinking water wells and wellhead protection areas would be temporary and minor.

The RA-07 route would not cross any aquifers designated by EPA as a sole source aquifer. Therefore, there would be no construction impacts on any sole source aquifer.

Degradation of Water Quality from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted to determine which waterbodies exist in areas along RA-07 that are geologically suitable for HDD. If a route permit is issued for RA-07, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. If a frac-out occurred during construction of RA-07 and went undetected or was not quickly contained, impacts on groundwater quality could be long-term and major. With implementation of measures described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-07, impacts on groundwater quality would be temporary and minor.

Operations Impacts

Changes in Groundwater Availability. Ongoing French drain effects could occur during pipeline operations in areas of groundwater upwelling. With proper installation of trench breakers and soil compaction during backfilling during construction as described for the Applicant's preferred route, impacts on groundwater availability during pipeline operations would be temporary and negligible.

Normal operation of the RA-07 route would not require withdrawal or discharge of water. During maintenance and repair activities over the duration of pipeline operation, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control have not been developed. As described for pipeline construction, the Applicant would be required to obtain water appropriation permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permit conditions and implementation of Applicant-proposed measures as described for construction, impacts on groundwater from withdrawals would be temporary and negligible.

Degradation of Groundwater Quality. Small fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles. Any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures set forth in the Environmental Protection Plan (Appendix E). Further, the volume of such spills and leaks would be small, likely would remain on the land surface, and likely would not infiltrate into groundwater supplies. Consequently, any groundwater contamination from small leaks and spills during operation would be temporary and negligible to minor. Potential impacts on groundwater resources from a crude oil release are discussed in Chapter 10.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the groundwater ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Changes in Groundwater Availability from Withdrawals. Construction of RA-08 would require approximately 44 to 68 million gallons of water (11 to 17 million gallons per construction spread) for hydrostatic testing during construction between Clearbrook and Carlton. Water appropriation needs for dust control, trench dewatering, and HDD installation have not been determined. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources. Dewatering of the pipeline trench also may be necessary during construction and would require a water appropriation permit. Trench breakers would need to be used to avoid subsurface groundwater flow within the pipeline trench. If construction of RA-08 is adheres to water appropriation permit conditions and uses appropriate BMPs as described for the Applicant's preferred route, impacts on groundwater availability from water withdrawals would be temporary and minor.

Increases in Total Suspended Solid Concentrations in Groundwater. Temporary erosion controls as described for the Applicant's preferred route would need to be implemented during excavation, trenching, and backfilling to prevent sediment transport into groundwater during construction. If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-08, impacts from increases in TSS concentrations and increased sedimentation in groundwater would be temporary and minor.

Degradation of Shallow Groundwater Quality from Blasting, Spills, or Contamination. Shallow groundwater along RA-08 may become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. Handling, treatment/disposal, and discharge measures as described for the Applicant's preferred route would be necessary for fuels and hazardous chemicals, concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing. In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-08 through procedures outlined in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route.

The need for blasting along RA-08 is not known but may be required in some areas where bedrock is at or near the land surface. If blasting is necessary, the Applicant would need to develop a site-specific Blasting Plan, which would include measures to protect groundwater resources.

Construction in contaminated sites can cause existing contaminants to be released and enter groundwater resources. If any contaminated soils or groundwater were encountered during construction, they would be handled and disposed of in accordance with applicable regulations; the Environmental Protection Plan; and a Contaminated Soils Management Plan, which the Applicant would develop prior to construction of RA-08. The plan would describe site assessment and response actions that would be implemented to manage contaminated soils and groundwater (Enbridge 2016a).

If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-08, impacts on shallow groundwater quality from blasting, small spills, or existing contamination during construction would be temporary and minor.

Degradation of Groundwater Quality in Potable Supply Wells, Sole Source Aquifers, or Designated Protection Areas. Water supply wells, aquifers, and wellhead protection areas could be affected by construction activities for RA-08. One domestic well is within the construction work area, and one is within the permanent right-of-way for the RA-08 route. The Applicant would work with landowners to develop site-specific plans for wells that could be affected by construction, or request a variance from MDH. The Applicant also would be required to participate in Minnesota DNR's well interference resolution process if well interference occurred during pipeline construction.

If appropriate BMPs as described for the Applicant's preferred route are used during construction of RA-08, construction impacts on drinking water wells and wellhead protection areas would be temporary and minor.

The RA-08 route would not cross any aquifers designated by EPA as a sole source aquifer. Therefore, there would be no construction impacts on any sole source aquifer.

Degradation of Water Quality from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted to determine which waterbodies exist in areas along RA-08 that are geologically suitable for HDD. If a route permit is issued for RA-08, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. If a frac-out occurred during construction of RA-08 and went undetected or was not quickly contained, impacts on groundwater quality could be long-term and major. With implementation of measures described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-08, impacts on groundwater quality would be temporary and minor.

Operations Impacts

Changes in Groundwater Availability. Ongoing French drain effects could occur during pipeline operations in areas of groundwater upwelling. With proper installation of trench breakers and soil compaction during backfilling during construction, as described for the Applicant's preferred route, impacts on groundwater availability during pipeline operations would be temporary and negligible.

Normal operation of the RA-08 route would not require withdrawal or discharge of water. During maintenance and repair activities over the duration of pipeline operation, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control have not been developed. As described for pipeline construction, the Applicant would be required to obtain water appropriation permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permit conditions and implementation of Applicant-proposed measures as described for construction, impacts on groundwater from withdrawals would be temporary and negligible.

Degradation of Groundwater Quality. Small fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles. Any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures set forth in the Environmental Protection Plan (Appendix E). Further, the volume of such spills and leaks would be small, likely would remain on the land surface, and likely would not infiltrate into groundwater supplies. Consequently, any groundwater contamination from small leaks and spills during operation would be temporary and negligible to minor. Potential impacts on groundwater resources from a crude oil release are discussed in Chapter 10.

6.3.1.1.4 Summary and Mitigation

Summary

For all of the issues related to groundwater, the Applicant's preferred route would result in minor and temporary impacts during construction and negligible impacts during operations. The same finding was made for all of the route alternatives. Table 6.3.1.1-13 provides a summary and comparison of potential construction and operation impacts for the Applicant's preferred route and the route alternatives between Clearbrook and Carlton. Beyond the finding that impacts would be minor or negligible, the exposure of groundwater resources along each of the routes varied to some degree.

RA-03AM is the longest route and would cross the greatest acreage of high vulnerability water table aquifers, high pollution sensitivity areas, very high to high sensitivity Precambrian shallow fractured bedrock aquifers and DWSMAs; the most WIMN sites; and the most domestic wells. RA-06 would cross the least acreage of high vulnerability water table aquifers, high contamination susceptibility, high pollution sensitivity, and DWSMAs, in addition to the least number of domestic and public wells. The Applicant's preferred route would cross the greatest acreage of high contamination susceptibility but the least number of EPA-listed contaminated sites and WIMN sites, and the fewest acres of wellhead protection areas. RA-07 and RA-08 are similar, but RA-08 would cross the greatest acreage of wellhead protection areas, and RA-07 would cross the greatest number of EPA-listed contaminated sites and public wells. **Construction of RA-06 would appear to have the least impact on groundwater sources, followed by the Applicant's preferred route, RA-07 and RA-08, and lastly, RA-03AM**.

With strict adherence to permit conditions and implementation of the Applicant-proposed measures, impacts on groundwater from construction of any of the route options would be temporary and minor during construction. Impacts between routes differ based on the acres of various groundwater sensitivity areas, DWSMAs, domestic and public wells, and contaminated sites crossed. During standard operations, negligible to minor and temporary impacts would be associated with ongoing French drain effects of the pipeline and small spills and leaks from pipeline inspection and maintenance.

Mitigation

Beyond the Applicant-proposed measures described above for the Applicant's preferred route, potential mitigation measures to minimize impacts on surface waters could include:

- If the owner of a potable supply well believed that the quality or yield of their water was negatively affected as a result of a pipeline construction-related activity, the Applicant could engage a third party to determine the nature and severity of the impact. If it was determined that impacts were related to construction, the Applicant could provide an alternate source of water to the well owner until the well water returned to preconstruction conditions. If the well water did not return to preconstruction conditions within a reasonable time period, the Applicant could compensate the landowner for installation of a new well or otherwise arrange for provision of a suitable water supply.
- To prevent the loss of drilling fluid from the borehole during HDD installation, the properties of drilling fluid may be augmented to aid in stabilizing the soils and in maintaining drilling fluid returns to the entry and exit pits. If circulation is lost, lost circulation materials can be used to seal around the borehole and prevent drilling fluid from escaping into the formation, and allow for reestablishment of drilling fluid returns to the entry and exit pits. Many types of lost circulation materials that are inert and environmentally benign are available for use during HDD installation. These can include wood fibers, cotton seed husks, ground walnut shells, and other natural materials. Special polymers that swell to several times their original size when introduced to water also can be used. These polymers are industrial-grade equivalents of food-grade polymers that are used to swell and absorb fluids in the food industry.

Table 6.3.1.1-13. Summary of Potential Impacts on Groundwater for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Changes in groundwater availability	Temporary/minor impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing (44–68 million gallons)	Temporary/minor impacts • 5 spreads requiring water appropriation and discharge for hydrostatic testing (55–85 million gallons)	Temporary/minor impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing (44–68 million gallons)	Temporary/minor impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing (44–68 million gallons)	Temporary/minor impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing (44–68 million gallons)
Increases in TSS concentrations during trenching and excavation activities in shallow aquifers	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts

Table 6.3.1.1-13. Summary of Potential Impacts on Groundwater for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Degradation of shallow groundwater quality	Temporary/minor impacts • Blasting 0.3 mile • 9 EPA-listed contaminated sites • 67 WIMN sites • 18,215 acres of high vulnerability aquifers • 26,382 acres of high contamination susceptibility • 15,475 acres of high pollution sensitivity • 1,700 acres of high and very high bedrock sensitivity • No known karst topography	Temporary/minor impacts • Need for blasting unknown • 70 EPA-listed contaminated sites • 182 WIMN sites • 25,928 acres of high vulnerability aquifers • 25,152 acres of high contamination susceptibility • 25,588 acres of high pollution sensitivity • 2,917 acres of karst topography • 2,547 acres of high and very high bedrock sensitivity	Temporary/minor impacts • Need for blasting unknown • 13 EPA-listed contaminated sites • 72 WIMN sites • 5,806 acres of high vulnerability aquifers • 305 acres of high contamination susceptibility • 3,134 acres of high pollution sensitivity • No known karst topography • 512 acres of high and very high bedrock sensitivity	Temporary/minor impacts • Need for blasting unknown, but not expected • 92 EPA-listed contaminated sites • 120 WIMN sites • 21,141 acres of high vulnerability aquifers • 19,833 acres of high contamination susceptibility • 15,355 acres of high pollution sensitivity • No known karst topography • 512 acres of high and very high bedrock sensitivity	Temporary/minor impacts • Need for blasting unknown • 50 EPA-listed contaminated sites • 101 WIMN sites • 16,889 acres of high vulnerability aquifers • 20,012 acres of high contamination susceptibility • 11,699 acres of high pollution sensitivity • No known karst topography • 446 acres of high and very high bedrock sensitivity
Degradation of groundwater quality in potable supply wells, sole source aquifers, or other designated groundwater protection areas	Temporary/minor impacts • No sole source aquifers • 164 domestic wells • 1 public well • 0.6 acre of wellhead protection areas • 172 acres of DWSMAs	Temporary/minor impacts • No sole source aquifers • 396 domestic wells • 10 public wells • 329 acres of wellhead protection areas • 849 acres of DWSMAs	Temporary/minor impacts • No sole source aquifers • 40 domestic wells • 0 public wells • 56 acres of wellhead protection areas • 131 acres of DWSMAs	Temporary/minor impacts • No sole source aquifers • 183 domestic wells • 23 public wells • 536 acres of wellhead protection areas • 754 acres of DWSMAs	Temporary/minor impacts • No sole source aquifers • 162 domestic wells • 7 public wells • 672 acres of wellhead protection areas • 810 acres of DWSMAs

Table 6.3.1.1-13. Summary of Potential Impacts on Groundwater for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Degradation of water quality from drilling mud releases during HDD crossings	Temporary/minor impacts (*if quickly contained*) to long-term/major (*if undetected or uncontained*) • 12 HDD crossings	Temporary/minor impacts (*if quickly contained*) to long-term/major (*if undetected or uncontained*) • Number of HDD crossings not determined for route alternatives			
Operations Impacts					
Changes in groundwater availability	Temporary/negligible impact	Temporary/negligible impact	Temporary/negligible impact	Temporary/negligible impact	Temporary/negligible impact
Changes in groundwater quality	Temporary/negligible to minor impacts • Minor leaks and spills	Temporary/negligible to minor impacts • Minor leaks and spills	Temporary/negligible to minor impacts • Minor leaks and spills	Temporary/negligible to minor impacts • Minor leaks and spills	Temporary/negligible to minor impacts • Minor leaks and spills

Table 6.3.1.1-13. Summary of Potential Impacts on Groundwater for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

DWSMA = drinking water supply management area, EPA = U.S. Environmental Protection Agency, HDD = horizontal directional drill, WIMN = "What's in My Neighborhood"

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to groundwater. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, public water supply well counts do not consider the influence that overlying geology may have on the susceptibility of public water supply wells to impacts. However, data from the aquifer vulnerability dataset can aid the reader in understanding the influence that overlying geology may have on the susceptibility of groundwater along the route to impacts. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3), as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-186 to 6-199. This table, for example, provides the acreage of DWSMAs and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to DWSMAs is contained in the impacts discussion in the text (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-186 to 6-190. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-190 to 6-192. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-192 to 6-195. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[f] **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-195 to 6-197. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-197 to 6-199. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

6.3.1.1.5 References

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6.3.1.2 Surface Water

Surface water in the vicinity of the Applicant's preferred route and route alternatives consists of streams, rivers, lakes, wild rice waterbodies, and wetlands. Streams, rivers, lakes, and wild rice waterbodies are discussed in this section; wetlands are discussed in Section 6.3.1.3. This section identifies the surface waters that would be crossed, including their state and federal classifications or beneficial use designations. This section also assesses the potential for construction and operation of the Applicant's preferred route and route alternatives to affect those resources. The analysis of potential impacts on surface water resources during construction and operation of the Applicant's preferred route and route alternatives considered the following:

- Runoff and flows – increases in stormwater runoff and erosion, increases in TSSs concentrations and increased sedimentation, changes in stream flows from water withdrawals and discharges, and disruption of flow paths or local hydrologic connectivity;
- Surface water and aquatic habitat quality – degradation of surface water quality, degradation of aquatic habitat from instream and other construction activities, degradation of water quality and habitat from releases of drilling mud during HDD crossings;
- Channel morphology and stability – changes in channel morphology and stability caused by channel and streambank modifications; and
- Disturbance of wild rice waterbodies.

This section first describes the regulations relevant to assessing surface water impacts, the methods used to conduct the impact assessment, and the existing surface water conditions within the defined ROIs of the Applicant's preferred route and route alternatives. The potential impacts of construction and operation of the Applicant's preferred route and route alternatives on surface waters are considered next. A summary and comparison of the impacts for the route options between Clearbrook and Carlton are included at the end of the section, along with potential mitigation measures that could be used to minimize impacts.

Section 6.3.4 addresses surface water quality impacts that affect fish and wildlife and their habitats, including fisheries, Aquatic Management Areas (AMAs), surface waters assigned an Index of Biotic Integrity, Lakes of Biological Significance, designated wildlife lakes, trout streams, and invasive species. This section and Section 6.3.4 should be considered together to provide an overall picture of the potential impacts of the Project on surface water.

Potential impacts on surface water from unanticipated crude oil releases are discussed in Chapter 10.

6.3.1.2.1 Regulatory Context and Methodology

Regulatory Context

Federal, state, and local agencies have oversight and permitting requirements for activities that may affect surface water use, flow, current, or quality. These permits include required actions and BMPs that would reduce potential impacts on surface water resources. Within Minnesota, Minnesota PCA implements federal water quality regulations via authority from EPA and manages the list of impaired surface waters based on the Clean Water Act (CWA) Section 303(d) list. Minnesota PCA also implements a permitting program to manage stormwater discharges in compliance with the NPDES and State Disposal System (SDS), administering joint NPDES/SDS permits. Minnesota DNR regulates public waters and oversees permitting for public waterbody crossings and water appropriation. Local agencies also implement water quality requirements. In addition, regional watershed districts, of which there are 46 in the state, manage water drainage and flow and issue permits for activities that may affect waters within the watershed. Watershed districts are discussed further in Section 6.2.1. State and federal rules as they pertain to the Project are described below.

Separate tribal water quality regulations and standards may be relevant for various routes that pass through tribal lands. These unique situations likely would be addressed during easement agreements, when and if a final route is determined. As shown in Chapter 9, American Indian tribes within Minnesota have jurisdiction for the management of natural resources within reservations and in some cases on ceded lands. For instance, the Leech Lake Band of Ojibwe (LLBO) have passed interim water quality standards. The intent of these standards is to protect the health and welfare of persons residing and doing business on the reservation (LLBO 2001). The DOC has consulted with American Indian tribes regarding natural resources, including surface waters. A listing of these tribes is provided in Chapter 9.

Minnesota Beneficial Use Designations

Surface waters in Minnesota are classified according to beneficial use designations, which identify how humans and terrestrial and aquatic wildlife use the waterbody. As required by the CWA, water quality standards must be set to protect the beneficial use(s) of a waterbody, and permits must be obtained for activities that may affect water quality. The seven beneficial use designations of Minnesota surface waters (defined in Minn. R. 7050.0140) are as follows:

- Class 1 – domestic consumption (i.e., drinking water);
- Class 2 – aquatic life and recreation;
- Class 3 – industrial or commercial use;
- Class 4 – agricultural use, irrigation (4A), and livestock and wildlife watering (4B);
- Class 5 – aesthetics and navigation;
- Class 6 – other uses and protection of border waters; and
- Class 7 – limited resource value waters.

Limited resource value waters are not fully protected for aquatic life because water quantities are intermittent or very low, existing aquatic life is severely limited, the waters have been irreversibly and significantly altered by human activity, and there are limited recreational opportunities. All surface waters are protected for Class 2 beneficial use unless the waterbody has been individually assessed and reclassified as a Class 7 limited resource value water. Minnesota Administrative Rules Part 7050.0470 lists the classifications of major surface waters in the state. If a waterbody is not listed there and is not a wetland, it is classified as a Class 2B, 3C, 4A, 4B, 5, and 6 water per Minnesota Administrative Rules Part 7050.0430. Thus, in practice, all surface waters of the state are protected for their associated beneficial use or all of the above uses other than drinking water (Minnesota PCA 2006). Minnesota Administrative Rules Part 7050.0222 further defines the water quality standards for the following subclasses of Class 2 waters:

- Class 2A – Coldwater fisheries, trout waters, suitable for all aquatic recreation and protected as a source of drinking water;

- Class 2Bd – Coldwater and warmwater fisheries, suitable for all aquatic recreation and protected as a source of drinking water;
- Class 2B – Coldwater and warmwater fisheries, suitable for all aquatic recreation but not protected for drinking water;
- Class 2C – Indigenous fish and associated aquatic community, suitable for boating but not protected for drinking water; and
- Class 2D – Wetlands – aquatic and terrestrial species, suitable for boating but not protected for drinking water.

State-Designated/Sensitive Surface Waters

Various Minnesota streams and lakes are designated as Class 2A trout streams, for which stringent water quality standards and fishing restrictions are implemented to maintain and propagate healthy communities of trout (Minn. R. 7050.0222 and 6264.0050). Minnesota PCA requires construction sites that discharge near trout streams to implement additional BMPs and enhanced runoff controls as part of the NPDES permit. In addition, all Minnesota surface waters in the Lake Superior Basin, other than Class 7 waters and designated Outstanding Resource Value Waters (ORVWs), are designated as Outstanding International Resource Waters (Minn. R. 7052.0300).

Nationwide Rivers Inventory

Rivers listed in the National Park Service's (NPS's) Nationwide Rivers Inventory (NRI) are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance (NPS 2011). Some NRI-listed rivers also are federally designated as Wild and Scenic Rivers, which are rivers or river segments with outstanding natural, cultural, and recreational values that are to be voluntarily protected in a free-flowing condition for the characteristics for which they were first designated. Minnesota also has state-designated Wild and Scenic River segments.

Impaired Surface Waters

Section 303(d) of the CWA requires that states review, establish, and revise water quality standards for all surface waters within the state. Each state, territory, and authorized tribe must biennially submit to EPA a list of surface waters that do not meet EPA-approved water quality standards. These waters are considered impaired and do not meet their designated beneficial use for reasons such as elevated contaminant levels, low dissolved oxygen, high temperature, or bacterial contamination. The law also requires that states establish priority rankings for waters on the list and develop total maximum daily loads (TMDLs) for these waters. Approximately 40 percent of Minnesota's surface waters are impaired for conventional pollutants. Projects that discharge near a waterbody that is impaired for phosphorous, turbidity, dissolved oxygen, and biotic impairment must meet special conditions required under the NPDES permit. In Minnesota, Minnesota PCA implements federal water quality regulations and identifies and manages the list of impaired surface waters.

When a waterbody is added to the Minnesota Impaired Waters List, a TMDL must be developed for it. A TMDL is the maximum amount of a pollutant a body of water can receive without violating water quality standards and an allocation of that amount to the pollutant sources. The TMDL development process identifies all sources of a pollutant and determines how much each source must reduce its contribution in order to meet the standard. Minnesota PCA organizes impaired surface waters into TMDL projects, which are then approved by EPA.

Minnesota uses a watershed approach, encompassing water quality assessment, watershed analysis, civic engagement, planning, implementation, and measurement of results, to address restoration and protection of the state's 80 major watersheds. On a 10-year cycle, a Watershed Restoration and Protection Strategy (WRAPS) report is completed for each watershed as a result of that work (Minnesota PCA 2016a). The water quality management cycles for the 80 major watersheds are staggered, with 8 to 10 watersheds beginning a new cycle each year. The WRAPS report includes a watershed TMDL study, TMDL implementation strategies for impaired waters, and protection study and implementation strategies for waters needing additional protection to prevent future water quality impairments (Minnesota PCA 2014b).

Navigable Waterways

The U.S. Army Corps of Engineers (USACE) has jurisdiction over navigable waterways in accordance with Section 10 of the Rivers and Harbors Act of 1899. Navigable waters of the United States are those that are subject to the ebb and flow of the tide or are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Work in or affecting these waterways must be approved by USACE under the Section 10 of the Rivers and Harbors Act and under Section 404 of the CWA, if the activity involves discharging dredged or fill material into waters of the US. A CWA Section 401 Individual Water Quality Certification for the proposed Project in Minnesota is required. The Minnesota PCA is responsible for CWA Section 401 certification in Minnesota.

Public Waters

Public waters have been defined in Minnesota Law since 1897. The waters included in the definition have evolved and been refined over the years. Significant clarification was given to which waters were included as public waters in the Public Waters Inventory process conducted in the late 1970s through the early 1980s. Public waters are protected from destruction and degradation because of their value to the people of Minnesota for water supplies; groundwater recharge potential; retention of water to prevent and minimize downstream flooding and property damage; entrapment of nutrients and sediment; recreational activities such as boating, swimming, fishing and hunting, and navigation; and wildlife habitat areas for spawning, rearing, feeding, and nesting of wildlife.

Wild Rice Waterbodies

Various tribal, federal, state, and local laws and regulations are designed to manage and protect wild rice. These are associated with formal recognition of the significance of natural wild rice and its protection, management, and harvest. In Minnesota, wild rice and other aquatic vegetation growing in public waters is owned by the State, and a person may not acquire a property interest in or destroy wild rice except as allowed by law. Outside of tribal jurisdictions, Minnesota statutes and agency rules regulate the harvest of natural wild rice, including methods and timing of harvest. The Minnesota DNR Aquatic Plant Management Program prohibits removal of wild rice without an approved permit. Wild rice also is protected through shoreland protection laws and regulations, which are based on a system of classification for lakes and rivers that applies different zoning regulations depending on their classification.

Minnesota PCA is proposing amendments to Minnesota Administrative Rules Chapters 7001, 7050, 7052, and 7053. These amendments would refine how a wild rice waterbody is defined as well as acceptable sulfate levels. Since 1975, wild rice waterbodies have been defined as an area with a wild rice stem density of eight stems per square mile over 0.25 acre or four stems per square mile over 0.5 acre. Minnesota PCA proposes to change this to define a wild rice waterbody as an area that contains a selfperpetuating wild rice population with at least 8,000 stems over a lake or wetland surface or 800 stems over a river-mile reach. Minnesota PCA also is proposing refinement of the acceptable sulfate levels for identified wild rice waterbodies. A 2015 technical document showed that factors such as organic matter and iron concentration affect how much sulfate is converted to sulfide, which is toxic to wild rice (Minnesota PCA 2014c). Based on this, Minnesota PCA is proposing to determine acceptable sulfate levels on a site-by-site basis by the organic carbon and iron concentrations found at each wild rice waterbody (Minnesota PCA 2016a). These amendments have not been enacted and therefore were not used in the analyses in this EIS.

Tribal regulations related to the harvest and protection of wild rice within reservation boundaries vary from tribe to tribe and are managed by tribe-specific wild rice committees. In addition to tribal regulations, treaties and other agreements with the U.S. government have reserved off-reservation harvesting rights for certain tribes.

Methodology

Potential impacts on surface water and effects on sensitive surface waters from construction and operation of the Applicant's preferred route and route alternatives were assessed. Impacts on surface waters from pipeline construction would be largely due to waterbody crossing procedures, and potential impacts from normal pipeline operation typically are localized. Therefore, the ROI for the assessment of construction impacts on surface waters includes the construction work area for each surface water crossed by the Applicant's preferred route in Minnesota (typically 120 feet wide) as well as the area immediately downstream from the crossing for flowing surface waters, and in the immediate vicinity for crossings of non-flowing surface waters such as lakes and wild rice waterbodies. Similarly, the ROI for the assessment of construction impacts on surface waters for the route alternatives is based on a 120-foot-wide construction work area for RA-03AM, RA-06, and RA-08; a 205-foot-wide construction work area for RA-07; and the areas immediately downstream of flowing surface waters and in the immediate vicinity of non-flowing surface waters. The assessment of operations impacts is based on the location of the 50-foot-wide permanent pipeline right-of-way for all the route options, as well as areas immediately downstream of flowing surface waters and in the immediate vicinity of non-flowing surface waters.

Watersheds and surface waters within the ROIs for the Applicant's preferred route and route alternatives were identified using GIS datasets and layers in the following data sources:

- USGS National Hydrography Dataset;
- USACE Section 10 navigable waterways;
- NPS's NRI national datasets;
- Minnesota DNR's Public Waters Inventory;
- Minnesota-designated trout streams;
- Minnesota DNR-identified wild rice waterbodies; and
- Section 303(d)-listed impaired surface waters, TMDL, and WRAPS project boundaries.

The acreages of areas that could be affected by construction of the Applicant's preferred route were estimated by using maps depicting surface waters with an overlay of the construction work area and footprints of aboveground facilities provided by the Applicant. Except for RA-07, the acreages of areas that could be affected by construction of the route alternatives were estimated using maps depicting surface waters with an overlay of a 120-foot-wide construction work area centered on the pipeline route; for RA-07, a 205-foot-wide construction work area was used.

Acreages of wild rice waterbodies that could be affected were estimated using maps of the Minnesota DNR-identified wild rice waterbodies and rivers database (Minnesota DNR 2009), classified according to U.S. Fish and Wildlife Service (USFWS) Circular No. 39 (EPA 2002). These maps were overlaid with the construction work area and permanent right-of-way for the Applicant's preferred route; a 120-foot-wide construction work area for RA-03, RA-06, and RA-8; and a 205-foot-wide construction work area for RA-07. Because some construction activities and indirect effects may occur within areas beyond the construction work areas, wild rice resources also were identified within 0.5 mile of the pipeline routes. Wild rice lakes not identified within the DNR database may occur along alternative routes.

Potential impacts on surface waters were evaluated by:

- Identifying the existing conditions of surface waters that would be crossed, such as water quality and impairment, fishery resources (i.e., trout streams), beneficial use designations, state and federal classifications, and overall watershed health.
- Comparing the Applicant's proposed construction methods described in Chapter 2 and the special wetland construction methods described in the Applicant's November 2016 EAW and associated construction BMP plans (Enbridge 2016a) to peer-reviewed literature and agency documents, including permit requirements and guidance manuals, related to the proposed pipeline construction methods.
- Considering the potential for construction and operation of the Applicant's preferred route and route alternatives to affect the identified surface waters. The specific environmental concerns addressed in the impact analysis are listed in the introduction to Section 6.3.1.2.3.

No single one of the datasets listed above provides a complete indication of all relevant impacts to surface water. Together, though, these datasets provide a reasonably comprehensive indication of the potential impacts. For example, water crossing counts do not consider water quality indicators that are relevant in understanding the nature of the potential impacts of construction and operation. However, data on high quality surface waters and waterbody/waterway use designations can aid the reader in understanding the influence that water quality may have on the the nature of the potential impacts.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. The summary table at the end of the surface water section, for example, provides counts of wild rice waterbodies and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to these waterbodies is contained in the text of this section.

6.3.1.2.2 Existing Conditions

Overview of Drainage Basins and Watersheds

A "drainage basin" is an area of land where all surface water from rain and snowmelt converges to a single point at a lower elevation, such as a river, lake, reservoir, or wetland. Drainage basins are made up of smaller watershed units. There are 10 major drainage basins and 80 major watersheds in

Minnesota (Minnesota PCA n.d.). The Red River, Lake Superior, St. Croix River, and Upper Mississippi River basins are described in Section 5.2.1.2.2.

In addition to those basins crossed by the Applicant's preferred route, the Rainy River Basin would be crossed by one route alternative (RA-06). The Rainy River Basin encompasses a total area of 27,114 square miles, of which 11,244 square miles (41 percent) are in Minnesota, and 15,870 square miles (59 percent) are in Ontario, Canada. The basin is home to important forest and water resources: Voyageurs National Park and the Boundary Waters Canoe Area Wilderness, several of the state's most famous walleye fisheries, and many exceptional trout streams. The majority of the land within the basin is forested (Minnesota PCA 2001).

Overview of Wild Rice Waterbodies

Wild rice waterbodies are bodies of water where rice, a persistent annual grass, reproduces each year from seed stock deposited in previous fall seasons. Wild rice beds are very attractive to migrating waterfowl, and many rice areas are traditional waterfowl staging and hunting areas. Because they are an important component of Minnesota's agricultural economy, they are protected in Minnesota. Wild rice can be susceptible to disturbance in all habitats (lake, river, or wetland) and is sensitive to temperature changes, contaminants, and hydrology changes—all of which on their own or in combination could affect germination and production.

Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the surface water ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Drainage Basins and Watersheds

The Applicant's preferred route would cross the Red River, Upper Mississippi River, Lake Superior, and St. Croix River basins, which are described in Section 5.2.1.2.2. Table 6.3.1.2-1 presents the average watershed health scores, water quality scores, and affected watershed acres for the major drainage basins and watersheds that would be crossed by the Applicant's preferred route. Watershed biological indices scores are discussed in Section 6.3.4.

Surface Waters Crossed

Table 6.3.1.2-2 lists the surface waters that would be crossed by the Applicant's preferred route in Minnesota. The Applicant's preferred route would require 192 crossings of surface waters (109 crossings between Clearbrook and Carlton), including perennial and intermittent streams, rivers, ponds, and lakes; unnamed surface waters and non-jurisdictional ditches; rivers listed in the NRI; navigable waters; sensitive and specially designated surface waters; and impaired surface waters. See Appendix G for a listing of all proposed waterbody crossings.

The Applicant's preferred route crosses a total of 56 public waters in Minnesota. These include 4 public water ditches, 14 artificial paths, 25 perennial streams/rivers and 13 intermittent streams/rivers. Between Clearbrook and Carlton, the Applicant's preferred route crosses a total of 36 public waters. These include 3 public water ditches, 10 artificial paths, 18 perennial streams/rivers, and 5 intermittent streams/rivers.

Table 6.3.1.2-1. Major Drainage Basins and Watersheds Crossed by the Applicant's Preferred Route in Minnesota

Drainage Basin	Watershed	HUC-8	Average Watershed Health Score[a]	Water Quality Score[b]	Construction[c] (acres)	Operations[d] (acres)
Red River of the North	Tamarac River	09020311	44	63	463.9	197.8
	Snake River	09020309	46	66	242.2	105.7
	Grand Marais Creek	09020306	42	58	39.0	17.1
	Red Lake River	09020303	54	63	301.2	132.8
	Clearwater River	09020305	60	70	719.4	323.9
	Wild Rice River	09020108	57	77	72.0	38.1
Upper Mississippi River (Mississippi Headwaters)	Mississippi River – Headwaters	07010101	68	89	251.2	112.7
	Crow Wing River	07010106	61	79	664.1	299.8
	Pine River	07010105	67	95	551.9	244.2
	Leech Lake River	07010102	69	89	7.6	3.2
	Mississippi River – Grand Rapids	07010103	65	83	621.0	298.5
	Mississippi River – Brainerd	07010104	63	76	77.9	38.1
Lake Superior	Nemadji River	04010301	64	80	161.3	72.0
	St. Louis River	04010201	59	56	64.8	28.0
St. Croix River	Kettle River	07030003	64	76	318.0	149.8

Source: Minnesota DNR 2015a.

[a] Average score is based on numerous indices comprising five main components: biology, connectivity, geomorphology, hydrology, and water quality. Index scores of 0 to 20 represent components that are heavily affected/low quality, scores of 40 to 60 represent moderately affected/moderate quality, and scores of 80 to 100 represent the least affected/high quality (scores of 20–40 and 60–80 are intermediate values). The overall watershed health scores and five component scores are calculated on a scale from 0 to 100, with 100 representing a highest score.

[b] Water quality score based on indices such as temperature, dissolved oxygen, pH, nutrient load, turbidity/sedimentation, and contaminant concentrations.

[c] Watershed acres that would be crossed by the construction work area.

[d] Watershed acres that would be crossed by the permanent right-of-way during operations.

HUC-8 = 8-digit hydrologic unit code that delineates watershed boundaries, defined by the U.S. Geological Survey (2016).

Table 6.3.1.2-2. Surface Waters Crossed by the Applicant's Preferred Route in Minnesota

Waterbody Type/Flow	Number of Crossings (PWI)
North Dakota Border to Clearbrook	
Artificial path	4
Canal/ditch	34
Connector	1
Lake/pond – perennial	2
Stream/river – intermittent	27
Stream/river – perennial	9
North Dakota border to Clearbrook subtotal	***77***
Clearbrook to Carlton	
Artificial path	11 (10)
Canal/ditch	15 (4)
Connector	3 (0)
Lake/pond – perennial	15 (0)
Stream/river – intermittent	40 (5)
Stream/river – perennial	25 (18)
Clearbrook to Carlton subtotal	***109 (36)***
Carlton to Wisconsin Border	
Lake/pond – perennial	1
Stream/river – intermittent	5
Carlton to Wisconsin border subtotal	***6***
TOTAL	**192**

Source: USGS 2017.

Notes:

An artificial path is a feature that represents flow through a two-dimensional feature, such as a lake or a double-banked stream. An artificial path represents the flow of water into, through, and out of features (channel, estuary, lake/pond, playa, reservoir, swamp, marsh). A canal ditch specifies that it is artificial and that it is used to transport water, to drain or irrigate land, to connect two or more water bodies, or to serve as a waterway for watercraft. A connector establishes a known, but non-specific connection between two non-adjacent network segments that have flow.

Perennial waterbodies are those that hold water at all times, except in cases of extreme drought. Intermittent waterbodies are those that are wet only during part of the year, usually in spring, when rain and snowmelt saturate the ground surface.

Also see maps in Appendix A.

PWI = Public Waters Inventory.

Sensitive/Specially Designated Surface Waters

The Applicant's preferred route would require nine crossings of Lake Superior Basin waters, which are designated as Outstanding International Resource Waters. Minnesota has designated the entire St. Croix River and its Kettle River tributary as ORVWs. The Applicant's preferred route would cross the Kettle River. Minnesota DNR has identified water resources crossed by the Applicant's preferred route that are sensitive due to their flow, steep slopes, beneficial use, or past construction activities on co-located projects or other factors. The Applicant and Minnesota DNR have communicated regarding these crossings, and the Applicant would prepare site-specific plans for the crossing of Mud Lake, LaSalle Creek, Hay Creek, and Straight River and two crossings of the Sandy River (and possibly others as determined by DNR) as part of its application for a License to Cross Public Waters.

The Applicant's preferred route would require six crossings of designated trout streams (Table 6.3.1.2-3). All trout stream crossings would occur in the Clearbrook-to-Carlton segment of the proposed route (maps with these trout streams are provided in Appendix A).

Table 6.3.1.2-3. Trout Streams Crossed by the Applicant's Preferred Route in Minnesota

Trout Stream	Crossing Milepost
Clearbrook to Carlton	
Blackhoof River (S-001-003)	352.1
King Creek (M-050-046-029-023)	344.2
LaSalle Creek (M-163)	170.1
Spring Brook (M-106-004-002-001)	265.3
Straight River (M-096-035-002-002)	198.3
Unnamed stream/river (perennial) (S-001-003-029)	352.3
TOTAL CROSSINGS	**6**

Source: Minnesota DNR 2015b.

Nationwide Rivers Inventory

The Applicant's preferred route would require seven crossings of NRI-listed rivers (Table 6.3.1.2-4). All of the rivers crossed have an Outstanding Resource Value (ORV) of scenery, recreation, or both. A recreational ORV signifies that recreational opportunities are, or have the potential to be, popular enough to attract visitors—or are unique or rare within the region; and visitors are willing to travel long distances to use the river resources for recreational purposes. A scenery ORV signifies that the landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features or attractions. The route would not cross a federally or state-designated Wild and Scenic River segment, though it may cross tributaries or upstream locations on other sensitive/specially designated waters.

Table 6.3.1.2-4. Rivers Listed in the Nationwide Rivers Inventory Crossed by the Applicant's Preferred Route in Minnesota

River	Outstanding Resource Value	Crossing Milepost
North Dakota Border to Clearbrook		
Middle River	Scenery	62.3
Red Lake River	Scenery; recreation	91.9
Clearbrook to Carlton		
Clearwater River	Scenery	149.5
Shell River (two crossings)	Scenery	209.5 and 215.3
Crow Wing River	Scenery; recreation	217.4
Willow River	Scenery	292.8

Source: NPS 2011.

Notes:

No rivers listed in the Nationwide Rivers Inventory would be crossed by the Applicant's preferred route in the Carlton-to-Wisconsin border segment.

Also see maps in Appendix A.

Recreation: Recreational opportunities are, or have the potential to be, popular enough to attract visitors or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes.

Scenery: The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions.

Impaired Surface Waters

The Applicant's preferred route would require 13 crossings of impaired streams in Minnesota (Table 6.3.1.2-5) but would not cross any impaired lakes or wetlands. The Applicant's preferred route would cross three TMDL study areas, including:

- Big Sandy and Minnewawa Lakes TMDL study area (excess nutrients: phosphorus),
- Lake St. Croix Nutrient TMDL study area (excess nutrients: phosphorus), and
- Lower Wild Rice River TMDL study area (excess turbidity) (Minnesota PCA n.d.).

Table 6.3.1.2-5. Impaired Surface Waters Crossed by the Applicant's Preferred Route in Minnesota

Waterbody Name	Impaired Beneficial Use	Impairment	EPA Impairment Classification[a]	Crossing Milepost
North Dakota Border to Clearbrook				
Red River of the North	Fish consumption	Methylmercury	5	27.6
Tamarac River	Aquatic life	Aquatic macroinvertebrate bioassessments; fishes bioassessments	5	54.4
Middle River	Aquatic life	Dissolved oxygen; turbidity; aquatic macroinvertebrate bioassessments	5	62.3
Black River	Aquatic life	Dissolved oxygen	5	82.6
Clearwater River	Aquatic consumption; aquatic life	Mercury in fish tissue; dissolved oxygen; turbidity	4A	103.0
Silver Creek	Aquatic recreation	Fecal coliform	5	135.9 / 135.3 / 135.6
Clearbrook to Carlton				
Clearwater River	Aquatic consumption; aquatic life	Mercury in fish tissue; dissolved oxygen	4A	149.5
Walker Brook	Aquatic life	Dissolved oxygen	5	151.4
Mississippi River	Aquatic life	Dissolved oxygen	5	165.1
Mississippi River	Aquatic consumption	Mercury in fish tissue	4A	296.7
Kettle River	Aquatic consumption	Mercury in fish tissue	5	338.2

Sources: Minnesota PCA 2014a, 2016b, 2016c.

[a] U.S. Environmental Protection Agency (EPA) Impairment Classifications-

Category 4A: Waterbody is impaired or threatened, but a total maximum daily load (TMDL) study has been approved by EPA.

Category 5: Use assessment indicates an impaired status, and no TMDL plan has been completed.

Notes:

Also see maps in Appendix A.

No impaired rivers would be crossed by the Applicant's preferred route in the Carlton-to-Wisconsin border segment.

Navigable Waterways

The Applicant's preferred route would require five crossings of navigable waterways, as shown in Appendix A. From the North Dakota border to Clearbrook, the navigable surface waters that would be crossed include:

- Red Lake River (MP 91.9), and
- Red River of the North (MP 27.6).

From Clearbrook to Carlton, the navigable surface waters that would be crossed include:

- Kettle River (MP 338.2),

- Sandy River (MP 305.9), and
- Mississippi River (MP 296.7).

Wild Rice Waterbodies

All wild rice waterbodies within the ROI for the Applicant's preferred route occur between Clearbrook and Carlton. The areas of wild rice waterbodies that occur within 0.5 mile and that would be affected by construction and operation of the Applicant's preferred route are listed in Table 6.3.1.2-6. Seventeen wild rice waterbodies occur within 0.5 mile of the Applicant's preferred route. Four wild rice waterbodies could be affected by construction and operation of the Applicant's preferred route: Mud Lake, Peterson Lake, Portage Lake, and an unnamed lake. Wild rice waterbodies that would be crossed by the Applicant's preferred route are shown in Figure 6.3.1.2-1.

Table 6.3.1.2-6. Wild Rice Waterbodies Crossed by the Applicant's Preferred Route in Minnesota (acres)

Wild Rice Waterbody	Construction and Operations	Within 0.5 Mile of Centerline
Mud Lake	0.99	118.1
Peterson Lake	1.43	141.6
Portage Lake	2.11	74.9
Unnamed lake	0.3	54.1
TOTAL	**4.92**	**388.7**

Source: Minnesota DNR 2009b.

Route Alternatives

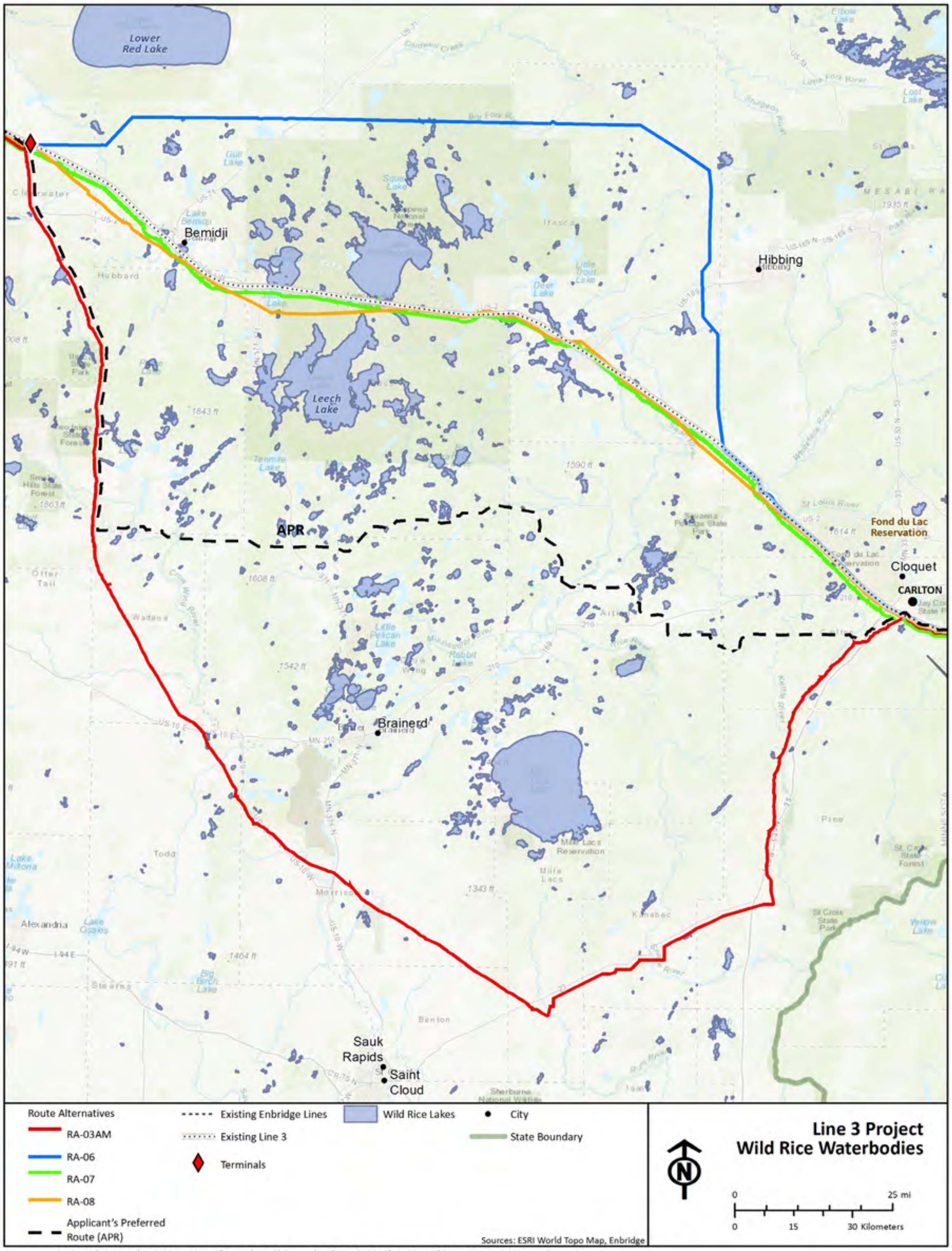
The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route in Minnesota is between Clearbrook and Carlton. The existing conditions relevant to surface water for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1mile length (see Section 6.7). Descriptions of existing conditions within the surface water ROI for RA-03AM reflect the current state of resources in the environment along the existing this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Drainage Basins and Watersheds

RA-03AM would cross the Red River, Upper Mississippi River, Lake Superior, and St. Croix River basins, which are described in Section 5.2.1.2.2. Table 6.3.1.2-7 presents the average watershed health scores, water quality scores, and affected watershed acres for the major drainage basins and watersheds that would be crossed by the RA-03AM route. Watershed biological indices scores are discussed in Section 6.3.4.



Sources: Minnesota DNR 2009a, 2009b.

Figure 6.3.1.2-1. Wild Rice Waterbodies near the Applicant's Preferred Route and Route Alternatives from Clearbrook to Carlton

Table 6.3.1.2-7. Major Drainage Basins and Watersheds Crossed by Route Alternative RA-03AM

Drainage Basin	Watershed	HUC-8	Average Watershed Health Score[a]	Water Quality Score[b]	Construction[c] (acres)	Operations[d] (acres)
Clearbrook to Carlton						
Red River of the North	Tamarac River	09020311	44	63	474.8	197.8
	Snake River	09020309	46	66	778.0	105.7
	Grand Marais Creek	09020306	42	58	40.9	17.0
	Red Lake River	09020303	54	63	318.5	132.7
	Clearwater River	09020305	60	70	792.9	330.4
	Wild Rice River	09020108	57	77	80.0	33.5
Upper Mississippi River (Mississippi Headwaters)	Mississippi River – Headwaters	07010101	68	89	270.2	112.6
	Crow Wing River	07010106	61	79	681.6	284.0
	Long Prairie River	07010108	59	64	153.7	64.0
	Mississippi River – Brainerd	07010104	63	76	267.6	111.6
	Mississippi River – Sartell	07010201	58	63	291.2	132.7
	Redeye	07010107	64	83	267.6	111.5
	Rum	07010207	61	71	383.6	159.8
Lake Superior	Nemadji River	04010301	64	80	172.8	72.0
	St. Louis River	04010201	59	56	67.2	28.0
St. Croix River	Kettle River	07030003	64	76	701.9	17.0

Source: Minnesota DNR 2015a.

[a] Average score is based on numerous indices comprising five main components: biology, connectivity, geomorphology, hydrology, and water quality. Index scores of 0 to 20 represent components that are heavily affected/low quality, scores of 40 to 60 represent moderately affected/moderate quality, and scores of 80 to 100 represent the least affected/high quality (scores of 20–40 and 60–80 are intermediate values). The overall watershed health scores and five component scores are calculated on a scale from 0 to 100, with 100 representing a highest score.

[b] Water quality score based on indices such as temperature, dissolved oxygen, pH, nutrient load, turbidity/sedimentation, and contaminant concentrations.

[c] Watershed acres that would be crossed by the construction work area.

[d] Watershed acres that would be crossed by the permanent right-of-way during operations.

HUC-8 = 8-digit hydrologic unit code that delineates watershed boundaries, defined by the U.S. Geological Survey (2016).

Surface Waters Crossed

Table 6.3.1.2-8 lists the surface waters crossed by RA-03AM. Route alternative RA-03AM would require 167 crossings of surface waters from Clearbrook to Carlton, including perennial, intermittent, and ephemeral streams; unnamed surface waters and non-jurisdictional ditches; rivers listed in the NRI; navigable waters; sensitive and specially designated surface waters; and impaired surface waters. See Appendix G for a listing of all proposed waterbody crossings.

From Clearbrook to Carlton, RA-03AM crosses a total of 60 public waters. These include 4 public water ditches, 13 artificial paths, 38 perennial streams/rivers and 4 intermittent streams/rivers, and 1 swamp/marsh.

Table 6.3.1.2-8. Surface Waters Crossed by Route Alternative RA-03AM

Waterbody Type/Flow	Number of Crossings (PWI)
Clearbrook to Carlton	
Artificial path	13 (13)
Canal ditch	31 (4)
Connector	6 (0)
Lake/pond – perennial	14 (0)
Stream/river – intermittent	62 (4)
Stream/river – perennial	41 (38)
Swamp/marsh – intermittent	? (1)
TOTAL	**167 (60)**

Source: USGS 2017.

Notes:

An artificial path is a feature that represents flow through a two-dimensional feature, such as a lake or a double-banked stream. An artificial path represents the flow of water into, through, and out of features (channel, estuary, lake/pond, playa, reservoir, swamp, marsh). A canal ditch specifies that it is artificial and that it is used to transport water, to drain or irrigate land, to connect two or more water bodies, or to serve as a waterway for watercraft. A connector establishes a known, but non-specific connection between two non-adjacent network segments that have flow.

Perennial waterbodies are those that hold water at all times, except in cases of extreme drought. Intermittent waterbodies are those that are wet only during part of the year, usually in spring, when rain and snowmelt saturate the ground surface.

PWI = Public Waters Inventory.

Sensitive/Specially Designated Surface Waters

Route alternative RA-03AM would require nine crossings of designated trout streams between Clearbrook and Carlton (Table 6.3.1.2-9). Maps with these trout streams are provided in Appendix A. RA-03AM would also cross the Kettle River, which is an ORVW.

Table 6.3.1.2-9. Trout Streams Crossed by Route Alternative RA-03AM

Trout Stream	Crossing Milepost
Clearbrook to Carlton	
Blackhoof River (S-001-003)	352.1
Cat River (M-096-028)	212.0 / 213.2
LaSalle Creek (M-163)	170.1
Mission Creek (M-050-044-006)	355.9
Straight River (M-096-035-002-002)	198.3
Unnamed Canal Ditch (M-096-018)	238.2
Unnamed stream/river (perennial) (M-096-020-001)	235.0
Unnamed stream/river (perennial) (S-001-003-029)	352.3
TOTAL CROSSINGS	**9**

Source: Minnesota DNR 2015b.

Nationwide Rivers Inventory

Between Clearbrook and Carlton, route alternative RA-03AM would cross one NRI-listed river: the Clearwater River with ORV-listed scenery at MP 149.5 (NPS 2011). RA-03AM also would cross state-designated Wild and Scenic Rivers sections of the Rum River and Kettle River.

Impaired Surface Waters

Between Clearbrook and Carlton, route alternative RA-03AM would require 14 crossings of impaired streams (Table 6.3.1.2-10) but would not cross any impaired lakes or wetlands. The route would cross six TMDL study areas, including:

- Lake St. Croix Nutrient TMDL study area (excess nutrients: phosphorus);
- Lower Wild Rice River TMDL study area (excess turbidity);
- Ann River watershed Bacteria, Nutrient, and Biota TMDL study area (excess nutrients (phosphorus), biota (fish and invertebrate), E. coli);
- Groundhouse River Fecal Coliform and Biota TMDL study area (excess fecal coliform and sediment levels);
- Long Prairie River Watershed TMDL study area (low dissolved oxygen); and
- Snake River Major Watershed (St. Croix Basin) WRAPS (excess nutrients: phosphorus), sediment, and bacteria) (Minnesota PCA n.d.).

Table 6.3.1.2-10. Impaired Surface Waters Crossed by Route Alternative RA-03AM

Waterbody Name	Impaired Beneficial Use	Impairment	EPA Impairment Classification[a]	Crossing Milepost
Clearbrook to Carlton				
Clearwater River	Aquatic consumption; aquatic life	Mercury in fish tissue; dissolved oxygen	4A	149.5
Walker Brook	Aquatic life	Dissolved oxygen	5	151.4
Mississippi River	Aquatic life	Dissolved oxygen	5	165.1
Skunk River	Aquatic recreation	Fecal coliform	5	286.8
South Fork Groundhouse River	Aquatic life	Aquatic macroinvertebrate bioassessments	4A	323.3
Groundhouse River	Aquatic life	Aquatic macroinvertebrate bioassessments	4A	328.5
Ann River	Aquatic life	Aquatic macroinvertebrate bioassessments	4A	332.7
Snake River	Aquatic consumption	Mercury in fish tissue	4A	334.9
Spring Brook	Aquatic life	Fishes bioassessments	5	337.0 / 338.0 / 335.2
Kettle River	Aquatic consumption	Mercury in fish tissue	5	384.6
Mud Creek	Aquatic life	Aquatic macroinvertebrate bioassessments; fishes bioassessments; *Escherichia coli*	4A	343.5
Grindstone River	Aquatic life	Fishes bioassessments	5	359.1

Sources: Minnesota PCA 2014a, 2016b, 2016c.

[a] U.S. Environmental Protection Agency (EPA) Impairment Classifications-

Category 4A: Waterbody is impaired or threatened, but a total maximum daily load (TMDL) study has been approved by EPA.

Category 5: Use assessment indicates an impaired status, and no TMDL plan has been completed.

Notes:

Also see maps in Appendix A.

Navigable Waterways

RA-03AM would require seven crossings of navigable waterways between Clearbrook and Carlton (USACE n.d.). The navigable surface waters that would be crossed include:

- Kettle River (MP 384.6),
- Grindstone River (MP 359.1),
- Snake River (MP 334.9),
- Ann River (MP 332.7),
- Groundhouse River (MP 328.5),
- Rum River (MP 314.3), and

- Mississippi River (MP 273.3).

Wild Rice Waterbodies

The areas of wild rice waterbodies that would be affected by construction and operation of RA-03AM are listed in Table 6.3.1.2-11 and shown in Figure 6.3.1.2-1. Eleven wild rice waterbodies occur within 0.5 mile of RA-03AM. Six wild rice waterbodies could be affected by RA-03AM: Mud Lake, Hay Creek (HDD crossing), Portage Lake, Hayden Lake, Fox Lake, and Moose Horn River. Mud Lake, Portage Lake, Hayden Lake, and Fox Lake would be crossed within an existing pipeline corridor. Moose Horn River in Pine County, a wild rice waterbody not included in Minnesota DNR's 2009 database, also would be crossed by RA-03AM at MP 400.2, within an existing pipeline corridor.

Table 6.3.1.2-11. Wild Rice Waterbodies Crossed by Route Alternative RA-03AM (acres)

Wild Rice Waterbody Type	Construction[a]	Operations[b]	Within 0.5 Mile of Centerline
Clearbrook to Carlton			
Type 3 – Inland shallow fresh marshes	2.6	1.1	226.1
Type 4 – Inland deep fresh marshes	0.0	0.0	105.1
Type 5 – Inland open fresh water	4.9	2.1	513.4
TOTAL	**7.5**	**3.1**	**844.6**

Source: Minnesota DNR 2009b.

[a] Acres of wild rice waterbodies that would be crossed by the construction work area.

[b] Acres of wild rice waterbodies that would be crossed by the permanent right-of-way during operations.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7 mile length (see Section 6.7). Descriptions of existing conditions within the surface water ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Drainage Basins and Watersheds

RA-06 would cross the Red River, Upper Mississippi River Lake Superior, and St. Croix River basins, which are described in Section 5.2.1.2.2; the Rainy River Basin is described at the beginning of this section. Table 6.3.1.2-12 presents the average watershed health scores, water quality scores, and affected watershed acres for the major drainage basins and watersheds that would be crossed by the RA-06 route. Watershed biological indices scores are discussed in Section 6.3.4.

Table 6.3.1.2-12. Major Drainage Basins and Watersheds Crossed by Route Alternative RA-06

Drainage Basin	Watershed	HUC-8	Average Watershed Health Score[a]	Water Quality Score[b]	Construction[c] (acres)	Operations[d] (acres)
Clearbrook to Carlton						
Red River of the North	Tamarac River	09020311	44	63	474.8	197.8
	Snake River	09020309	46	66	253.6	105.7
	Grand Marais Creek	09020306	42	58	40.9	17.0
	Red Lake River	09020303	54	63	318.5	132.7
	Upper/Lower Red Lake	09020302	73	76	556.9	232.2
	Clearwater River	09020305	60	70	703.6	293.2
Upper Mississippi River (Mississippi Headwaters)	Mississippi River – Headwaters	07010101	68	89	17.8	7.3
	Mississippi River – Grand Rapids	07010103	65	83	339.7	141.6
Rainy River	Big Fork River	09030006	78	97	651.0	271.3
	Little Fork River	09030005	69	77	268.3	111.8
Lake Superior	Nemadji River	04010301	64	80	93.9	39.1
	St. Louis River	04010201	59	56	863.7	359.8
St. Croix River	Kettle River	07030003	64	76	21.6	9.0

Source: Minnesota DNR 2015a.

[a] Average score is based on numerous indices comprising five main components: biology, connectivity, geomorphology, hydrology, and water quality. Index scores of 0 to 20 represent components that are heavily affected/low quality, scores of 40 to 60 represent moderately affected/moderate quality, and scores of 80 to 100 represent the least affected/high quality (scores of 20–40 and 60–80 are intermediate values). The overall watershed health scores and five component scores are calculated on a scale from 0 to 100, with 100 representing a highest score.

[b] Water quality score based on indices such as temperature, dissolved oxygen, pH, nutrient load, turbidity/sedimentation, and contaminant concentrations.

[c] Watershed acres that would be crossed by the construction work area.

[d] Watershed acres that would be crossed by the permanent right-of-way during operations.

HUC-8 = 8-digit hydrologic unit code that delineates watershed boundaries, defined by the U.S. Geological Survey (2016).

Surface Waters Crossed

Table 6.3.1.2-13 lists the surface waters crossed by RA-06 from Clearbrook to Carlton. RA-06 would require 137 crossings of surface waters, including perennial, intermittent, and ephemeral streams; unnamed surface waters and non-jurisdictional ditches; rivers listed in the NRI; navigable waters; sensitive and specially designated surface waters; and impaired surface waters. See Appendix G for a listing of all proposed waterbody crossings.

From Clearbrook to Carlton, RA-06 crosses a total of 76 public waters. These include 2 public water ditches, 2 connectors, 17 artificial paths, 41 perennial streams/rivers and 8 intermittent streams/rivers, and 6 lakes/ponds.

Table 6.3.1.2-13. Surface Waters Crossed by Route Alternative RA-06

Waterbody Type/Flow	Number of Crossings (PWI)
Clearbrook to Carlton	
Artificial path	18 (17)
Canal/ditch	12 (2)
Connector	5 (2)
Lake/pond – perennial	16 (6)
Stream/river – intermittent	29 (8)
Stream/river – perennial	57 (41)
TOTAL	**137 (76)**

Source: USGS 2017.

Notes:

An artificial path is a feature that represents flow through a two-dimensional feature, such as a lake or a double-banked stream. An artificial path represents the flow of water into, through, and out of features (channel, estuary, lake/pond, playa, reservoir, swamp, marsh). A canal ditch specifies that it is artificial and that it is used to transport water, to drain or irrigate land, to connect two or more water bodies, or to serve as a waterway for watercraft. A connector establishes a known, but non-specific connection between two non-adjacent network segments that have flow.

Perennial waterbodies are those that hold water at all times, except in cases of extreme drought. Intermittent waterbodies are those that are wet only during part of the year, usually in spring, when rain and snowmelt saturate the ground surface.

PWI = Public Waters Inventory.

Sensitive/Specially Designated Surface Waters

Route alternative RA-06 would require eight crossings of designated trout streams between Clearbrook and Carlton (Table 6.3.1.2-14). Maps with these trout streams are provided in Appendix A. The RA-06 route crosses 37 Lake Superior Basin waters, which are considered to be Outstanding International Resource Waters.

Table 6.3.1.2-14. Trout Streams Crossed by Route Alternative RA-06

Trout Stream	Crossing Milepost
Clearbrook to Carlton	
Clearwater River (H-026-030-019)	149.2
Little Otter Creek (S-002-009-001)	304.2
O'Brien Creek (H-026-030-069-004) (3 crossings)	172.4 / 172.6 / 172.7
Unnamed stream/river (intermittent) (S-002-032-011)	283.6
Unnamed stream/river (perennial) (H-001-030-023-002-010-001-001)	243.6
Venning Creek (H-001-030-023-002-010)	242.7
TOTAL CROSSINGS	**8**

Source: Minnesota DNR 2015b.

Nationwide Rivers Inventory

Between Clearbrook and Carlton, RA-06 would cross two NRI-listed rivers: the Clearwater River with ORV-listed scenery at MP 149.2, and the Big Fork River with ORV-listed scenery and recreation at MP 223.4 (NPS 2011). The route would not cross a federally or state-designated Wild and Scenic River segment.

Impaired Surface Waters

Between Clearbrook and Carlton, RA-06 would require one crossing of Ruffy Brook, which has aquatic recreation beneficial uses and is impaired by fecal coliform (EPA Category 5) (Minnesota PCA 2014a, 2016b, 2016c). RA-06 would not cross any impaired lakes or wetlands. The route would cross the Lake St. Croix Nutrient TMDL study area once, which is impaired by excess nutrients (phosphorus) (Minnesota PCA n.d.).

Navigable Waterways

Route alternative RA-06 would cross the Big Fork River nine times (USACE n.d.) at the following mileposts:

- MP 214.5
- MP 215.2
- MP 223.4
- MP 210.0
- MP 215.9
- MP 203.9
- MP 212.6
- MP 204.2
- MP 205.6

Wild Rice Waterbodies

The areas of wild rice waterbodies that would be affected by construction and operation of RA-06 are listed in Table 6.3.1.2-15 and shown in Figure 6.3.1.2-1. Five wild rice waterbodies occur within 0.5 mile of RA-06. Four wild rice waterbodies would be crossed by RA-06, all within new pipeline rights-of-way: Rice Lake, Coddington Lake, Dora Lake, and Big Fork River. Rice Lake in Beltrami County, a wild rice waterbody not included in Minnesota DNR's 2009 database, would be crossed by RA-06 at MP 160.0.

Table 6.3.1.2-15. Wild Rice Waterbodies Crossed by Route Alternative RA-06 (acres)

Wild Rice Waterbody Type	Construction[a]	Operations[b]	Within 0.5 Mile of Centerline
Clearbrook to Carlton			
Type 4 – Inland deep fresh marshes	0.0	0.0	74.9
Type 5 – Inland open fresh water	10.6	4.4	352.6
TOTAL	**10.6**	**4.4**	**427.5**

Source: Minnesota DNR 2009b.

[a] Acres of wild rice waterbodies that would be crossed by the construction work area.

[b] Acres of wild rice waterbodies that would be crossed by the permanent right-of-way during operations.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the surface water ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Drainage Basins and Watersheds

RA-07 would cross the Red River, Upper Mississippi River Lake Superior, and St. Croix River basins, which are described in Section 5.2.1.2.2. Table 6.3.1.2-16 presents the average watershed health scores, water quality scores, and affected watershed acres for the major drainage basins and watersheds that would be crossed by the RA-03AM route. Watershed biological indices scores are discussed in Section 6.3.4.

Table 6.3.1.2-16. Major Drainage Basins and Watersheds Crossed by Route Alternative RA-07

Drainage Basin	Watershed	HUC-8	Average Watershed Health Score[a]	Water Quality Score[b]	Construction[c] (acres)	Operations[d] (acres)
Clearbrook to Carlton						
Red River of the North	Tamarac River	09020311	44	63	635.4	197.8
	Snake River	09020309	46	66	253.6	105.7
	Grand Marais Creek	09020306	42	58	40.9	17.0
	Red Lake River	09020303	54	63	318.5	132.7
	Clearwater River	09020305	60	70	864.0	306.5
Upper Mississippi River (Mississippi Headwaters)	Mississippi River – Headwaters	07010101	68	89	1341.3	327.5
	Leech Lake River	07010102	69	89	474.8	169.4
	Mississippi River – Grand Rapids	07010103	65	83	581.2	132.7
Lake Superior	Nemadji River	04010301	64	80	97.0	39.1
	St. Louis River	04010201	59	56	1,171.2	295.9
St. Croix River	Kettle River	07030003	64	76	42.3	9.0

Source: Minnesota DNR 2015a.

[a] Average score is based on numerous indices comprising five main components: biology, connectivity, geomorphology, hydrology, and water quality. Index scores of 0 to 20 represent components that are heavily affected/low quality, scores of 40 to 60 represent moderately affected/moderate quality, and scores of 80 to 100 represent the least affected/high quality (scores of 20–40 and 60–80 are intermediate values). The overall watershed health scores and five component scores are calculated on a scale from 0 to 100, with 100 representing a highest score.

[b] Water quality score based on indices such as temperature, dissolved oxygen, pH, nutrient load, turbidity/sedimentation, and contaminant concentrations.

[c] Watershed acres that would be crossed by the construction work area.

[d] Watershed acres that would be crossed by the permanent right-of-way during operations.

HUC-8 = 8-digit hydrologic unit code that delineates watershed boundaries, defined by the U.S. Geological Survey (2016).

Surface Waters Crossed

Table 6.3.1.2-17 lists the surface waters crossed by RA-07 from Clearbrook to Carlton. RA-07 would require 81 crossings of surface waters, including perennial, intermittent, and ephemeral streams; unnamed surface waters and non-jurisdictional ditches; rivers listed in the NRI; navigable waters; sensitive and specially designated surface waters; and impaired surface waters. See Appendix G for a listing of all proposed waterbody crossings.

From Clearbrook to Carlton, RA-07 crosses a total of 34 public waters. These include 3 public water ditches, 1 connector, 5 artificial paths, 17 perennial streams/rivers, 6 intermittent streams/rivers, 1 lake/pond and 1 swamp/marsh.

Table 6.3.1.2-17. Surface Waters Crossed by Route Alternative RA-07

Waterbody Type/Flow	Number of Crossings (PWI)
Clearbrook to Carlton	
Artificial path	5 (5)
Canal/ditch	19 (3)
Connector	2 (1)
Lake/pond – perennial	6 (1)
Stream/river – intermittent	20 (6)
Stream/river – perennial	28 (17)
Swamp/marsh – intermittent	1 (1)
TOTAL	**81 (34)**

Source: USGS 2017.

Notes:

An artificial path is a feature that represents flow through a two-dimensional feature, such as a lake or a double-banked stream. An artificial path represents the flow of water into, through, and out of features (channel, estuary, lake/pond, playa, reservoir, swamp, marsh). A canal ditch specifies that it is artificial and that it is used to transport water, to drain or irrigate land, to connect two or more water bodies, or to serve as a waterway for watercraft. A connector establishes a known, but non-specific connection between two non-adjacent network segments that have flow.

Perennial waterbodies are those that hold water at all times, except in cases of extreme drought. Intermittent waterbodies are those that are wet only during part of the year, usually in spring, when rain and snowmelt saturate the ground surface.

PWI = Public Waters Inventory.

Sensitive/Specially Designated Surface Waters

Route alternative RA-07 would require six crossings of designated trout streams between Clearbrook and Carlton (Table 6.3.1.2-18). Maps with these trout streams are provided in Appendix A.

Table 6.3.1.2-18. Trout Streams Crossed by Route Alternative RA-07

Trout Stream	Crossing Milepost
Clearbrook to Carlton	
Clearwater River (H-026-030-019)	151.2
Little Otter Creek (S-002-009-001)	304.2
Necktie River (M-146-017-001)	176.4
Unnamed stream/river (intermittent) (M-146-017-001-001)	174.5
Unnamed stream/river (intermittent) (M-146-017-001-002)	173.3
Unnamed stream/river (perennial) (H-026-030-019-025.1)	151.1
TOTAL CROSSINGS	**6**

Source: Minnesota DNR 2015b.

Nationwide Rivers Inventory

Route alternative RA-07 would cross one NRI-listed river between Clearbrook and Carlton: the Clearwater River, with ORV-listed scenery at MP 151.2 (NPS 2011). The route would not cross a federally or state-designated Wild and Scenic River segment.

Impaired Surface Waters

Route alternative RA-07 would require two crossings of impaired streams between Clearbrook and Carlton (Table 6.3.1.2-19) but would not cross any impaired lakes or wetlands. The route would cross the Lake St. Croix Nutrient TMDL study area once, which is impaired by excess nutrients (phosphorus) (Minnesota PCA n.d.).

Table 6.3.1.2-19. Impaired Surface Waters Crossed by Route Alternative RA-07

Waterbody Name	Impaired Beneficial Use	Impairment	EPA Impairment Classification[a]	Crossing Milepost
Clearbrook to Carlton				
Ruffy Brook	Aquatic recreation	Fecal coliform	5	143.1
Swan River	Aquatic consumption	Mercury in fish tissue	4A	253.9

Sources: Minnesota PCA 2014a, 2016b, 2016c.

[a] U.S. Environmental Protection Agency (EPA) Impairment Classifications-

Category 4A: Waterbody is impaired or threatened, but a total maximum daily load (TMDL) study has been approved by EPA.

Category 5: Use assessment indicates an impaired status, and no TMDL plan has been completed.

Note:

Also see maps in Appendix A.

Navigable Waterways

Route alternative RA-07 would cross the Mississippi River at MP 241.8.

Wild Rice Waterbodies

The areas of wild rice waterbodies that would be affected by construction and operation of RA-07 are listed in Table 6.3.1.2-20 and shown in Figure 6.3.1.2-1. Eleven wild rice waterbodies occur within 0.5 mile of RA-07 (Table 6.3.1.2-20). One wild rice waterbody (White Oak Lake) is crossed by RA-07 within the existing pipeline corridor at the stream inlet to the lake basin portion of the wild rice lake boundary.

Table 6.3.1.2-20. Wild Rice Waterbodies Crossed by Route Alternative RA-07 (acres)

Wild Rice Waterbody Type	Construction[a]	Operations[b]	Within 0.5 Mile of Centerline
Clearbrook to Carlton			
Type 3 – Inland shallow fresh marshes	0.0	0.0	0.0
Type 4 – Inland deep fresh marshes	6.1	2.5	581.3
Type 5 – Inland open fresh water	0.0	0.0	840.7
TOTAL	**6.1**	**2.5**	**1,422.0**

Source: Minnesota DNR 2009b.

[a] Acres of wild rice waterbodies that would be crossed by the construction work area.

[b] Acres of wild rice waterbodies that would be crossed by the permanent right-of-way during operations.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the surface water ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Drainage Basins and Watersheds

RA-08 would cross the Red River, Upper Mississippi River Lake Superior, and St. Croix River basins, which are described in Section 5.2.1.2.2. Table 6.3.1.2-21 presents the average watershed health scores, water quality scores, and affected watershed acres for the major drainage basins and watersheds that would be crossed by the RA-08 route. Watershed biological indices scores are discussed in Section 6.3.4.

Table 6.3.1.2-21. Major Drainage Basins and Watersheds Crossed by Route Alternative RA-08

Drainage Basin	Watershed	HUC-8	Average Watershed Health Score[a]	Water Quality Score[b]	Construction[c] (acres)	Operations[d] (acres)
Clearbrook to Carlton						
Red River of the North	Tamarac River	09020311	44	63	474.8	197.8
	Snake River	09020309	46	66	253.6	105.7
	Grand Marais Creek	09020306	42	58	40.9	17.0
	Red Lake River	09020303	54	63	318.5	132.7
	Clearwater River	09020305	60	70	714.5	297.7

Table 6.3.1.2-21. Major Drainage Basins and Watersheds Crossed by Route Alternative RA-08

Drainage Basin	Watershed	HUC-8	Average Watershed Health Score[a]	Water Quality Score[b]	Construction[c] (acres)	Operations[d] (acres)
Upper Mississippi River (Mississippi Headwaters)	Mississippi River – Headwaters	07010101	68	89	664.4	276.8
	Leech Lake River	07010102	69	89	536.7	223.6
	Mississippi River – Grand Rapids	07010103	65	83	388.3	161.8
Lake Superior	Nemadji River	04010301	64	80	93.8	39.1
	St. Louis River	04010201	59	56	631.6	263.3
St. Croix River	Kettle River	07030003	64	76	22.9	9.3

Source: Minnesota DNR 2015a.

[a] Average score is based on numerous indices comprising five main components: biology, connectivity, geomorphology, hydrology, and water quality. Index scores of 0 to 20 represent components that are heavily affected/low quality, scores of 40 to 60 represent moderately affected/moderate quality, and scores of 80 to 100 represent the least affected/high quality (scores of 20–40 and 60–80 are intermediate values). The overall watershed health scores and five component scores are calculated on a scale from 0 to 100, with 100 representing a highest score.

[b] Water quality score based on indices such as temperature, dissolved oxygen, pH, nutrient load, turbidity/sedimentation, and contaminant concentrations.

[c] Watershed acres that would be crossed by the construction work area.

[d] Watershed acres that would be crossed by the permanent right-of-way during operations.

HUC-8 = 8-digit hydrologic unit code that delineates watershed boundaries, defined by the U.S. Geological Survey (2016).

Surface Waters Crossed

Table 6.3.1.2-22 lists the surface waters crossed by RA-08 from Clearbrook to Carlton. RA-08 would require 106 crossings of surface waters, including perennial, intermittent, and ephemeral streams; unnamed surface waters and non-jurisdictional ditches; rivers listed in the NRI; navigable waters; sensitive and specially designated surface waters; and impaired surface waters. See Appendix G for a listing of all proposed waterbody crossings.

From Clearbrook to Carlton, RA-08 crosses a total of 36 public waters. These include 1 public water ditch, 1 connector, 5 artificial paths, 21 perennial streams/rivers, 4 intermittent streams/rivers, and 1 lake/pond.

Table 6.3.1.2-22. Surface Waters Crossed by Route Alternative RA-08

Waterbody Type/Flow	Number of Crossings (PWI)
Clearbrook to Carlton	
Artificial path	6 (5)
Canal ditch	27 (1)
Connector	4 (1)
Lake/pond – perennial	11 (1)
Stream/river – intermittent	27 (4)
Stream/river – perennial	31 (21)
TOTAL	**106 (36)**

Source: USGS 2017.

Notes:

An artificial path is a feature that represents flow through a two-dimensional feature, such as a lake or a double-banked stream. An artificial path represents the flow of water into, through, and out of features (channel, estuary, lake/pond, playa, reservoir, swamp, marsh). A canal ditch specifies that it is artificial and that it is used to transport water, to drain or irrigate land, to connect two or more water bodies, or to serve as a waterway for watercraft. A connector establishes a known, but non-specific connection between two non-adjacent network segments that have flow.

Perennial waterbodies are those that hold water at all times, except in cases of extreme drought. Intermittent waterbodies are those that are wet only during part of the year, usually in spring, when rain and snowmelt saturate the ground surface.

Also see maps in Appendix A.

PWI = Public Waters Inventory.

Sensitive/Specially Designated Surface Waters

Route alternative RA-08 would require four crossings of designated trout streams between Clearbrook and Carlton (Table 6.3.1.2-23). Maps with these trout streams are provided in Appendix A.

Table 6.3.1.2-23. Trout Streams Crossed by Route Alternative RA-08

Trout Stream	Crossing Milepost
Clearbrook to Carlton	
Little Otter Creek (S-002-009-001)	301.4
Necktie River (M-146-017-001)	177.0
Unnamed stream/river (intermittent) (M-146-017-001-001)	173.9
Unnamed stream/river (intermittent) (M-146-017-001-002)	172.7
TOTAL CROSSINGS	**4**

Source: Minnesota DNR 2015b.

Nationwide Rivers Inventory

Route alternative RA-08 would cross one NRI-listed river between Clearbrook and Carlton: the Clearwater River, with ORV-listed scenery at MP 148.8 (NPS 2011). The route would not cross a federally or state-designated Wild and Scenic River.

Impaired Surface Waters

Route alternative RA-08 would require five crossings of impaired streams between Clearbrook and Carlton (Table 6.3.1.2-24) but would not cross any impaired lakes or wetlands. The route would cross the Lake St. Croix Nutrient TMDL study area once, which is impaired by excess nutrients (phosphorus) (Minnesota PCA n.d.).

Table 6.3.1.2-24. Impaired Surface Waters Crossed by Route Alternative RA-08

Waterbody Name	Impaired Beneficial Use	Impairment	EPA Impairment Classification[a]	Crossing Milepost
Clearbrook to Carlton				
Ruffy Brook (two crossings)	Aquatic recreation	Fecal coliform	5	144.1 / 144.3
Clearwater River	Aquatic consumption; aquatic life	Mercury in fish tissue; dissolved oxygen	4A	148.8
Swan River	Aquatic consumption	Mercury in fish tissue	4A	252.3
Mississippi River	Aquatic consumption	Mercury in fish tissue	4A	165.8

Sources: Minnesota PCA 2014a, 2016b, 2016c.

[a] U.S. Environmental Protection Agency (EPA) Impairment Classifications-

Category 4A: Waterbody is impaired or threatened, but a total maximum daily load (TMDL) study has been approved by EPA.

Category 5: Use assessment indicates an impaired status, and no TMDL plan has been completed.

Notes:

Also see maps in Appendix A.

Navigable Waterways

Route alternative RA-08 would cross the Mississippi River at MP 241.6 and Sucker Creek at MP 192.5 (USACE n.d.).

Wild Rice Waterbodies

The areas of wild rice waterbodies that would be affected by construction and operation of RA-08 are listed in Table 6.3.1.2-25 and shown in Figure 6.3.1.2-1. Two wild rice waterbodies, Nushka Lake and White Oak Lake, would be crossed by RA-08; both crossings would be located within an existing pipeline corridor. White Oak Lake would be crossed by RA-08 at the stream inlet to the lake basin, while Nushka Lake would be crossed at the lake shoreline.

Table 6.3.1.2-25. Wild Rice Waterbodies Crossed by Route Alternative RA-08 (acres)

Wild Rice Waterbody Type	Construction[a]	Operations[b]	Within 0.5 Mile of Centerline
Clearbrook to Carlton			
Type 4 – Inland deep fresh marshes	9.8	4.1	948.2
Type 5 – Inland open fresh water	0.0	0.0	246.8
Type 9 – Inland saline flats	0.0	0.0	9.4
TOTAL	**9.8**	**4.1**	**1,204.5**

Source: Minnesota DNR 2009b.

[a] Acres of wild rice waterbodies that would be crossed by the construction work area.

[b] Acres of wild rice waterbodies that would be crossed by the permanent right-of-way during operations.

6.3.1.2.3 Regional Analysis of the Quality of Existing Surface Water Conditions

This analysis provides a summary of general quality comparisons of surface water conditions across Minnesota as well as more detailed potential effects on specific surface water resources along the Applicant's preferred route and the route alternatives.

The north-central and northeast portion of Minnesota consist of water resources that are generally the highest quality recreational water resources in the state. To describe the general regionwide or statewide difference in surface water resource quality across Minnesota, different general methods can be used, including the Minnesota PCA ecoregion concept to guide typical water quality conditions and Minnesota DNR's WHAF. The quality of existing surface water conditions are discussed using each of these frameworks below.

- Minnesota PCA Ecoregion Concept to Guide Typical Water Quality Conditions. The state is divided into seven different ecoregions based on soils. Ecoregions have similar soil, geomorphology, land use and natural vegetation. The Northern Lakes and Forests (NLF) Ecoregion typically has the highest water quality compared to other ecoregions, especially those with areas more dominated by altered landscapes. Minnesota PCA offers a guide to typical water quality conditions in these seven ecoregions, "large expanses of land containing a geographically distinct collection of plants, animals, natural communities and environmental conditions."[9]
- Minnesota DNR WHAF. Another approach used to describe surface water quality conditions across landscapes in Minnesota is the WHAF Tool, developed by Minnesota DNR, which uses the science of watershed health. The **science** of watershed health is based on a whole-system approach. Ecological processes interact to provide services such as clean air and water, available groundwater, and diverse plant and animal communities. The science of health explores how all the parts system work together to provide a "healthy watershed." In order to explore the watershed system in a consistent, systematic way, the ecological processes have been divided into five different components: biology, connectivity, geomorphology, hydrology, and water quality. A suite of **watershed health index scores** have been calculated that represent many of

[9] https://www.pca.state.mn.us/quick-links/eda-guide-typical-minnesota-water-quality-conditions.

the important ecological relationships within and between the components. These scores are built on statewide GIS data that are compared consistently across Minnesota to provide a baseline health condition report for each of the 81 major watersheds in the state. The Watershed Health Assessments consist of health scores that rank the condition of Minnesota's watersheds from 0 (poor health condition, red) to 100 (good health condition, green). Watershed report cards indicate poorer water quality related to altered land use indicators as depicted in this analysis[10] (Appendix J-1).

The ecoregion approach used to assess water quality by Minnesota PCA and the WHAF Tool developed by Minnesota DNR are useful in describing existing surface water conditions across Minnesota. In general, the north-central and northeast forested portions of Minnesota are the least impaired and have the highest quality surface water resources; areas in the west and south agricultural portions of the state have the most impaired surface water resources and are of poorer quality.

Specifically, the data indicate that there are higher quality resources in the NLF ecoregion of the state. Lower nutrients (mainly phosphorus) and chlorophyll-a (algae) and greater transparency are indicative of lakes in this ecoregion. Streams in this ecoregion exhibit lower nutrients, turbidity, and fecal coliform, as well as lower temperature and biological oxygen demand conditions. A spatial distribution of lakes and streams depicted in Appendices J-2 and J-3, which show lakes and streams relative to pipeline routes across the state. There are a large number of lakes and streams in north-central and northeast Minnesota, and they are of the highest quality when comparing ecoregion data.

Three watersheds were assessed to represent potential pipeline routing areas throughout the state: the Pine River watershed (north-central), Chippewa River (west) and Le Sueur River (south). The watershed health index scores indicate that the best health scores are represented in the Pine River and the worst scores in the Chippewa and Le Sueur River watersheds accordingly. Further, in general, statewide maps indicate better health scores across the north and east and poorer scores across the south and west, as depicted by analysis of the five different components: biology, connectivity, geomorphology, hydrology, and water quality (Appendix J-1). Water quality scores for the Applicant's preferred route and route alternatives are provided in Tables 6.3.1.2-7, 6.3.1.2-12, 6.3.1.2-16, and 6.2.1.3-21).

Trout Streams

Several trout streams are intersected by the route alternatives. Often because of their non-impaired or minimally impaired watersheds and their locations, soils, and geologic setting within the state, these streams represent high-quality, cold, oxygenated water necessary for trout survival. RA-06, RA-07, RA-08, RA-03AM, and the Applicant's preferred route occur or intersect, within 0.5 mile, 17 to 24 designated trout streams or protected tributaries to designated trout streams (Table 6.3.2.1-26).

10 http://www.dnr.state.mn.us/whaf/index.html.

Table 6.3.2.1-26. High-Quality Surface Water Resources Occurring within 0.5 Mile of Route Centerline for the Applicant's Preferred Route and Route Alternatives

High-Quality Surface Water Resource	Applicant's Preferred Route	Route Alternatives			
		RA-06	RA-07	RA-08	RA-03AM
Trout streams	17	24	17	16	17
Wild rice lakes	17	5	11	9	11
Lakes of high and outstanding biological significance	8	4	12	9	4
Tulibee lakes	4	1	9	10	3

Wild Rice Lakes

Minnesota has more acres of natural wild rice (*Zizania palustris*) than any other state in the country. Wild rice has been historically documented in 45 of Minnesota's 87 counties and in all corners of the state. Anecdotal information suggests an even broader distribution prior to European settlement. Wild rice is an important social and cultural component for American Indian tribes and rural Minnesota communities.

A Minnesota DNR assessment found over 1,200 lakes and rivers in 54 counties that currently contain or historically had wild rice. Over 64,000 acres of wild rice (out of roughly 2 million basin acres) were found on these waters. More than half of the acreage was found in Aitkin, Cass, Crow Wing, Itasca, and St. Louis counties.

Large numbers of wild rice lakes exist in the NLF ecoregion, and this is represented by several lakes located within 0.5 miles of each of the routes in this ecoregion (Table 6.3.2.1-26).

Lakes of Biological Significance (High and Outstanding)

Lakes of Biological Significance were identified and classified by Minnesota DNR subject matter experts on objective criteria for four community types (aquatic plants, fish, amphibians, and birds). Unique plant or animal presence was the primary measure of a lake's biological significance. Lakes were rated and grouped for each of the following communities: aquatic plants, fish, birds, and amphibians. Lakes were assigned one of three biological significance classes (outstanding, high, or moderate). This assessment viewed outstanding and high sites as they are representative of the highest quality conditions. Many Minnesota lakes have not been sampled for plants or animals, so this list of lakes will be periodically revised as additional biological data become available.

There are a large number of lakes with high and outstanding biological significance in the NLF ecoregion. RA-06, RA-07, RA-08, RA-03AM and the Applicant's preferred route all cross some of these lakes in this ecoregion (Table 6.3.2.1-26).

Tullibee Lakes

Minnesota has about 650 tullibee lakes, more than any other state in the lower 48. Many of these waters are prized by anglers because tullibee (also known as cisco, or lake herring in Lake Superior) provide a high-energy feast for walleye, northern pike, muskellunge, and lake trout. Changes in land use and climate are causing many lakes to lose tullibee. Keeping forested land intact can help maintain water quality in lakes with tullibee and other coldwater species. The Tullibee Lake Watershed Forest Stewardship Project[11] is engaging owners of private woodlands and other conservation partners to protect vulnerable waters in north-central Minnesota (Table 6.3.2.1-26).

Other Spatial Indicators of the Quality of Surface Water

Ditches

An evaluation was also done on the number of public water ditches crossed by the routes. High numbers of ditches is an indication of landscape alteration that adversely affects water resources, thus diminishing the quality of water resources in the area. An image of the total number of ditches, including private, in the vicinity of the Applicant's preferred route and route alternatives is depicted on a statewide map in Appendix J-4.

Perennial Cover

Areas that tend to rate low in perennial cover, terrestrial habitat quality, and connectivity have poorer overall health index scores as depicted in watershed health scores for the Pine, Chippewa, and Le Sueur River watersheds (Appendix J-5).

Wetlands

The northern routes (RA-06, RA-07, and RA-08) extend through areas containing a large number of wetlands, many of which are peat wetlands. Minnesota's 6 million acres of peatlands represent a major component of the state's natural heritage. In a worldwide context, the patterned peatlands in Minnesota are extremely valuable for the study of ecological and developmental processes in peatlands as noted in *Recommendations for the Protection of Ecologically Significant Peatlands in Minnesota* (Minnesota DNR 1984). The number of wetlands statewide is also depicted in viewing watershed health scores under "Loss of Hydrologic Storage, Wetland Loss" in (Appendices J-6 and J-7).

Walleye Lakes

Walleyes and walleye fishing are an important heritage to all Minnesotans and can be an indicator of ecological condition of lakes. Walleye lakes are fairly dispersed across the state; however, habitat suitable for reproduction and self-sustaining populations has a much higher presence in the high-quality waters representative of the NLF ecoregion.

Applicant's Preferred Route – Clearbrook to Carlton

The Applicant's preferred route follows a route south of Clearbrook, following an existing pipeline right-of-way, and then follows an existing transmission line corridor easterly toward Carlton. The northern routes (RA-06, RA-07, RA-08, and the Applicant's preferred route) all pass through a large number of streams, lakes, wetlands, and accompanying resources—all of which are generally of high quality. The Applicant's preferred route intersects a similar amount of resources as the route alternatives; however, the Applicant's preferred route has the potential to affect the highest number of wild rice lakes (17). Among other notable resources, this route passes 17 trout streams and 8 lakes of high and outstanding biodiversity significance as well as 4 tullibee lakes. See Table 6.2.1.2-26 for a comparison of resources intersected.

[11] http://www.dnr.state.mn.us/tullibeelake.html.

RA-03AM – Clearbrook to Carlton

RA-03AM follows a route south of Clearbrook following an existing pipeline right-of-way and continues southeast toward Staples, Little Falls, and Milaca and then northeast toward Mora, Hinckley, Moose Lake, and Carlton. This route avoids areas of highest quality surface water resources in areas of north-central and northeast Minnesota. Notable in this route are similar amounts of trout stream and designated trout stream tributaries (17) as well as wild rice lakes (11). There are fewer tullibee lakes (3) and lakes of high and outstanding biodiversity significance (4) than most other northern routes. The longer length of this route increases the potential of intersecting more resources.

When reviewing Minnesota PCA’s ecoregion concept for assessing lake water quality as well as Minnesota DNR WHAF data, there is a trend toward poorer water quality associated with more intensive land use in the southern portion of this route. This is noted in water quality conditions in the North Central Hardwood Forests as compared to the NLF ecoregion and WHAF health scores as well as layers depicting ditches, perennial cover, or loss of hydrologic storage from wetlands. See Table 6.2.1.2-26 for a comparison of resources intersected.

RA-06 – Clearbrook to Carlton

This route is the most northerly route around the Chippewa National Forest. The northern routes (RA-06, RA-07, RA-08, and the Applicant’s preferred route) all pass through a large number of streams, lakes, wetlands and accompanying resources all of which are generally of high quality. Though there are fewer lakes of high and outstanding biodiversity intersected by RA-06, there are 5 wild rice lakes and a large number of trout streams and trout stream tributaries within this route (24). This route also passes four lakes of high and outstanding biodiversity significance and one tullibee lake. The large amount of undisturbed upland and wetland forest cover helps maintain healthy surface water conditions in this route area. See Table 6.2.1.2-26 for a comparison of resources intersected.

RA-07 – Clearbrook to Carlton

This route follows the existing pipeline corridor southeast to Carlton nearest U.S. Highway 2 until it leaves the highway and follows a southeasterly route toward Carlton. In evaluating the overall quality resources in the northern routes as well as trout streams, wild rice lakes, and lakes of high and outstanding biodiversity significance, this route has similar high-quality resources and potential effects when compared to other northern routes. Among notable resources, this route passes 17 trout streams, 11 wild rice lakes, 12 lakes of high and outstanding biodiversity significance, and 9 tullibee lakes. The difference in this route is that it is within an existing corridor that has already had similar land use alterations from previous pipeline installations and operations as well as U.S. Highway 2 and railway. See Table 6.2.1.2-26 for a comparison of resources intersected.

RA-08 – Clearbrook to Carlton

This route follows the existing pipeline corridor southeast to Carlton near but more south of U.S. Highway 2 than RA-07 until it follows a southeasterly route toward Carlton. In evaluating the overall quality resources in the northern routes as well as trout streams, wild rice lakes, lakes of high and outstanding biodiversity significance and tullibee lakes, this route has similar potential effects when compared to other northern routes. Notable resources, this route passes 16 trout streams, 9 wild rice lakes, 9 lakes of high and outstanding biodiversity significance and 10 tullibee lakes. Similar to RA-07, the difference is this route is that it is within an existing corridor that has already had similar land use alterations from previous pipeline installations and operations as well as U.S. Highway 2 and railway. See Table 6.2.1.2-26 for comparison of resources intersected.

6.3.1.2.4 Impact Assessment

This section addresses the impact analysis conducted for the Applicant's preferred route and the route alternatives. The analysis assessed potential impacts on surface waters in the ROIs for the route options, as described in Section 6.3.1.2.1, related to the following concerns:

- Runoff and flows – increases in stormwater runoff and erosion, increases in TSSs concentrations and increased sedimentation, changes in stream flows from water withdrawals and discharges, and disruption of flow paths or local hydrologic connectivity;
- Surface water and aquatic habitat quality – degradation of surface water quality, degradation of aquatic habitat from instream and other construction activities, degradation of water quality and habitat from releases of drilling mud during HDD crossings;
- Channel morphology and stability – changes in channel morphology and stability caused by channel and streambank modifications; and
- Disturbance of wild rice waterbodies.

Many pipeline construction activities have the potential to affect surface water flow and quality. These activities include clearing and grading, dewatering and trenching, blasting, access road construction, waterbody crossings, surface water withdrawals and discharges (e.g., for hydrostatic test water), fueling and use of hazardous materials, and restoration or reclamation of construction areas. The following sections address potential impacts on surface water from these activities for the Applicant's preferred route and route alternatives. After the discussion of construction impacts, the potential impacts of operations on surface waters are addressed for the Applicant's preferred route and each route alternative.

Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the surface water ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

<u>Construction Impacts</u>

Runoff and Flows

Increases in Stormwater Runoff and Erosion. Clearing and grading would be required within the construction work area for the pipeline, MLVs, new and expanded pump stations, and cathodic protection sites—as well as for access roads and ATWS, including six pipe yards in Minnesota. Newly cleared areas and impervious surfaces could cause increased stormwater runoff and erosion into nearby surface waters; however, the Applicant would comply with the requirements of applicable permit programs that are in place to manage potential impacts, as addressed below.

The Applicant would obtain NPDES permits for the pipeline, MLVs, pump stations, cathodic protection sites, access roads and ATWS, and pipe yards prior to construction. Minnesota PCA already has granted NPDES General Construction Stormwater Coverage permits for the pipe yard locations. NPDES permits would specify various stormwater and erosion control measures to be implemented, such as requiring stormwater to be routed around exposed soil areas through conveyance channels and requiring stormwater discharges to be directed from the site to vegetated areas in order to increase sediment removal and infiltrate stormwater on the site when feasible (Minnesota PCA 2013a). Prior to submitting an application for an NPDES permit, the Applicant would be required to develop a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would provide a site description identifying the construction activities, where stormwater discharge would occur, and the receiving waters. The plan also would describe erosion and sediment controls to be implemented during construction, stormwater pollution management, waste disposal, maintenance and inspection practices, and any additional requirements. The permit application and SWPPP must be submitted for Minnesota PCA review at least 30 days before the start of construction activity.

The Applicant's Environmental Protection Plan (Appendix E) describes the Applicant-proposed measures that likely would be included in the SWPPP and as conditions in the NPDES permit. These include temporary sediment and erosion control measures to be used during construction, such as slope breakers, sediment barriers (e.g., silt fence, straw bales, and bio-logs), stormwater diversions, trench breakers, mulch, and erosion control blankets. These temporary controls would be placed across the entire construction work area at the base of slopes greater than 5 percent, where the base of the slope is less than 50 feet from surface waters, until the area is revegetated and there is no potential for scouring or sediment transport to surface waters. Trench breakers would be used at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep accumulated trench water out of the waterbody. Permanent berms, as approved in permit conditions, would be installed 100 to 250 feet apart on all slopes greater than 3 percent to prevent erosion and sedimentation into surface waters once construction is complete.

To further protect surface water resources, NPDES permits would require maintenance of a 50-foot-wide natural buffer downgradient of the construction site, or redundant sediment controls if a buffer is not feasible, when construction is within 50 feet of a surface water (Minnesota PCA 2013b). For any construction site within 1 mile of a special water, NPDES permits also would require that an undisturbed buffer zone extending not less than 100 feet from the water be maintained at all times. If the buffer zone cannot be maintained, redundant BMPs must be used to protect the special water (e.g., trout streams) (Minnesota PCA 2013a). Trout rely on coldwater habitats for survival, and exposure to sunlight from vegetation removal can cause adverse warming of the water. Therefore, construction NPDES permits prohibit removal of woody vegetation and replacement with grassy vegetation near trout streams unless the reasons are absolutely necessary and completely documented in the SWPPP (Minnesota PCA 2013c). Further, to minimize stormwater discharge into and temperature increases in trout streams, NPDES permits would require that impervious surfaces be minimized; discharges be made into vegetated areas or grass swales, avoiding impervious surfaces when possible; and infiltration or other volume reduction practices be used to reduce runoff in excess of pre-Project conditions (Minnesota PCA 2013d).

The NPDES permits also would require that soil stabilization be initiated immediately (i.e., by the end of the day following the day that land-disturbing activities have temporarily or permanently ceased) when construction activities would not resume for 14 days for most sites, for 7 days for sites that drain to special or impaired waters, and within 24 hours for sites where Minnesota DNR "work in water restrictions" apply during fish spawning timeframes. Further, the NPDES permits would require inspection of the entire construction site once every 7 days or within 24 hours of a rainfall event greater than 0.5 inch in 24 hours as measured by a rain gauge installed onsite, a weather station that is within 1 mile of the Project location, or a weather reporting system that provides site specific rainfall data from radar summaries. All non-functioning stormwater and erosion control measures would be replaced or repaired within 24 hours of discovery.

By complying with these NPDES permit conditions and implementing the Applicant-proposed measures to minimize impacts, the impact of increased stormwater runoff and erosion from clearing and grading due to construction would be short-term to long-term and minor.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. In addition to clearing and grading, other construction activities such as blasting, trenching, waterbody crossings, establishment of ATWS, access road construction, and water discharges may result in increased suspended solids and sedimentation in surface waters crossed. The Applicant's temporary erosion controls, SWPPP requirements, and NPDES permit requirements described above would be implemented during these activities to prevent sediment transport into surface waters during construction. The Applicant anticipates the need for four blasting events from MP 354.6 to 356.6 in Carlton County, Minnesota, due to shallow bedrock. As noted above, blasting can cause increases in TSS and sedimentation in surface waters near the blast site. Prior to construction, the Applicant would develop a Blasting Plan, which would adhere to all stipulations set forth by federal (CFR Title 29, Part 1926 Safety and Health Regulations for Construction/Subpart U – Blasting and the Use of Explosives – Blasting) and state regulations (Minnesota Administrative Rules Chapter 7500) and would include measures to protect nearby surface waters from these impacts. Therefore, the impacts from four blasting events on TSS and sedimentation are expected to be temporary and negligible to minor.

During pipeline construction across a waterbody, the extent and duration of increased sedimentation and increased erosion potential depend on the soils, sediments, and topography of the crossing site and the crossing method used. As described in detail in Section 2.7.2, the types of methods that may be used include the wet open-cut crossing method, dry open-cut crossing methods (dam-and-pump and flume), and HDD or guided bore.

Construction of the pipeline across the waterbody using dry open-cut methods would occur in a dry area created by temporary dams upstream and downstream of the work area. TSS and sedimentation would increase when flow is returned to the dry channel but would readily dissipate to negligible levels in the downstream vicinity of the crossing. As a result, impacts on surface water quality due to increases in TSS concentrations and increased sedimentation in surface waters crossed using dry open-cut crossing methods would be temporary to short-term and minor.

Wet open-cut methods involve excavation of the channel and banks in the wetted channel. Because excavated soils would be in direct contact with surface water, the Applicant would install sediment containment devices (e.g., in-water BMPs such as floating silt curtains) to contain the excavated material and minimize the potential for increased sedimentation. The in-water BMPs would remain in place until construction is completed. The NPDES permits would require inspection of surface waters, drainage ditches, and conveyance systems at least every 7 days (or within 24 hours following a rainfall event greater than 0.5 inch) for sediment and would require removal of any deposits within 7 days (Minnesota PCA 2013b). To reduce the potential for long-term erosion and sedimentation, disturbed areas at waterbody crossings would be restored to preconstruction contours after pipeline installation is completed. The Applicant would reestablish streambank vegetation using Minnesota Seed Mix 2 (described in Appendix C of the Applicant's Environmental Protection Plan [Appendix E]) or a native seed mix recommended by the Minnesota BWSR. If the Applicant maintains compliance with NPDES permit conditions and implements the Applicant-proposed measures, impacts on water quality due to increases in TSS concentrations and increased sedimentation in surface waters crossed using the wet open-cut crossing method would be temporary to short-term to long-term and minor.

Changes in Stream Flows from Water Withdrawals and Discharges. The Applicant would withdraw water for hydrostatic testing, dust control, trench dewatering, and HDD installation. Hydrostatic testing would require approximately 120 million gallons of water (between 11 and 17 million gallons for each of seven construction spreads) (Enbridge 2016b) that the Applicant would obtain from lakes, streams, or groundwater wells. The proportion of water that would be obtained from groundwater versus surface water has not been determined. The Applicant is currently evaluating transferring water from one test section to another in order to minimize the total quantity of water needed to complete the hydrostatic test. Water appropriation needs for dust control, trench dewatering, and HDD installation have not been determined. Prior to construction, the Applicant would obtain a water appropriation permit from Minnesota DNR. These permits would require identification of and rationale for choosing specific surface water sources; requested maximum pumping rates and maximum annual volumes of water to be used; monitoring of pumping rates during appropriation with an approved device or method; and reporting of daily, monthly, and/or yearly appropriation amounts.

As stipulated in permit requirements, the Applicant would select appropriation sites that would meet Minnesota DNR's criteria of "doing no harm," and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources and must not adversely affect trout streams, calcareous fens, or other significant environmental resources. If water is withdrawn from surface water, hose intakes would be equipped with screens to prevent entrainment of aquatic species, and adequate waterbody flow rates and volumes would be maintained to protect aquatic life and allow for downstream uses as required by the water use permit (Appendix E).

Hydrostatic test water would be discharged from a test section in accordance with the NPDES permit in one of two ways: (1) into well-vegetated upland areas using controlled-flow velocity with a dewatering structure such as a silt fence and straw bales or into geotextile filter bags that are used to avoid soil erosion, sediment transport, and bottom scouring; or (2) into the waterbody from which it was withdrawn to prevent the spread of invasive species or degradation in water quality; the discharge rate would not exceed the permitted applicable discharge rate (Appendix E). Water would be treated as specified in the NPDES permit prior to discharge; and the Applicant would monitor pH, dissolved oxygen levels, and any other parameters required by the permit, as described in Appendix D of the Environmental Protection Plan (Appendix E). Discharges would adhere to all conditions set forth in NPDES and water appropriation permits, including discharge over approved energy dissipation measures (e.g., sand bags, plastic sheeting, or natural rock riprap) and the sedimentation control measures as described above. With adherence to water appropriation and NPDES permit conditions and implementation of Applicant-proposed measures, impacts on stream flows from water appropriation and discharge during construction would be temporary and minor.

Disruption of Flow Paths or Local Hydrologic Connectivity. "Hydrologic connectivity" is the water-mediated transport of matter, energy, and organisms within or between elements of the hydrologic cycle (the continuous movement of water on, above, and below the Earth's surface) (Pringle 2003).

Pipeline construction may disrupt flow paths and groundwater-surface water interaction due to clearing and grading of riparian vegetation, water appropriation and discharge, and channel and streambank modifications caused by waterbody crossings (discussed above). Hydrologic connectivity can be decreased if barriers are constructed to prevent the natural flow of water and can be increased if natural barriers are removed. Disruption of hydrologic connectivity and the natural interaction between groundwater and surface water can affect water quality by altering the acidity, dissolved oxygen levels, and nutrient and contaminant loads in surface waters, thereby affecting the aquatic environment. It also can allow the spread of invasive species and prevent migration and reproduction of species.

With implementation of the Applicant-proposed measures described above to prevent or minimize erosion and sedimentation, to monitor stream flows during water appropriation and discharge, and to restore streambanks to their original attributes after construction, impacts on flow and hydrologic connectivity during construction along the construction work area would be temporary to permanent and minor to major. Potential impacts that are permanent and major would be associated with specific site features that are sensitive to disruption of hydrologic connectivity. Springs and other surface water features that are dependent on shallow groundwater have the potential for permanent and major impacts.

Construction would involve creation of both temporary and permanent access roads, which also could affect hydrologic connectivity. The Applicant would restore temporary access roads, including roads that were widened and graded, to preconstruction conditions upon completion of construction. The restoration would include seeding disturbed areas with a suitable seed mix for the area. The Applicant would leave any improved roads intact if requested by the respective landowner. Impacts on hydrologic connectivity associated with temporary access roads is expected to be short-term and negligible to minor, depending on the location of the roads. Impacts from permanent access roads are discussed in the operations section below.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. Because only minor increases in stormwater runoff would occur during construction, the potential for stormwater to carry contaminants into surface waters is low. The impact of contaminants on surface water quality therefore would be short-term to long-term and negligible to minor, continuing until vegetative cover is restored to approximate preconstruction conditions. For areas that will not be returned to preconstruction conditions the potential impact would be permanent and minor. These impacts are discussed further as operational impacts.

Trout rely on coldwater habitats for survival, and exposure to sunlight from vegetation removal can cause adverse warming of the water. Therefore, construction NPDES permits typically prohibit removal of woody vegetation and replacement with grassy vegetation near trout streams unless the reasons are absolutely necessary and completely documented in the SWPPP (Minnesota PCA 2013c). Further, to minimize stormwater discharge into and temperature increases in trout streams, NPDES permits typically require that impervious surfaces be minimized; discharges be made into vegetated areas or grass swales, avoiding impervious surfaces when possible; and infiltration or other volume reduction practices be used to reduce runoff in excess of pre-Project conditions (Minnesota PCA 2013d). By complying with these NPDES permit conditions and implementing the Applicant-proposed measures to minimize impacts, it is not likely that construction would affect water temperature in surface waters crossed.

During construction, surface water may become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals as a result of activities such as fuel storage, equipment refueling, and equipment maintenance. To protect surface water resources, NPDES permits would require secondary containment of hazardous materials, prohibition of engine degreasing at work sites, containment and collection of liquid and solid wastes, and a spill prevention and response plan for fueling and maintenance of vehicles (Minnesota PCA 2013b). The Applicant would store petroleum products, hazardous chemicals, and lubricating oils; conduct refueling, maintenance, and lubricating operations; and perform concrete coating activities in upland areas more than 100 feet from surface waters (Appendix E). Concrete wash water, grindings, and slurry disposal would be limited to a designated area and would not be discharged to surface waters. Rinse water, used in conjunction with a cleaning pig to remove any accumulated construction debris, dirt, and dust prior to hydrostatic testing, would be treated and disposed of or discharged in accordance with applicable permit conditions. During HDD installation, drilling mud and slurry would be stored away from the waterbody in a bermed sediment control structure, in tanks, or by other methods so that it would not flow into the waterbody. Excess drilling mud would be disposed of offsite at an approved disposal facility. In addition to these prevention measures, the Applicant would be responsible for cleaning up small spills through procedures outlined in their Environmental Protection Plan (Appendix E), including notifying proper personnel (e.g., the onsite spill coordinator) and agencies, stopping work activity that caused the spill, using absorbent booms and pads to contain and recover released materials in water, and disposing of contaminated response materials at approved facilities. With adherence to NPDES permit conditions and implementation of Applicant-proposed measures, impacts on surface water quality from small leaks and spills would be temporary and minor.

Potential impacts on surface water due to an unanticipated crude oil release are discussed in Chapter 10.

As discussed above, 100-foot buffers would be required adjacent to special waters (e.g., the Mississippi River, St. Croix River, and trout streams) during construction and as a permanent feature post-construction, except where a water crossing or other encroachment is necessary. As required by NPDES permit stipulations, the reasons that the buffer encroachment would be necessary and reasons for the use of redundant BMPs and restoration activities must be included in the SWPPP.

For Section 303(d)-listed surface waters, which already have an impairment that prevents a beneficial use, degradation of water quality is of particular concern. Aquatic life, human health, and/or recreational activities are already at risk in these surface waters, and further degradation of water quality may exacerbate an existing impairment, cause additional impairments, interfere with restoration activities, and delay attainment of water quality standards. NPDES permits would require identification of Section 303(d) waters with phosphorus, turbidity, dissolved oxygen, or biotic impairment within 1 mile of construction. If the impaired waters have an approved TMDL implementation plan, the plan must be incorporated into the SWPPP, and discharges must comply with specified TMDLs (Minnesota PCA 2013d). With adherence to the above NPDES permit conditions and implementation of Applicant-proposed measures, impacts of construction activities on Section 303(d)-listed surface waters would be temporary to short-term and negligible to minor.

Degradation of Aquatic Habitat from Instream Activities. Pipeline construction across surface waters has the potential to alter and degrade aquatic habitat through increased sedimentation and erosion, disruption or alteration of stream flow, and streambank disturbance. Stream crossings would be designed as close to perpendicular to the axis of the stream channel as engineering and routing constraints allow, to create the shortest possible crossing length in order to minimize disturbance to the stream. The Applicant has proposed primary and alternative crossing methods for the Applicant's preferred route based on various factors, including waterbody size, sensitivity (e.g., trout stream), water levels, soil/sediment stability installation, and anticipated season of installation (Appendix G). If a route permit is issued for a specific route, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. Minnesota DNR would consider various factors, including geological, topographic, hydrographic, geotechnical, and scour depth characteristics of each crossing, after final pipeline design in determining their approval for specific waterbody crossing methods.

In general, surface waters with stable banks in mineral soil and noticeable flow at the time of construction would be crossed using dry crossing methods, HDD, or guided bore. Surface waters that are dry during construction and selected surface waters that consist of ditches in peatland with no banks or impoundments (e.g., beaver dams and plugged culverts), with stagnant or no noticeable flow conditions, and that would not support dams necessary to isolate and dry the construction area, would be crossed using the wet open-cut method.

One of two types of dry crossing methods would be used for certain surface waters. The dam-and-pump method would be used for surface waters of low flow, those with meandering channels, and those for which fish passage is not a concern; the flume method would be used in narrow surface waters with defined banks and a straight channel across the construction work area that has a solid substrate (Appendix E provides additional details on water crossing methods). Dry crossing methods are advantageous because they limit sediment release and downstream transport, maintain stream flow, reduce the potential for trench sloughing, and provide a dry working environment for pipe installation. However, dry crossings take more time to complete than wet trenching, may require fish salvage, and create a short-term barrier to fish passage.

Crossings constructed using either dry open-cut crossing method would release sediments after the dams are removed and natural waterbody flow returns. However, the sediments would readily dissipate to negligible levels in the downstream area in the vicinity of the crossing. As a result, the potential impact on aquatic habitat of using the dry crossing method is expected to be temporary to short-term and minor for each crossing.

Wet open-cut crossings can be completed more rapidly than dry crossing methods and would result in a shorter duration of instream disturbance than dry crossings. This method also would be used where dry methods and HDD are not permitted. Wet crossings would require implementation of the erosion and sediment control measures discussed above. Instream construction activities for wet crossing methods would be completed within 24 hours for minor surface waters (i.e., those less than or equal to 10 feet wide at the water's edge at the time of crossing), within 48 hours for intermediate surface waters (i.e., those greater than 10 feet wide but less than 100 feet wide at the water's edge at the time of crossing), and as specified in applicable permits or by the Applicant for major surface waters (greater than 100 feet wide at the time of crossing). The erosion and sedimentation control measures discussed above would be implemented during and after wet open-cut crossings, and disturbed areas at crossings would be restored and stabilized as soon as practical after pipeline installation. As a result, instream construction activities for wet open-cut crossings would cause short-term and minor impacts on aquatic habitat.

Guided bore crossings would be used at narrow wetlands and at shallow ditches adjacent to roads or railroads. Disturbance to the water in the ditch would be avoided because the guided bore method involves boring an auger from an excavated pit on one side of the ditch to an excavated pit on the other side. This method is not suitable in areas with a high water table, loose sand and gravel substrates, or steep slopes. It also requires excavations and ATWS on either side of the crossing and increases the potential for streambank subsidence; if dewatering is required, sediment release is possible. However, successful bore crossings would result in no impact on aquatic habitat.

HDD crossings would be used to avoid impacts on certain sensitive surface waters, such as impaired waters and coldwater fishery resources; particularly deep, wide, or high-flow surface waters; and where appropriate based on subsurface substrate conditions and length of the drill path. HDD crossings are advantageous because they do not disturb streambeds or streambanks and they maintain stream flow and fish passage. However, they require ATWS on both sides of the crossing, which involves vegetative clearing, soil disturbance, and subsequent restoration activities. Woody vegetation in riparian areas typically would not be cleared for the purpose of ATWS unless approved by appropriate regulatory agencies, as stipulated in permits issued for the Applicant’s preferred route (Appendix E). Installation of HDD crossings has the potential for inadvertent releases (discussed below). However, successful HDD crossings would cause no impact on aquatic habitat.

Degradation of Water Quality and Habitat from Drilling Mud Releases during HDD Crossings*.* When used in appropriate conditions and completed successfully, HDD Crossings have the potential to reduce the amount of sedimentation produced by conventional techniques (Golder 1998). Consequently, HDD can provide a cost effective and environmentally viable solution to water crossings. This appealing potential has encouraged its use in sensitive crossings such as wetlands and trout streams. Despite increased use over time a serious risk of inadvertent releases or “frac-outs” exists (Golder 1998).

Multiple conditions can lead to frac-outs, such as circulation losses when drilling into highly permeable gravels and inaccurate drilling of pilot holes. The amount of fluid released is related to variables such as the pressure exerted on the fluid by the hydraulic system. Finally, “the subsequent dispersion from the release point will then be a function of the energy, or sediment transport characteristics of the receiving waterbody” (Golder 1998).

Negative impacts from frac-outs include toxicity of drilling mud to aquatic organisms, the effects of spills or inadvertent releases of drilling fluid, and the disposal of drilling wastes. Slade (2000) reports “short-term effects of releasing drilling fluid into wetlands include temporary displacement of resident fauna, smothering of benthic organisms and plant root systems, increased turbidity of water quality, and effects on water chemistry and wetland hydrology.” A release can reduce densities and emergence of adult benthic invertebrates; change hydrological and soil conditions; change fish physiology, behavior, and habitat suitability; and cause long-term impacts on the aquatic ecosystem (Golder 1998). Slade (2000) also identifies additional environmental considerations for the drill rig set-up with respect to water resources and sensitive areas: containment and storage placement of raw fluids, water appropriation and water storage areas, delineation of the “no fueling” areas, and disposal of drilling fluid and cuttings upon completion.

It can be difficult to predict the probability of an occurrence. Yet loss of circulation is common in HDD operations. Longer crossings and HDDs passing through glacial tills, boulders and gravels, have a higher risk of failure. Slade (2000) studied a pipeline construction project from Stockbridge to Freedom Junction Michigan (Enbridge). This was a 35-mile, 16-inch crude petroleum pipeline using 11 HDDs to cross through wetlands, streams, and state recreational areas. Results determined multiple relatively minor releases requiring less clean up and two major frac-outs resulting in significant (volume, location, and ecology) issues.

It is important to consider the implications (on organisms, sediment, physical disturbance) of potential frac-outs and clean-up operations, identify the pros and cons of each type of crossing method, then match the appropriate technique to each crossing based on the site characteristics and conditions. Therefore, the Applicant would consider all of these factors when deciding what technique is applied to each site when using HDD[1] (see HDD contingency plan). The Applicant would follow BMPs to minimize potential impacts for all crossings during the Project.

Geotechnical surveys would be conducted to determine which surface waters to be crossed are geologically suitable for HDD. The Applicant has proposed HDD crossings at 19 locations (12 between Clearbrook and Carlton) to minimize construction impacts on certain surface waters (Table 6.3.1.2-27). The impact analysis includes the assumption that, if an HDD crossing has been proposed for a waterbody along the Applicant’s preferred route, the same construction method would be used if the same waterbody is crossed by a route alternative. Other HDD crossings for surface waters crossed by route alternatives would be determined and permitted prior to construction.

During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or “frac-out” of this drilling fluid to occur when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground or river bed surface. Although bentonite clay is non-toxic, drilling mud can smother aquatic wildlife and increase turbidity in affected surface waters. Additives may be mixed with the drilling fluids/mud for viscosity or lubricating reasons. Only non-hazardous additives approved under permit conditions would be used, and a Material Safety Data Sheet for the drilling fluid would be maintained onsite. If a frac-out occurred near the streambank, bank stability may be compromised. Construction personnel would monitor the crossing to detect releases of drilling mud.

The HDD operator would constantly monitor drilling fluid pressures during pilot hole operations and, if a loss in fluid pressure or circulation were identified, the operator would notify onsite construction observers who would visually monitor the portion of the drill path where the drill tool is located to determine whether a drilling mud release occurred. If a release occurred, the Applicant would implement containment, response, and clean-up procedures as outlined in the Applicant’s Environmental Protection Plan (Appendix E) to limit the potential for drilling mud to reach surface water. These procedures include containment using straw bales, sandbags, pumps and hoses, vacuum trucks; response activities, including adjusting drill rates and pump volumes or stopping drilling, removal of mud with pumps and appropriate storage away from the waterbody prior to disposal; and coordination with appropriate agencies to discuss additional containment or clean-up requirements. If the frac-out caused impacts on the streambank, the bank would be restored to the extent possible using the channel and streambank modification BMPs described above. Frac-outs would be reported to the Minnesota Duty Officer. If a frac-out occurred and went undetected or was not quickly contained, impacts on surface water quality could be long-term and major. However, with implementation of the Applicant-proposed measures to respond to a drilling mud release during HDD construction, the impact of a release could be short-term and minor.

Table 6.3.1.2-27. Proposed Horizontal Directional Drilling Crossings in Minnesota for the Applicant's Preferred Route and Route Alternatives

Waterbody	Milepost	Agency Designation	Minnesota PCA Classification	Route Option Crossing
North Dakota-Minnesota Border to Clearbrook				
Tamarac River	54.4	Section 303(d) impaired	1C, 2Bd, 3C	All routes
Middle River	62.3	NRI, Section 303(d) impaired	2B, 3C	All routes
Snake River	70.5	Public Water	2B, 3C	All routes
Red Lake River	91.9	NRI, Section 10	1C, 2Bd, 3C	All routes
Unnamed ditch	92.3	None	None	All routes
Clearwater River	103.0	Public Water, Section 303(d) impaired	2B, 3C	All routes
Red River of the North	ND 27.6	Public Water, Section 303(d) impaired, Section 10	1C, 2Bd,3C	All routes
Clearbrook to Carlton				
Clearwater River	149.5	Public Water, Section 303(d) impaired, NRI	2B, 3C	Applicant's preferred route; RA-03AM
Mississippi River	165.1	Public Water, Section 303(d) impaired	2B, 3C	Applicant's preferred route; RA-03AM
Hay Creek	187.8	Public Water, NRI, wild rice water	2B, 3C	Applicant's preferred route; RA-03AM
Straight River	198.3	Trout stream	1B, 2A, 3B	Applicant's preferred route; RA-03AM
Shell River	207.8	Wild rice water	2B, 3C	Applicant's preferred route
Unnamed stream/river perennial	209.5	Public Water	2B, 3C	Applicant's preferred route
Shell River	215.3	NRI	2B, 3C	Applicant's preferred route
Crow Wing River	317.4	Public Water, NRI	2B, 3C	Applicant's preferred route
Willow River	292.8	Public Water, NRI	2B, 3C	Applicant's preferred route
Mississippi River	296.7	Section 303(d) impaired, Section 10, Public Water	2B, 3C	Applicant's preferred route
Sandy River	305.9	Section 10, Public Water	2B, 3C	Applicant's preferred route
Sandy River	312.8	Public Water	2B, 3C	Applicant's preferred route

Source: Enbridge 2016a.

Notes:

No horizontal directional drilling is proposed to cross a surface water in the Carlton-to-Minnesota-Wisconsin border segment.

Minnesota PCA = Minnesota Pollution Control Agency, NRI = Nationwide Rivers Inventory

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications

Dry and wet open-cut waterbody crossing methods involve excavation of the streambed and potential changes to streambank stability and channel morphology. To minimize impacts on waterbodies, Minnesota Administrative Rules Part 6135.1100, Subp. 4 specifies that crossings should be placed at the narrowest section of a waterbody feasible; crossing of lakes should be avoided when possible, and they should be crossed under water (i.e., using guided bore or HDD) when necessary; and crossing on or under the beds of trout streams should be avoided unless there is no feasible alternative. The Applicant would adhere to these stipulations when feasible, and each waterbody crossing would be approved prior to construction.

As outlined in the Environmental Protection Plan (Appendix E), temporary erosion control measures would be implemented as necessary during waterbody crossing activities; and rock riprap, geotextile fabric, and other bioengineering techniques would be used to stabilize sites as needed. Following crossing construction, river beds and streambeds would be restored to preconstruction conditions, with no impediments to water flow; and streambanks would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. Finally, streambanks would be restored with appropriate vegetation. The use of open-cut crossings during pipeline construction would result in short-term to long-term and minor changes in channel morphology and streambank stability. Construction for HDD crossings would result in no impacts on channel morphology or streambank stability.

Disturbance of Wild Rice Waterbodies

Four wild rice waterbodies would be crossed by the Applicant's preferred route, with about 5 acres of the delineated waterbody basins within the construction work area. Construction would occur across the edge of the basins within the existing pipeline corridor but not through the wild rice stands on Mud Lake, Peterson Lake, and Portage Lake (Appendix A). In addition, some or all of the wild rice areas occur along the margins of larger waterbodies where the Applicant would use site-specific waterbody crossing techniques, including HDD. HDD would be used to cross the unnamed wild rice waterbody at Hay Creek and the Shell River within the existing pipeline corridor. At this location and at other sites where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs (see previous discussion of frac-outs).

Where HDD is not used, the wild rice waterbodies would be crossed using applicable wetland crossing methods for the water saturation conditions at the crossing (see Section 2.7.2 for a description of waterbody and wetland construction methods). Trenched crossing could remove the rice plants and disturb sediments, and could increase sedimentation within the remainder of the waterbody. Although the Applicant would restore the hydrology and soils of the affected wild rice waterbodies after construction, rice yield would be reduced in the portion of the waterbody directly affected by the repair or replacement activities for the first growing season after construction. To minimize impacts of construction through wild rice waterbodies, the Applicant would implement applicable measures identified in the Stream and River Crossing Requirements and Construction Methods in the Environmental Protection Plan (Appendix E). These plans contain measures to reduce or avoid impacts on wild rice during construction. Avoidance measures include use of a narrower construction work area, reseeding, monitoring, and use of timber mats, and incorporate any additional measures proposed by local and state agencies to reflect existing regional policies and procedures to protect wild rice. Two stands also would be monitored for overall condition, function, and vegetative regrowth after construction until the permit conditions are met.

Although not anticipated, construction-related impacts on wild rice waterbodies could include longer than expected recovery time for native wild rice stands (i.e., impacts could affect rice waterbodies beyond the first growing season after construction), introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions—all of which could be detrimental to wild rice germination and production. These potential impacts would be reduced through Project-specific SPCC plans, invasive species management plans, and post-construction monitoring of vegetation for a period of time until permit conditions are met, as described in the Applicant's Environmental Protection Plan (Appendix E). With implementation of these measures, impacts on wild rice waterbodies are expected to be short-term and minor. However, if HDD frac-out, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions occur as a result of construction, impacts could be major.

<u>Operations Impacts</u>

Runoff and Flows

Increases in Stormwater Runoff and Erosion. After the pipeline is installed, revegetation of the permanent right-of-way may require up to several years to reestablish to approximately preconstruction conditions, except in areas where new impervious surfaces are created, as addressed below. Runoff patterns along the non-impervious portions of the permanent right-of-way therefore would be altered during the first few years of operation, resulting in impacts of increased runoff and erosion that would be short-term and negligible to minor. After vegetation is reestablished along the permanent right-of-way, surface water runoff and erosion would return to approximately preconstruction conditions. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements. Runoff characteristics in areas where woody vegetation has been permanently removed would result in permanent and minor changes in runoff. These effects could be more pronounced in areas where forest habitat is removed and herbaceous vegetation used for revegetation.

Within Minnesota, expansion of the Clearbrook terminal, modification of three pump stations, construction of four new pump stations, and installation of 27 MLVs would add approximately 67 acres of impervious surfaces, with approximately 30.3 acres of that area between Clearbrook and Carlton. Stormwater retention ponds would be located at each pump station, consisting of an additional approximately 10 acres. The Applicant would be required to manage stormwater runoff at these new or expanded facilities in accordance with the stipulations of NPDES permits and SWPPPs as described above, which include the use of the stormwater retention ponds or other permanent stormwater controls. As a result, the potential impacts on surface water due to increased stormwater runoff from impervious surfaces would be permanent and negligible to minor.

During operation, the Applicant would implement their Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. This could result in topographical changes and loss of vegetation in localized areas for relatively short periods of time, which would alter runoff patterns and could increase erosion. The Applicant would implement measures to minimize impacts during and after these activities, similar to the measures incorporated into the Project during construction. As a result, the impacts of these integrity management activities on stormwater runoff and erosion would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. During the first few years of operation, there may be a small increase in surface water runoff and erosion as revegetation continues, potentially resulting in increases in TSS and sedimentation in nearby surface waters. The impact of this increase on surface waters would be short-term and negligible to minor. These effects could be more pronounced in areas where forest habitat is removed and herbaceous vegetation used for revegetation.

The pipeline right-of-way in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. The permanent removal of riparian vegetation within the permanent right-of-way in areas adjacent to waterbody crossings would result in localized alterations in habitat, streambank stability loss and erosion, and sedimentation. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify streambank areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements. With implementation of these measures, the impacts associated with the localized changes to topography or vegetation would result in short-term and minor impacts in the vicinity of the alteration.

During operation, the Applicant would implement their Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. This could result in topographical changes and loss of vegetation in localized areas for relatively short periods of time, which would alter runoff patterns and could increase erosion. The Applicant would implement measures to minimize impacts during and after these activities, similar to the measures incorporated into the Project during construction. As a result, the impacts of these integrity management activities would be similar to those experienced from construction, but over a much smaller area. The impacts on TSS and sedimentation in nearby surface waters would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project.

Changes in Stream Flows from Water Withdrawals and Discharges. Normal operation of the Applicant's preferred route would not require withdrawal or discharge of water. However, during repair or replacement of pipe as part of the Applicant's Integrity Management Program described above, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control are not defined. However, as described for pipeline construction, the Applicant would be required to obtain water appropriation and NPDES permits for testing procedures; and the volume of water would be substantially less than for construction. With adherence to permits and implementation of existing BMPs, alterations in stream flows from water appropriation and discharge would be temporary and negligible.

Disruption of Flow Paths or Local Hydrologic Connectivity. Integrity management digs would result in minor alterations of topography and stormwater flows at the excavation sites. With implementation of the Applicant-proposed measures described above to avoid changes to stormwater runoff and restore streambanks to their original attributes after work is completed, impacts on flow and hydrologic connectivity during in the areas excavated for pipe repair or replacement would be temporary to short-term and negligible to minor.

Permanent access roads during operation also could affect hydrologic connectivity. It is anticipated that permanent access roads would require local or state permits, which likely would require culverts to minimize the changes to hydrologic connectivity. Although the extent of the changes in those cases would depend on the topography of the area and the design of the roadway, the impact on hydrologic connectivity likely would be permanent and minor. For access roads without culverts, the extent of changes to hydrologic connectivity could be greater, again dependent on the topography of the area and the design of the roadway. Where those roadways are present, the impact on hydrologic connectivity likely would be permanent and minor.

Other permanent aboveground facilities, such as pump stations and MLVs, also would affect hydrologic connectivity. Due to the relatively small footprints of these facilities, it is anticipated that their presence would result in permanent but negligible to minor impacts.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. The pipeline right-of-way in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. The permanent removal of riparian vegetation in areas adjacent to waterbody crossings would allow more light to enter the waterbody and could cause long-term to permanent but negligible to minor increases in temperature and runoff characteristics at these locations.

During normal operation, there would be no other measurable changes to water quality in surface waters. Water quality is not anticipated to materially change in the surface waters of the basins and watershed along the route, including impaired surface waters.

Minor accidental fuel and lubricant leaks and spills could be related to maintenance and inspection vehicles. Any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures set forth in the Environmental Protection Plan (Appendix E). Thus, minor leaks and spills would result in temporary and negligible to minor impacts on surface water quality. The potential impacts of an unanticipated crude oil release on surface water quality are addressed in Chapter 10.

Degradation of Aquatic Habitat from Instream Activities. Instream excavations may be required to repair or replace pipe segments buried beneath surface waters. This would result in impacts similar to those described for surface water crossings. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would release sediments after the dams are removed and natural waterbody flow returns. However, the sediments would readily dissipate to negligible levels in the downstream area in the vicinity of the crossing. As a result, the potential impact on aquatic habitat of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and minor for each crossing.

If the wet open-cut method is used for integrity digs, the Applicant would implement the erosion and sediment control measures discussed above for construction of surface water crossings. These measures would be implemented during and after wet open-cut integrity digs; if streambanks are disturbed, they would be restored and stabilized as soon as practical after completion of the pipe repair or replacement. As a result, instream integrity dig activities for using the wet open-cut method would result in short-term and minor impacts on aquatic habitat.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications

Excavation and repair or replacement of pipe may be required within surface waters or at the banks of surface waters. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would involve backfilling of the trench, after the repair or replacement is made, to the approximate contours of the river or streambed. This could result in a minor temporary change in channel morphology until the natural sedimentation processes of the waterbody return the affected area to essentially match the nearby morphology. If streambanks are affected by the digs, they would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. After reestablishing the grade, streambanks would be restored with appropriate vegetation. As a result, the potential impact on channel morphology and stability of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and negligible to minor for each crossing.

Using the wet open-cut method for instream integrity digs may require a longer period of time for natural sedimentation processes to accomplish the same result. If streambanks are affected by the digs, they would be restored as described above. As a result, the potential impact on channel morphology and stability of using the wet open-cut method for instream integrity digs is expected to be short-term and minor for each crossing.

Disturbance of Wild Rice Waterbodies

The wild rice waterbodies crossed by HDD at Hay Creek and Shell River would not be affected during operations. Wild rice waterbodies crossed by other methods would not be affected by normal pipeline operation unless it is necessary to repair or replace a section of pipe within the waterbody as a part of the Applicant's Integrity Management Program. In that event, the impacts would be similar to those for the original crossing construction. Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity. It is likely that only a portion of the approximately 3 acres of wild rice waterbodies within the permanent right-of-way for the Applicant's preferred route would require repair or replacement at any one time; therefore, these activities could result in short-term and negligible to minor impacts. However, if replacement of a section of pipe within the waterbody resulted in the introduction of contaminants, invasive aquatic plants and non-native strains of wild rice, or altered lakebed conditions, then impacts could be major.

Route Alternatives (from Clearbrook to Carlton)

The types of activities that could result in impacts during construction and operation of the route alternatives would be essentially the same as those described for the Applicant's preferred route. As a result, some of those activities are briefly mentioned below, with more details provided in the previous sections on construction and operation.

Route Alternative RA-03AM

Route alternative RA-03AM is the longest of the route alternatives. It would be 436 miles in total, with 395 miles in Minnesota, of which 275 miles would be from Clearbrook to Carlton. The RA-03AM route would require 167 waterbody crossings from Clearbrook to Carlton. Although the route requires the largest number of waterbody crossings compared to the Applicant's preferred route and other route alternatives, it avoids the Minnesota Lakes region, thereby avoiding pipeline construction impacts on this region.

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the surface water ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. Clearing and grading would be required along the route alternative for construction of the pipeline, MLVs, new and expanded pump stations, and cathodic protection sites—as well as for access roads and ATWS, including pipe yards in Minnesota. Newly cleared areas and impervious surfaces could cause increased stormwater runoff and erosion into nearby surface waters; however, the Applicant would comply with the requirements of applicable permit programs that are in place to manage potential impacts, as addressed below.

If RA-03AM is selected, the Applicant would obtain NPDES permits for the pipeline, MLVs, pump stations, cathodic protection sites, access roads and ATWS, and pipe yards prior to construction. NPDES permits would specify various stormwater and erosion control measures to be implemented, such as requiring stormwater to be routed around exposed soil areas through conveyance channels and stormwater discharges to be directed from the site to vegetated areas in order to increase sediment removal and infiltrate stormwater on the site when feasible (Minnesota PCA 2013a). With compliance with NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, impacts associated with increases in stormwater runoff and erosion from clearing and grading during construction would be short-term and minor. For areas that will not be returned to preconstruction conditions the potential impact would be permanent and minor. These impacts are discussed further as operational impacts.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. In addition to clearing and grading, other construction activities such as blasting, trenching, waterbody crossings, ATWS and access road construction, and water discharges may cause increased suspended solids and sedimentation in the surface waters crossed. The Applicant-proposed measures for temporary erosion controls, SWPPP requirements, and NPDES permit requirements described for the Applicant's preferred route would be implemented during these activities to prevent sediment transport into surface waters during construction. During pipeline construction across a waterbody, the extent and duration of sedimentation and increased erosion potential depend on the soils, sediments, and topography of the crossing site and the proposed crossing method used.

RA-03AM would cross 167 surface waters; however, the specific crossing methods for surface waters have not been determined for the route. When using the dry crossing method, increases in TSS and sedimentation would be localized and temporary in surface waters crossed because construction of the pipeline across the waterbody would occur in a dry area created by the temporary dams upstream and downstream of the work area. TSS and sedimentation would increase when flow is returned to the dry channel but would readily dissipate to negligible levels downstream in the vicinity of the crossing. As a result, impacts would be temporary to short-term and minor.

Wet open-cut methods involve excavation of the channel and banks in the wetted channel, and excavated soils would be in direct contact with surface water. With adherence to NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, impacts from increases in TSS concentrations and increased sedimentation in surface waters crossed using open-cut wet crossings would be temporary to short-term and minor.

Changes in Stream Flows from Water Withdrawals and Discharges. Construction of RA-03AM would require water withdrawal for hydrostatic testing, dust control, trench dewatering, and HDD installation, which would be sourced from lakes, streams, or groundwater wells. Approximately 55 to 85 million gallons (11 to 17 million gallons for each of five construction spreads between Clearbrook and Carlton) would be required for hydrostatic testing. The Applicant has not determined the volume of water appropriation needed for dust control, trench dewatering, and HDD installation. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR.

As stipulated in permit requirements, the Applicant would select appropriation sites along RA-03AM that would meet Minnesota DNR's criteria of "doing no harm," and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources and must not adversely affect trout streams, calcareous fens, or other significant environmental resources.

Hydrostatic test water would be discharged from a test section in one of two ways, as described for the Applicant's preferred route. Discharges would adhere to all conditions set forth in NPDES and water appropriation permits, including discharge over approved energy dissipation measures (e.g., sand bags, plastic sheeting, or natural rock riprap) and the sedimentation control measures as described above. With adherence to water appropriation and NPDES permit conditions and implementation of Applicant-proposed measures, impacts on stream flows from water appropriation and discharge during construction would be temporary and minor.

Disruption of Flow Paths or Local Hydrologic Connectivity. As described for the Applicant's preferred route, pipeline construction may disrupt flow paths and groundwater-surface water interaction due to clearing and grading of riparian vegetation, water appropriation and discharge, and channel and streambank modifications caused by waterbody crossings. With implementation of measures similar to those described for the Applicant's preferred route to prevent erosion and sedimentation, to monitor stream flows during water appropriation and discharge, and to restore streambanks to their original attributes following construction, impacts on flow and hydrologic connectivity during construction of RA-03AM would be temporary to permanent and minor to major. Potential impacts that are permanent and major would be associated with specific site features that are sensitive to disruption of hydrologic connectivity. Springs and other surface water features that are dependent on shallow groundwater have the potential for permanent and major impacts.

In addition, construction would involve creation of temporary and permanent access roads, which could affect hydrologic connectivity. The Applicant would restore temporary access roads, including roads that were widened and graded, to preconstruction conditions upon completion of construction. The Applicant would leave any improved roads intact if requested by the respective landowner. Impacts on hydrologic connectivity associated with temporary access roads is expected to be short-term and negligible to minor, depending on the location of the roads. Impacts from permanent access roads are discussed in the operations section below.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. Because only minor increases in stormwater runoff would occur during construction, the potential for stormwater to carry contaminants into surface waters is low. Surface water along RA-03AM could become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. To protect surface water resources, NPDES permits for construction of the route would require secondary containment of hazardous materials, prohibition of engine degreasing at work sites, containment and collection of liquid and solid wastes, and a spill prevention and response plan for fueling and maintenance of vehicles (Minnesota PCA 2013b). Similar treatment/disposal or discharge measures to those described for the Applicant's preferred route would be necessary for handling concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing.

In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-03AM through procedures similar to those described in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route, including notifying proper personnel (e.g., the onsite spill coordinator) and agencies, stopping the work activity that caused the spill, using absorbent booms and pads to contain and recover released materials in water, and disposing of contaminated response materials at approved facilities.

In areas near sensitive or specially designated surface waters (e.g., the Clearwater River and trout streams), 100-foot buffers from the shoreline would be required during construction and as a permanent feature post-construction, except where a water crossing or other encroachment is necessary. For Section 303(d)-listed surface waters, which already have an impairment that prevents a beneficial use, degradation of water quality is of particular concern. NPDES permits for construction of RA-03AM would require identification of Section 303(d) waters with phosphorus, turbidity, dissolved oxygen, or biotic impairment within 1 mile of construction. If the impaired waters have an approved TMDL implementation plan, the plan must be incorporated into the SWPPP, and discharges must comply with specified TMDLs (Minnesota PCA 2013d). With adherence to these NPDES permit conditions and implementation of Applicant-proposed measures, impacts on surface water quality from small leaks and spills during construction would be temporary to short-term and negligible to minor.

Degradation of Aquatic Habitat from Instream Activities. Pipeline construction across surface waters has the potential to alter and degrade aquatic habitat through increased sedimentation and erosion, disruption or alteration of stream flow, and streambank disturbance. The specific crossing method for each crossing has not been determined for construction of RA-03AM but would be selected based on various factors, including waterbody size, sensitivity (e.g., trout stream), water levels, soil/sediment stability, and anticipated season of installation. If a route permit is issued for RA-03AM, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. Minnesota DNR would consider various factors, including geological, topographic, hydrographic, geotechnical, and scour depth characteristics of each crossing, after final pipeline design in determining their approval for specific waterbody crossing methods.

Similar to construction of the Applicant's preferred route, dry and wet open-crossing crossing methods would be used. Each method has advantages and disadvantages for minimizing potential impacts on aquatic habitats. Assuming that erosion and sedimentation control measures would be the same as those discussed above for the Applicant's preferred route, and that disturbed areas at crossings would be restored and stabilized as soon as practical after pipeline installation, using the dry or wet open-cut crossing methods would result in impacts on aquatic habitat that would be temporary to short-term and minor for each crossing.

If selected for certain crossings along RA-03AM (e.g., roads and ditches), successful guided bore crossings would result in no impacts on aquatic habitat, as described for the Applicant's preferred route. In addition, HDD crossings likely would be used to avoid impacts on certain sensitive surface waters such as impaired waters and coldwater fishery resources, and particularly deep, wide, or high-flow surface waters. The use of HDD crossings would be determined based on evaluations of subsurface substrate conditions and length of the drill path. HDD crossings are advantageous because they do not disturb streambeds or streambanks, and they maintain stream flow and fish passage. Construction of an HDD crossing is slower than a dry crossing, and there is the potential for inadvertent releases (discussed below). As described for the Applicant's preferred route, successful HDD crossings would result in no impacts on aquatic habitat during construction of RA-03AM.

Degradation of Water Quality and Habitat from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted along the route of RA-03AM to determine which surface waters would benefit from use of the HDD method and which of those surface waters are in areas that are geologically suitable for HDD. During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or frac-out of this drilling fluid when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground or river bed surface. Risk of HDD frac-out is discussed above in the assessment of impacts on surface water and aquatic habitat quality from the Applicant's preferred route. If a frac-out occurred during construction of RA-03AM and went undetected or was not quickly contained, impacts on surface water quality could be long-term and major. However, with implementation of measures similar to those described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-03AM, the impact of a release on surface water quality and streambank structure would be short-term and minor.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Dry and wet open-cut waterbody crossing methods involve excavation of the streambed and potential changes to streambank stability and channel morphology. To minimize impacts on surface waters, Minnesota regulations regarding water crossings would be considered for selecting RA-03AM crossing methods (Minn. R. 6135.1100, Subp. 4). These regulations specify that crossings should be placed at the narrowest section of a waterbody feasible; crossing of lakes should be avoided when possible, and they should be crossed under water when necessary; and crossing on or under the beds of trout streams should be avoided unless there is no feasible alternative. The Applicant would adhere to these stipulations when feasible, and each waterbody crossing would be approved prior to construction. Similar to construction of the Applicant's preferred route, temporary erosion control measures during construction of RA-03AM would be implemented as necessary during waterbody crossing activities; and rock riprap, geotextile fabric, and other bioengineering techniques would be used to stabilize sites as needed. Following crossing construction, river beds and streambeds would be restored to approximately preconstruction conditions, with no impediments to water flow, and streambanks would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. Finally, streambanks would be restored with appropriate vegetation.

The use of open-cut crossings for pipeline construction, along with the Applicant-proposed measures described above, would result in short-term to long-term and minor impacts on channel morphology and streambank stability. Successful construction of HDD crossings, where implemented for construction of RA-03AM, would result in no impacts on channel morphology or streambank stability.

Disturbance of Wild Rice Waterbodies. RA-03AM would cross about 8 acres of the six wild rice waterbodies crossed within the construction work area (see Table 6.3.1.2-11). Three of these crossings would be the same as for the Applicant's preferred route: Mud Lake, Hay Creek, and Portage Lake. Hayden Lake would be crossed at the basin inlet and Fox Lake would be crossed near the lake shoreline; both of these crossings would be within an existing pipeline corridor. Specific construction methods for crossing of wild rice waterbodies along RA-03AM have not been determined. Hay Creek would be crossed by the Applicant's preferred route using HDD. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs (see above for information on frac-outs).

Where HDD is not used, the wild rice waterbodies would be crossed using applicable wetland crossing methods for the water saturation conditions at the crossing (see Appendix E for a description of crossing methods). Trenching would remove the vegetation and sediments and increase sedimentation within the remainder of the waterbody. Although the Applicant would restore the hydrology and soils of the affected wild rice waterbodies after construction, rice yield could be reduced in the portion of the waterbody affected for the first growing season after construction. To minimize impacts of construction through wild rice waterbodies, the Applicant would implement applicable measures identified in the Applicant's Environmental Protection Plan (Appendix E). This plan would identify wild rice areas by milepost and contain specific measures to reduce or avoid impacts on wild rice during construction. Avoidance measures would include use of a narrower construction work area, reseeding, monitoring, and use of timber mats, and would incorporate any additional measures proposed by local and state agencies to reflect existing regional policies and procedures to protect wild rice. Wild rice stands also would be monitored for overall condition, function, and vegetative regrowth after construction until the permit conditions are met. As a result, construction through wild rice waterbodies would result in short-term minor impacts on wild rice waterbodies.

Although not anticipated, construction-related impacts on wild rice waterbodies could include longer than expected recovery time for native wild rice stands, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions—all of which could be detrimental to wild rice germination and production. These potential impacts would be reduced through Project-specific SPCC plans, invasive species management plans, and post-construction monitoring of vegetation for a period of time until permit conditions are met, as described in the Applicant's Environmental Protection Plan (Appendix E). With implementation of these measures, impacts on wild rice waterbodies are expected to be short-term and minor. However, if an HDD frac-out occurred, this could result in the introduction of contaminants, invasive aquatic plants, and non-native strains of wild rice, all considered long-term major impacts.

Operations Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. After the pipeline is installed, revegetation of the permanent right-of-way may require up to several years to reestablish to approximately preconstruction conditions, except for areas where new impervious surfaces are created as addressed below. Runoff patterns along the non-impervious portions of the permanent right-of-way therefore would be altered during the first few years of operation, resulting in impacts on runoff and erosion that would be short-term and negligible to minor. After vegetation is reestablished along the permanent right-of-way, surface water runoff and erosion would return to approximately preconstruction conditions. Areas of the permanent right-of-way that result in permanent vegetation changes, such as forested areas, would result in permanent changes to runoff conditions. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements.

The number, types, and locations of associated facilities that would be required for pipeline operation along each of the route alternatives have not been determined. However, based on the facility needs and spacing of the Applicant's preferred route, it was assumed that RA-03AM would require six pump stations and 23 MLVs. Assuming that approximately 8 acres are required for each pump station and 0.1 acre is required for each MLV, approximately 50 acres of newly impervious surfaces would be in place for RA-03AM for the life of the Project. The Applicant would be required to manage stormwater runoff at these new facilities in accordance with the stipulations of NPDES permits and SWPPPs as described above, which include the use of permanent stormwater control systems. As a result, the potential impacts on surface water due to increased stormwater runoff from impervious surfaces would be permanent and negligible to minor.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. This could result in topographical changes and loss of vegetation in localized areas for relatively short periods of time, which would alter runoff patterns and could increase erosion. The Applicant would implement measures to minimize impacts during and after these activities, similar to the measures incorporated into the Project during construction. As a result, the impacts of these integrity management activities on stormwater runoff and erosion would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. As described above, during the first few years of operation, there may be a small increase in surface water runoff and erosion as revegetation continues, resulting in short-term and negligible to minor impacts related to increases in TSS and sedimentation. Similar to the Applicant's preferred route, the permanent right-of-way for RA-03AM in upland areas would be maintained in an herbaceous vegetative state during operation to allow access for inspection, monitoring, and maintenance. The permanent removal of large woody vegetation also would result in permanent but minor and localized alterations in habitat, streambank stability loss and erosion, and sedimentation. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify streambank areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements. As a result, the impacts of these integrity management activities would be similar to those experienced from construction, but over a much smaller area. The impacts on

TSS and sedimentation in nearby surface waters would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project. In other portions of the permanent right-of-way, there would be a permanent but negligible impact related to increases in TSS and sediments in surface water.

Changes in Stream Flows from Water Withdrawals and Discharges. Normal operation of the route would not require withdrawal or discharge of water. However, during the repair or replacement of pipe as part of the Applicant's Integrity Management Program described above, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control are not defined. However, as described for pipeline construction, the Applicant would be required to obtain water appropriation and NPDES permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permits and implementation of existing BMPs, minor alterations in stream flows from water appropriation and discharge would be temporary and negligible.

Disruption of Flow Paths or Local Hydrologic Connectivity. Integrity management digs would result in minor alterations of topography and stormwater runoff flows at the excavation sites. With implementation of the Applicant-proposed measures described above to avoid changes to stormwater runoff and restore streambanks to their original attributes after work is completed, impacts on flow and hydrologic connectivity in the areas excavated for pipe repair or replacement would be temporary to short-term and negligible to minor.

Permanent access roads during operation also could affect hydrologic connectivity. It is anticipated that permanent access roads would require local or state permits, which likely would require culverts to minimize the changes to hydrologic connectivity. Although the extent of the changes in those cases would depend on the topography of the area and the design of the roadway, the impact on hydrologic connectivity likely would be permanent and minor. For access roads without culverts, the extent of changes to hydrologic connectivity could be greater, again dependent on the topography of the area and the design of the roadway. Where those roadways are present, the impact on hydrologic connectivity likely would be permanent and minor.

Other permanent aboveground facilities, such as pump stations and MLVs, also would affect hydrologic connectivity. Due to the relatively small footprints of these facilities, it is anticipated that their presence would result in permanent but negligible to minor impacts.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. The permanent right-of-way for RA-03AM in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. The permanent removal of riparian vegetation in areas adjacent to waterbody crossings would allow more light to enter the waterbody and could cause long-term to permanent but negligible to minor increases in temperature at these locations.

During normal operation, there would be no other measurable changes to water quality in surface waters. The minor changes within the major drainage basins and watersheds crossed by the route alternative would not result in degradation of the average watershed health score or water quality score. As a result, water quality would not be changed in the surface waters of the basins and watershed along the route, including impaired surface waters. Therefore, watershed surface water quality would not be affected during normal operation of the Project.

Minor fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles operating along RA-03AM. However, any refueling, fuel storage, or vehicle maintenance would follow measures similar to those in the Applicant's proposed Environmental Protection Plan (Appendix E). Thus, minor leaks and spills would result in negligible to minor and temporary impacts on surface water quality. The potential impacts of an unanticipated crude oil release are discussed in Chapter 10.

Degradation of Aquatic Habitat from Instream Activities. Instream excavations may be required to repair or replace pipe segments buried beneath surface waters. This would result in impacts similar to those described for surface water crossings. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would release sediments after the dams are removed and natural waterbody flow returns. However, the sediments would readily dissipate to negligible levels in the downstream area in the vicinity of the crossing. As a result, the potential impact on aquatic habitat of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and minor for each crossing.

If the wet open-cut method is used for integrity digs, the Applicant would implement the erosion and sediment control measures discussed above for construction of surface water crossings. These measures would be implemented during and after wet open-cut integrity digs; if streambanks are disturbed, they would be restored and stabilized as soon as practical after completion of the pipe repair or replacement. As a result, instream integrity dig activities using the wet open-cut method would result in short-term and minor impacts on aquatic habitat.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Excavation and repair or replacement of pipe may be required within surface waters or at the banks of surface waters. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve using one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would involve backfilling of the trench, after the repair or replacement is made, to the approximate contours of the river or streambed. This could result in a minor temporary change in channel morphology until the natural sedimentation processes of the waterbody return the affected area to essentially match the nearby morphology. If streambanks are affected by the digs, they would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. After reestablishing the grade, streambanks would be restored with appropriate vegetation. As a result, the potential impact on channel morphology and stability of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and negligible to minor for each crossing.

Use of the wet open-cut method for instream integrity digs may require a longer period of time for natural sedimentation processes to accomplish the same result. If streambanks are affected by the digs, they would be restored as described above. As a result, the potential impact on channel morphology and stability of using the wet open-cut method for instream integrity digs is expected to be short-term and minor for each crossing.

Disturbance of Wild Rice Waterbodies. During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described under construction impacts for the Applicant's preferred route. Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity. It is likely that only a portion of the approximately 3 acres of wild rice waterbodies within the permanent right-of-way would require repair or replacement at any one time; therefore, these activities could result in short-term and negligible to minor impacts. However, if replacement of a section of pipe within the waterbody resulted in the introduction of contaminants, a subsequent introduction of invasive aquatic plants and non-native strains of wild rice could occur, along with altered lakebed conditions, producing long-term and major impacts on wild rice waterbodies.

Route Alternative RA-06

Route alternative RA-06 would be 357 miles in total, with 317 miles in Minnesota, of which 197 miles would be from Clearbrook to Carlton. The RA-06 route would require 220 waterbody crossings in Minnesota and 137 from Clearbrook to Carlton. Because the RA-06 route is more northerly than the other route options, it avoids the Minnesota Lakes region and the Mississippi Headwaters. However, the route crosses 37 Lake Superior Basin waters, which are considered to be Outstanding International Resource Waters.

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the surface water ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. Clearing and grading would be required along the route alternative for construction of the pipeline, MLVs, new and expanded pump stations, and cathodic protection sites—as well as for access roads and ATWS, including pipe yards in Minnesota. Newly cleared areas and impervious surfaces could cause increased stormwater runoff and erosion into nearby surface waters; however, the Applicant would comply with the requirements of applicable permit programs that are in place to manage potential impacts as addressed below.

If RA-06 is selected, the Applicant would obtain NPDES permits for the pipeline, MLVs, pump stations, cathodic protection sites, access roads and ATWS, and pipe yards prior to construction. NPDES permits would specify various stormwater and erosion control measures to be implemented, such as requiring stormwater to be routed around exposed soil areas through conveyance channels and stormwater discharges to be directed from the site to vegetated areas in order to increase sediment removal and infiltrate stormwater on the site when feasible (Minnesota PCA 2013a). With compliance with NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, construction of the alternative would result in impacts related to stormwater runoff and erosion that would be temporary to long-term and minor.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. In addition to clearing and grading, other construction activities such as blasting, trenching, waterbody crossings, ATWS and access road construction, and water discharges may cause increased suspended solids and sedimentation in the surface waters crossed. The Applicant's temporary erosion controls, SWPPP requirements, and NPDES permit requirements described for the Applicant's preferred route would be implemented during these activities to prevent sediment transport into surface waters during construction. During pipeline construction across a waterbody, the extent and duration of sedimentation and increased erosion potential depend on the soils, sediments, and topography of the crossing site and the proposed crossing method used.

RA-06 would cross 137 surface waters; however, specific crossing methods for surface waters have not been determined for the route. When using the dry crossing method, increases in TSS and sedimentation would be localized and temporary in surface waters crossed because construction of the pipeline across the waterbody would occur in a dry area created by the temporary dams upstream and downstream of the work area. TSS and sedimentation would increase when flow is returned to the dry channel but would readily dissipate to negligible levels downstream in the vicinity of the crossing. As a result, impacts would be temporary to short-term and minor.

Wet open-cut methods involve excavation of the channel and banks in the wetted channel, and excavated soils would be in direct contact with surface water. With adherence to NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, impacts from increases in TSS concentrations and increased sedimentation in surface waters crossed using open-cut wet crossings would be temporary to short-term and minor.

Changes in Stream Flows from Water Withdrawals and Discharges. Construction of RA-06 would require water withdrawal for hydrostatic testing, dust control, trench dewatering, and HDD installation, which would be sourced from lakes, streams, or groundwater wells Approximately 44 to 68 million gallons of water (11 to 17 million gallons per construction spread) would be required for hydrostatic testing during construction of RA-06 between Clearbrook and Carlton. The Applicant has not determined the volume of water appropriation needed for dust control, trench dewatering, and HDD installation. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR.

As stipulated in permit requirements, the Applicant would select appropriation sites along RA-06 that would meet Minnesota DNR's criteria of "doing no harm," and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources and must not adversely affect trout streams, calcareous fens, or other significant environmental resources.

Hydrostatic test water would be discharged from a test section in one of two ways, as described for the Applicant's preferred route. Discharges would adhere to all conditions set forth in NPDES and water appropriation permits, including discharge over approved energy dissipation measures (e.g., sand bags, plastic sheeting, or natural rock riprap) and the sedimentation control measures as described above. With adherence to water appropriation and NPDES permit conditions and implementation of Applicant-proposed measures, impacts on stream flows from water appropriation and discharge during construction would be temporary and minor.

Disruption of Flow Paths or Local Hydrologic Connectivity. As described for the Applicant's preferred route, pipeline construction may disrupt flow paths and groundwater-surface water interaction due to clearing and grading of riparian vegetation, water appropriation and discharge, and channel and streambank modifications caused by waterbody crossings. With implementation of measures similar to those described for the Applicant's preferred route to prevent erosion and sedimentation, to monitor stream flows during water appropriation and discharge, and to restore streambanks to their original attributes following construction, impacts on flow and hydrologic connectivity during construction of RA-06 would be temporary to permanent and minor to major. Potential impacts that are permanent and major would be associated with specific site features that are sensitive to disruption of hydrologic connectivity. Springs and other surface water features that are dependent on shallow groundwater have the potential for permanent and major impacts.

In addition, construction would involve creation of temporary and permanent access roads, which could affect hydrologic connectivity. The Applicant would restore temporary access roads, including roads that were widened and graded, to preconstruction conditions upon completion of construction. The Applicant would leave any improved roads intact if requested by the respective landowner. Impacts on hydrologic connectivity associated with temporary access roads is expected to be short-term and negligible to minor, depending on the location of the roads. Impacts from permanent access roads are discussed in the operations section below.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. Because only minor increases in stormwater runoff would occur during construction, the potential for stormwater to carry contaminants into surface waters is low. Surface water along RA-06 could become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. However, to protect surface water resources, NPDES permits for construction of the route would require secondary containment of hazardous materials, prohibition of engine degreasing at work sites, containment and collection of liquid and solid wastes, and a spill prevention and response plan for fueling and maintenance of vehicles (Minnesota PCA 2013b). Similar treatment/disposal or discharge measures to those described for the Applicant's preferred route would be necessary for handling concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing.

In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-06 through procedures similar to those described in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route, including notifying proper personnel (e.g., the onsite spill coordinator) and agencies, stopping the work activity that caused the spill, using absorbent booms and pads to contain and recover released materials in water, and disposing of contaminated response materials at approved facilities.

In areas near sensitive or specially designated surface waters (e.g., the Clearwater River and trout streams), 100-foot buffers from the shoreline would be required during construction and as a permanent feature post-construction, except where a water crossing or other encroachment is necessary. For Section 303(d)-listed surface waters, which already have an impairment that prevents a beneficial use, degradation of water quality is of particular concern. NPDES permits for construction of RA-06 would require identification of Section 303(d) waters with phosphorus, turbidity, dissolved oxygen, or biotic impairment within 1 mile of construction. If the impaired waters have an approved TMDL implementation plan, the plan must be incorporated into the SWPPP, and discharges must comply with specified TMDLs (Minnesota PCA 2013d). With adherence to these NPDES permit conditions and implementation of Applicant-proposed measures, impacts on surface water quality from small leaks and spills during construction would be temporary to short-term and negligible to minor.

Degradation of Aquatic Habitat from Instream Construction Activities. Pipeline construction across surface waters has the potential to alter and degrade aquatic habitat through increased sedimentation and erosion, disruption or alteration of stream flow, and streambank disturbance. Crossing methods have not been determined for construction of RA-06 but would be selected based on various factors, including waterbody size, sensitivity (e.g., trout stream), water levels, soil/sediment stability, and anticipated season of installation. If a route permit is issued for RA-06, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. Minnesota DNR would consider various factors, including geological, topographic, hydrographic, geotechnical, and scour depth characteristics of each crossing, after final pipeline design in determining their approval for specific waterbody crossing methods.

Similar to construction of the Applicant's preferred route, dry and wet open-crossing crossing methods would be used. Each method has advantages and disadvantages for minimizing potential impacts on aquatic habitats. Assuming that erosion and sedimentation control measures would be the same as those discussed above for the Applicant's preferred route, and that disturbed areas at crossings would be restored and stabilized as soon as practical after pipeline installation, using the dry open-cut crossing method would result in impacts on aquatic habitat that would be temporary to short-term and minor for each crossing. For the wet open-cut method, the impact on aquatic habitat would be short-term to long-term and minor.

If selected for certain crossings along RA-06 (e.g., roads and ditches), successful guided bore crossings would result in no impacts on aquatic habitat, as described for the Applicant's preferred route. In addition, HDD crossings likely would be used to avoid impacts on certain sensitive surface waters, such as impaired waters and coldwater fishery resources; particularly deep, wide, or high-flow surface waters; and when appropriate based on subsurface substrate conditions and length of the drill path. HDD crossings are advantageous because they do not disturb streambeds or streambanks, and they maintain stream flow and fish passage. Construction of an HDD crossing is slower than a dry crossing, and there is the potential for inadvertent releases (discussed below). As described for the Applicant's preferred route, successful HDD crossings would result in no impacts on aquatic habitat during construction of RA-06.

Degradation of Water Quality and Habitat from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted along the route of RA-06 to determine which surface waters would benefit from use of the HDD method and which of those surface waters are in areas that are geologically suitable for HDD. During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or frac-out of this drilling fluid when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground or river bed surface. Risk of HDD frac-out is discussed above in the assessment of impacts on surface water and aquatic habitat quality from the Applicant's preferred route. If a frac-out occurred during construction of RA-06 and went undetected or was not quickly contained, impacts on surface water quality could be long-term and major. However, with implementation of measures similar to those described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-06, the impact of a release on surface water quality and streambank structure would be short-term and minor.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Dry and wet open-cut waterbody crossing methods involve excavation of the streambed and potential changes to streambank stability and channel morphology. To minimize impacts on surface waters, Minnesota regulations regarding water crossings would be considered for selecting RA-06 crossing methods (Minn. R. 6135.1100, Subp. 4). These regulations specify that crossings should be placed at the narrowest section of a waterbody feasible; crossing of lakes should be avoided when possible, and they should be crossed under water when necessary; and crossing on or under the beds of trout streams should be avoided unless there is no feasible alternative. The Applicant would adhere to these stipulations when feasible, and each waterbody crossing would be approved prior to construction. Similar to construction of the Applicant's preferred route, temporary erosion control measures during construction of RA-06 would be implemented as necessary during waterbody crossing activities; and rock riprap, geotextile fabric, and other bioengineering techniques would be used to stabilize sites as needed. Following crossing construction, river beds and streambeds would be restored to approximately preconstruction conditions, with no impediments to water flow, and streambanks would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. Finally, streambanks would be restored with appropriate vegetation.

The use of open-cut crossings for pipeline construction, along with the Applicant-proposed measures described above, would result in short-term to long-term and minor impacts on channel morphology and streambank stability. Successful construction of HDD crossings, where implemented for construction of RA-06, would result in no impacts on channel morphology or streambank stability.

Disturbance of Wild Rice Waterbodies. RA-06 would cross about 11 acres of the wild rice waterbodies within the construction work area (see Table 6.3.1.2-15). Specific construction methods for crossing of wild rice waterbodies along RA-06 have not been determined. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs (see above for information on frac-outs).

Where HDD is not used, the wild rice waterbodies would be crossed using applicable wetland crossing methods for the water saturation conditions at the crossing (see Section 2.7.2 for a description of crossing methods). Trenching would remove the vegetation cover and sediments and increase sedimentation within the remainder of the waterbody. Although the Applicant would restore the hydrology and soils of the affected wild rice waterbodies after construction, rice yield could be reduced in the portion of the waterbody affected for the first growing season after construction. To minimize impacts of construction through wild rice waterbodies, the Applicant would implement applicable measures identified in the Applicant's Environmental Protection Plan (Appendix E). This plan would identify wild rice areas by milepost and contain specific measures to reduce or avoid impacts on wild rice during construction. Avoidance measures would include use of a narrower construction work area, reseeding, monitoring, and use of timber mats, and would incorporate any additional measures proposed by local and state agencies to reflect existing regional policies and procedures to protect wild rice. Wild rice stands also would be monitored for overall condition, function, and vegetative regrowth after construction until the permit conditions are met. As a result, construction through wild rice waterbodies using the wet open-cut crossing method would result in short-term and minor impacts on wild rice waterbodies.

Although not anticipated, construction-related impacts on wild rice waterbodies could include longer than expected recovery time for native wild rice stands, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions—all of which could be detrimental to wild rice germination and production. These potential impacts would be reduced through Project-specific SPCC plans, invasive species management plans, and post-construction monitoring of vegetation for a period of time until permit conditions are met, as described in the Applicant's Environmental Protection Plan (Appendix E). With implementation of these measures, impacts on wild rice waterbodies are expected to be short-term and minor. However, if an HDD frac-out occurred, this could result in the introduction of contaminants, invasive aquatic plants, and non-native strains of wild rice, all considered long-term and major impacts.

Operations Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. After the pipeline is installed, revegetation of the permanent right-of-way may require up to several years to reestablish to approximately preconstruction conditions, except for areas where new impervious surfaces are created, as addressed below. Runoff patterns along the non-impervious portions of the permanent right-of-way therefore would be altered during the first few years of operation, resulting in impacts on runoff and erosion that would be short-term and negligible to minor. After vegetation is reestablished along the permanent right-of-way, surface water runoff and erosion would return to approximately preconstruction conditions. Areas of the permanent right-of-way that result in permanent vegetation changes, such as forested areas, would result in permanent changes to runoff conditions. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements.

The number, types, and locations of associated facilities that would be required for pipeline operation along each of the route alternatives have not been determined. However, based on the facility needs and spacing of the Applicant's preferred route, it was assumed that RA-06 would require four pump stations and 16 MLVs. Assuming that approximately 8 acres are required for each pump station and 0.1 acre is required for each MLV, approximately 34 acres of newly impervious surfaces would be in place for RA-06 for the life of the Project. The Applicant would be required to manage stormwater runoff at these new facilities in accordance with the stipulations of NPDES permits and SWPPPs, as described above, which include the use of permanent stormwater control systems. As a result, the potential impacts on surface water due to increased stormwater runoff from impervious surfaces would be permanent and negligible to minor.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. This could result in topographical changes and loss of vegetation in localized areas for relatively short periods of time, which would alter runoff patterns and could increase erosion. The Applicant would implement measures to minimize impacts during and after these activities, similar to the measures incorporated into the Project during construction. As a result, the impacts of these integrity management activities on stormwater runoff and erosion would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. As described above, during the first few years of operation, there may be a small increase in surface water runoff and erosion as revegetation continues, resulting in short-term and negligible to minor impacts related to increases in TSS and sedimentation. Similar to the Applicant's preferred route, the permanent right-of-way for RA-06 in upland areas would be maintained in an herbaceous vegetative state during operation to allow access for inspection, monitoring, and maintenance. The permanent removal of large woody vegetation also would result in permanent but minor and localized alterations in habitat, streambank stability loss and erosion, and sedimentation. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify streambank areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements. As a result, the impacts of these integrity management activities would be similar to those experienced from construction, but over a much smaller area. The impacts on TSS and sedimentation in nearby surface waters would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project. In other portions of the permanent right-of-way, there would be a permanent but negligible impact related to increases in TSS and sediments in surface water.

Changes in Stream Flows from Water Withdrawals and Discharges. Normal operation of the route would not require withdrawal or discharge of water. However, during the repair or replacement of pipe as part of the Applicant's Integrity Management Program described above, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control are not defined. However, as described for pipeline construction, the Applicant would be required to obtain water appropriation and NPDES permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permits and implementation of existing BMPs, minor alterations in stream flows from water appropriation and discharge would be temporary and negligible.

Disruption of Flow Paths or Local Hydrologic Connectivity. Integrity management digs would result in minor alterations of topography and stormwater flows at the excavation sites. With implementation of the Applicant-proposed measures described above to avoid changes to stormwater runoff and restore streambanks to their original attributes after work is completed, impacts on flow and hydrologic connectivity during in the areas excavated for pipe repair or replacement would be temporary to short-term and negligible to minor.

Permanent access roads during operation also could affect hydrologic connectivity. It is anticipated that permanent access roads would require local or state permits, which likely would require culverts to minimize the changes to hydrologic connectivity. Although the extent of the changes in those cases would depend on the topography of the area and the design of the roadway, the impact on hydrologic connectivity likely would be permanent and minor. For access roads without culverts, the extent of changes to hydrologic connectivity could be greater, again dependent on the topography of the area and the design of the roadway. Where those roadways are present, the impact on hydrologic connectivity likely would be permanent and minor.

Other permanent aboveground facilities, such as pump stations and MLVs, also would affect hydrologic connectivity. Due to the relatively small footprints of these facilities, it is anticipated that their presence would result in permanent but negligible to minor impacts.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. The permanent right-of-way of RA-06 in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. The permanent removal of riparian vegetation in areas adjacent to waterbody crossings would allow more light to enter the waterbody and could cause long-term to permanent but negligible to minor increases in temperature at these locations.

During normal operation, there would be no other measurable changes to water quality in surface waters. The minor changes within the major drainage basins and watersheds crossed by the route alternative would not result in degradation of the average watershed health score or water quality score. As a result, water quality would not be changed in the surface waters of the basins and watershed along the route, including impaired surface waters. Therefore, watershed surface water quality would not be affected during normal operation of the Project.

Minor fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles operating along RA-06. However, any refueling, fuel storage, or vehicle maintenance would follow measures similar to those in the Applicant's proposed Environmental Protection Plan (Appendix E). Thus, minor leaks and spills would result in negligible to minor and temporary impacts on surface water quality. The potential impacts of an unanticipated crude oil release are discussed in Chapter 10.

Degradation of Aquatic Habitat from Instream Activities. Instream excavations may be required to repair or replace pipe segments buried beneath surface waters. This would result in impacts similar to those described for surface water crossings. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would release sediments after the dams are removed and natural waterbody flow returns. However, the sediments would readily dissipate to negligible levels in the downstream area in the vicinity of the crossing. As a result, the potential impact on aquatic habitat of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and minor for each crossing.

If the wet open-cut method is used for integrity digs, the Applicant would implement the erosion and sediment control measures discussed above for construction of surface water crossings. These measures would be implemented during and after wet open-cut integrity digs; if streambanks are disturbed, they would be restored and stabilized as soon as practical after completion of the pipe repair or replacement. As a result, instream integrity dig activities for using the wet open-cut method would result in short-term and minor impacts on aquatic habitat.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Excavation and repair or replacement of pipe may be required within surface waters or at the banks of surface waters. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would involve backfilling of the trench, after the repair or replacement is made, to the approximate contours of the river or streambed. This could result in a minor temporary change in channel morphology until the natural sedimentation processes of the waterbody return the affected area to essentially match the nearby morphology. If streambanks are affected by the digs, they would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. After reestablishing the grade, streambanks would be restored with appropriate vegetation. As a result, the potential impact on channel morphology and stability of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and negligible to minor for each crossing.

Using the wet open-cut method for instream integrity digs may require a longer period of time for natural sedimentation processes to accomplish the same result. If streambanks are affected by the digs, they would be restored as described above. As a result, the potential impact on channel morphology and stability of using the wet open-cut method for instream integrity digs is expected to be short-term and minor for each crossing.

Disturbance of Wild Rice Waterbodies. During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described under construction impacts for the Applicant's preferred route. Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity. It is likely that only a portion of the approximately 4 acres of wild rice waterbodies within the permanent right-of-way would require repair or replacement at any one time; therefore, these activities could result in short-term and negligible to minor impacts. However, if replacement of a section of pipe within the waterbody resulted in, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions, then impacts could be long term and major.

Route Alternative RA-07

Route alternative RA-07 would be 328 miles in total, with 288 miles in Minnesota, of which 168 miles would be from Clearbrook to Carlton. The RA-07 route would require 164 waterbody crossings in Minnesota and 81 from Clearbrook to Carlton. RA-07 requires the fewest number of waterbody crossings. However, surface waters would be affected by the construction activities associated with removal of the existing Line 3 pipeline and installation of the new pipeline in the same trench. Removal and replacement would require a 205-foot-wide construction work area with all or almost all of the construction work area within the permanent right-of-way for the Enbridge Mainline and the previous construction work area for the Alberta Clipper pipeline.

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the surface water ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. Clearing and grading would be required along the route alternative for construction of the pipeline, MLVs, new and expanded pump stations, and cathodic protection sites—as well as for access roads and ATWS, including pipe yards in Minnesota. Newly cleared areas and impervious surfaces could cause increased stormwater runoff and erosion into nearby surface waters from the wider construction work area; however, the Applicant would comply with the requirements of applicable permit programs that are in place to manage potential impacts as addressed below.

If RA-07 is selected, the Applicant would obtain NPDES permits for the pipeline, MLVs, pump stations, cathodic protection sites, access roads and ATWS, and pipe yards prior to construction. NPDES permits would specify various stormwater and erosion control measures to be implemented, such as requiring stormwater to be routed around exposed soil areas through conveyance channels and stormwater discharges to be directed from the site to vegetated areas in order to increase sediment removal and infiltrate stormwater on the site when feasible (Minnesota PCA 2013a). With compliance with NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, construction of the route alternative would result in impacts on stormwater runoff and erosion that would be temporary to long-term and minor.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. In addition to clearing and grading, other construction activities such as blasting, trenching, waterbody crossings, ATWS and access road construction, and water discharges may cause increased suspended solids and sedimentation in the surface waters crossed. The Applicant's temporary erosion controls, SWPPP requirements, and NPDES permit requirements described for the Applicant's preferred route would be implemented during these activities to prevent sediment transport into surface waters during construction. During pipeline construction across a waterbody, the extent and duration of sedimentation and increased erosion potential depend on the soils, sediments, and topography of the crossing site and the proposed crossing method used.

RA-07 would cross 81 surface waters; however, specific crossing methods for surface waters have not been determined for the route. When using the dry crossing method, increases in TSS and sedimentation would be localized and temporary in surface waters crossed because construction of the pipeline across the waterbody would occur in a dry area created by the temporary dams upstream and downstream of the work area. TSS and sedimentation would increase when flow is returned to the dry channel but would readily dissipate to negligible levels downstream in the vicinity of the crossing. As a result, impacts would be temporary to short-term and minor.

Wet open-cut methods involve excavation of the channel and banks in the wetted channel, and excavated soils would be in direct contact with surface water. With adherence to NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, impacts from increases in TSS concentrations and increased sedimentation in surface waters crossed using open-cut wet crossings would be temporary to short-term and minor.

Changes in Stream Flows from Water Withdrawals and Discharges. Construction of RA-07 would require water withdrawal for hydrostatic testing, dust control, trench dewatering, and HDD installation, which would be sourced from lakes, streams, or groundwater wells. Approximately 44 to 68 million gallons of water (11 to 17 million gallons per construction spread) would be required for hydrostatic testing during construction between Clearbrook and Carlton. The Applicant has not determined the volume of water appropriation needed for dust control, trench dewatering, and HDD installation. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR.

As stipulated in permit requirements, the Applicant would select appropriation sites along RA-07 that would meet Minnesota DNR's criteria of "doing no harm," and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources and must not adversely affect trout streams, calcareous fens, or other significant environmental resources.

Hydrostatic test water would be discharged from a test section in one of two ways, as described for the Applicant's preferred route. Discharges would adhere to all conditions set forth in NPDES and water appropriation permits, including discharge over approved energy dissipation measures (e.g., sand bags, plastic sheeting, or natural rock riprap) and the sedimentation control measures as described above. With adherence to water appropriation and NPDES permit conditions and implementation of Applicant-proposed measures, impacts on stream flows from water appropriation and discharge during construction would be temporary and minor.

Disruption of Flow Paths or Local Hydrologic Connectivity. As described for the Applicant's preferred route, pipeline construction may disrupt flow paths and groundwater-surface water interaction due to clearing and grading of riparian vegetation, water appropriation and discharge, and channel and streambank modifications caused by waterbody crossings. With implementation of measures similar to those described for the Applicant's preferred route to prevent erosion and sedimentation, to monitor stream flows during water appropriation and discharge, and to restore streambanks to their original attributes following construction, impacts on flow and hydrologic connectivity during construction of RA-07 would be temporary to permanent and minor to major. Potential impacts that are permanent and major would be associated with specific site features that are sensitive to disruption of hydrologic connectivity. Springs and other surface water features that are dependent on shallow groundwater have the potential for permanent and major impacts.

In addition, construction would involve creation of temporary and permanent access roads, which could affect hydrologic connectivity. The Applicant would restore temporary access roads, including roads that were widened and graded, to preconstruction conditions upon completion of construction. The Applicant would leave any improved roads intact if requested by the respective landowner. Impacts on hydrologic connectivity associated with temporary access roads is expected to be short-term and negligible to minor, depending on the location of the roads. Impacts from permanent access roads are discussed in the operations section below.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. Because only minor increases in stormwater runoff would occur during construction, the potential for stormwater to carry contaminants into surface waters is low. Surface water along RA-07 could become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. However, to protect surface water resources, NPDES permits for construction of the route would require secondary containment of hazardous materials, prohibition of engine degreasing at work sites, containment and collection of liquid and solid wastes, and a spill prevention and response plan for fueling and maintenance of vehicles (Minnesota PCA 2013b). Similar treatment/disposal or discharge measures to those described for the Applicant's preferred route would be necessary for handling concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing.

In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-07 through procedures similar to those described in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route, including notifying proper personnel (e.g., the onsite spill coordinator) and agencies, stopping the work activity that caused the spill, using absorbent booms and pads to contain and recover released materials in water, and disposing of contaminated response materials at approved facilities.

In areas near sensitive or specially designated surface waters (e.g., the Clearwater River and trout streams), 100-foot buffers from the shoreline would be required during construction and as a permanent feature post-construction, except where a water crossing or other encroachment is necessary. For Section 303(d)-listed surface waters, which already have an impairment that prevents a beneficial use, degradation of water quality is of particular concern. NPDES permits for construction of RA-03AM would require identification of Section 303(d) waters with phosphorus, turbidity, dissolved oxygen, or biotic impairment within 1 mile of construction. If the impaired waters have an approved TMDL implementation plan, the plan must be incorporated into the SWPPP, and discharges must comply with specified TMDLs (Minnesota PCA 2013d). With adherence to these NPDES permit conditions and implementation of Applicant-proposed measures, impacts on surface water quality from small leaks and spills during construction would be temporary to short-term and negligible to minor.

Degradation of Aquatic Habitat from Instream Construction Activities. Pipeline construction across surface waters has the potential to alter and degrade aquatic habitat through increased sedimentation and erosion, disruption or alteration of stream flow, and streambank disturbance. Crossing methods have not been determined for construction of RA-07 but would be selected based on various factors, including waterbody size, sensitivity (e.g., trout stream), water levels, soil/sediment stability, and anticipated season of installation. If a route permit is issued for RA-07, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. Minnesota DNR would consider various factors, including geological, topographic, hydrographic, geotechnical, and scour depth characteristics of each crossing, after final pipeline design in determining their approval for specific waterbody crossing methods.

Similar to construction of the Applicant's preferred route, dry and wet open-crossing crossing methods would be used. Each method has advantages and disadvantages for minimizing potential impacts on aquatic habitats. Assuming that erosion and sedimentation control measures would be the same as those discussed above for the Applicant's preferred route, and that disturbed areas at crossings would be restored and stabilized as soon as practical after pipeline installation, using the dry and wet open-cut crossing methods would result in impacts on aquatic habitat that would be temporary to short-term and minor for each crossing.

If selected for certain crossings along RA-07 (e.g., roads and ditches), successful guided bore crossings would result in no impacts on aquatic habitat, as described for the Applicant's preferred route. In addition, HDD crossings likely would be used to avoid impacts on certain sensitive surface waters, such as impaired waters and coldwater fishery resources; particularly deep, wide, or high-flow surface waters; and when appropriate based on subsurface substrate conditions and length of the drill path. HDD crossings are advantageous because they do not disturb streambeds or streambanks, and they maintain stream flow and fish passage. Construction of an HDD crossing is slower than a dry crossing, and there is the potential for inadvertent releases (discussed below). As described for the Applicant's preferred route, successful HDD crossings would result in no impacts on aquatic habitat during construction of RA-07.

Degradation of Water Quality and Habitat from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted along the route of RA-07 to determine which surface waters would benefit from use of the HDD method and which of those surface waters are in areas that are geologically suitable for HDD. During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or frac-out of this drilling fluid when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground or river bed surface. Risk of HDD frac-out is discussed above in the assessment of impacts on surface water and aquatic habitat quality from the Applicant's preferred route. If a frac-out occurred during construction of RA-07 and went undetected or was not quickly contained, impacts on surface water quality could be long-term and major. However, with implementation of measures similar to those described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-07, the impact of a release on surface water quality and streambank structure would be short-term and minor.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Dry and wet open-cut waterbody crossing methods involve excavation of the streambed and potential changes to streambank stability and channel morphology. To minimize impacts on surface waters, Minnesota regulations regarding water crossings would be considered for selecting RA-07 crossing methods (Minn. R. 6135.1100, Subp. 4). These regulations specify that crossings should be placed at the narrowest section of a waterbody feasible; crossing of lakes should be avoided when possible, and they should be crossed under water when necessary; and crossing on or under the beds of trout streams should be avoided unless there is no feasible alternative. The Applicant would adhere to these stipulations when feasible, and each waterbody crossing would be approved prior to construction. Similar to construction of the Applicant's preferred route, temporary erosion control measures during construction of RA-07 would be implemented as necessary during waterbody crossing activities; and rock riprap, geotextile fabric, and other bioengineering techniques would be used to stabilize sites as needed. Following crossing construction, river beds and streambeds would be restored to approximately preconstruction conditions, with no impediments to water flow, and streambanks would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. Finally, streambanks would be restored with appropriate vegetation.

The use of open-cut crossings for pipeline construction, along with the mitigation measures described above, would result in short-term to long-term minor impacts on channel morphology and streambank stability. Successful construction of HDD crossings, where implemented for construction of RA-07, would result in no impacts on channel morphology or streambank stability.

Disturbance of Wild Rice Waterbodies. RA-07 would cross about 6 acres of wild rice waterbodies within the construction work area at only a single waterbody (White Oak Lake) (see Table 6.3.1.2-20). Specific construction methods for crossing of wild rice waterbodies along RA-07 have not been determined. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs (see above for information on frac-outs).

Where HDD is not used, the wild rice waterbodies would be crossed using applicable wetland crossing methods for the water saturation conditions at the crossing (see Section 2.7.2 for a description of the crossing methods). Trenching would remove the vegetation cover and sediments and increase sedimentation within the remainder of the waterbody. Although the Applicant would restore the hydrology and soils of the affected wild rice waterbodies after construction, rice yield could be reduced in the portion of the waterbody affected for the first growing season after construction. To minimize impacts of construction through wild rice waterbodies, the Applicant would implement applicable measures identified in the Applicant's Environmental Protection Plan (Appendix E). This plan would identify wild rice areas by milepost and contain specific measures to reduce or avoid impacts on wild rice during construction. Avoidance measures would include use of a narrower construction work area, reseeding, monitoring, and use of timber mats, and would incorporate any additional measures proposed by local and state agencies to reflect existing regional policies and procedures to protect wild rice. Wild rice stands also would be monitored for overall condition, function, and vegetative regrowth after construction until the permit conditions are met. As a result, construction through wild rice waterbodies using the wet open-cut crossing method would result in short-term and minor impacts on wild rice waterbodies.

Although not anticipated, construction-related impacts on wild rice waterbodies could include longer than expected recovery time for native wild rice stands, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions—all of which could be detrimental to wild rice germination and production. These potential impacts would be reduced through Project-specific SPCC plans, invasive species management plans, and post-construction monitoring of vegetation for a period of time until permit conditions are met, as described in the Applicant's Environmental Protection Plan (Appendix E). With implementation of these measures, impacts on wild rice waterbodies are expected to be short-term and minor. However, if an HDD frac-out occurred, this could result in the introduction of contaminants, invasive aquatic plants, and non-native strains of wild rice, all considered long-term and major impacts. This effect could be pronounced throughout White Oak Lake due to the corridor's crossing at the stream's inlet into the lake basin.

Operations Impacts

Runoff and Flows

<u>Increases in Stormwater Runoff and Erosion</u>. After the pipeline is installed, revegetation of the permanent right-of-way may require up to several years to reestablish to approximately preconstruction conditions, except for areas where new impervious surfaces are created as addressed below. Runoff patterns along the non-impervious portions of the permanent right-of-way would therefore be altered during the first few years of operation, resulting in impacts on runoff and erosion that would be short-term and negligible to minor. After vegetation is reestablished along the permanent right-of-way, surface water runoff and erosion would return to approximately preconstruction conditions. Areas of the permanent right-of-way that result in permanent vegetation changes, such as forested areas, would result in permanent changes to runoff conditions. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements.

The number, types, and locations of associated facilities that would be required for pipeline operation along each of the route alternatives have not been determined. However, based on the facility needs and spacing of the Applicant's preferred route, it was assumed that RA-07 would require upgrading of existing pump stations along the Applicant's existing Line 3 corridor and 14 MLVs. Assuming that approximately 8 acres are required for each pump station and 0.1 acre is required for each MLV, approximately 1 acre of newly impervious surfaces would be in place for RA-07 for the life of the Project. The Applicant would be required to manage stormwater runoff at these new facilities in accordance with the stipulations of NPDES permits and SWPPPs as described above, which include the use of permanent stormwater control systems. As a result, potential impacts on surface water due to increased stormwater runoff from impervious surfaces would be permanent and negligible to minor.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. This could result in topographical changes and loss of vegetation in localized areas for relatively short periods of time, which would alter runoff patterns and could increase erosion. The Applicant would implement measures to minimize impacts during and after these activities, similar to the measures incorporated into the Project during construction. As a result, the impacts of these integrity management activities on stormwater runoff and erosion would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project.

<u>Increases in Total Suspended Solids Concentrations and Increased Sedimentation</u>. As described above, during the first few years of operation, there may be a small increase in surface water runoff and erosion as revegetation continues, resulting in short-term and negligible to minor impacts related to increases in TSS and sedimentation. Similar to the Applicant's preferred route, the permanent right-of-way for RA-07 in upland areas would be maintained in an herbaceous vegetative state during operation to allow access for inspection, monitoring, and maintenance. The permanent removal of large woody vegetation also would result in permanent but minor and localized alterations in habitat, streambank stability loss and erosion, and sedimentation. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify streambank areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements. As a result, the impacts of these integrity management activities would be similar to those experienced from construction, but over a much smaller area. The impacts on TSS and sedimentation in nearby surface waters would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project. In other portions of the permanent right-of-way, there would be a permanent but negligible impact related to increases TSS and sediments in surface water.

<u>Changes in Stream Flows from Water Withdrawals and Discharges</u>. Normal operation of the route would not require withdrawal or discharge of water. However, during the repair or replacement of pipe as part of the Applicant's Integrity Management Program described above, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control are not defined. However, as described for pipeline construction, the Applicant would be required to obtain water appropriation and NPDES permits for testing procedures and the volume of water would be substantially less than for construction. With adherence to permits and implementation of existing BMPs, minor alterations in stream flows from water appropriation and discharge would be temporary and negligible.

<u>Disruption of Flow Paths or Local Hydrologic Connectivity</u>. Integrity management digs would result in minor alterations of topography and stormwater flows at the excavation sites. With implementation of the Applicant-proposed measures described above to avoid changes to stormwater runoff and restore

streambanks to their original attributes after work is completed, impacts on flow and hydrologic connectivity during in the areas excavated for pipe repair or replacement would be temporary to short-term and negligible to minor.

Permanent access roads during operation also could affect hydrologic connectivity. It is anticipated that permanent access roads would require local or state permits, which likely would require culverts to minimize the changes to hydrologic connectivity. Although the extent of the changes in those cases would depend on the topography of the area and the design of the roadway, the impact on hydrologic connectivity likely would be permanent and minor. For access roads without culverts, the extent of changes to hydrologic connectivity could be greater, again dependent on the topography of the area and the design of the roadway. Where those roadways are present, the impact on hydrologic connectivity likely would be permanent and minor.

Other permanent aboveground facilities, such as pump stations and MLVs, also would affect hydrologic connectivity. Due to the relatively small footprints of these facilities, it is anticipated that their presence would result in permanent but negligible to minor impacts.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. The permanent right-of-way of RA-07 in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. The permanent removal of riparian vegetation in areas adjacent to waterbody crossings would allow more light to enter the waterbody and could cause long-term to permanent but negligible to minor increases in temperature at these locations.

During normal operation, there would be no other measurable changes to water quality in surface waters. The minor changes within the major drainage basins and watersheds crossed by the route alternative would not result in degradation of the average watershed health score or water quality score. As a result, water quality would not be changed in the surface waters of the basins and watershed along the route, including impaired surface waters. Therefore, watershed surface water quality would not be affected during normal operation of the Project.

Minor fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles operating along RA-07. However, any refueling, fuel storage, or vehicle maintenance would follow measures similar to those in the Applicant's proposed Environmental Protection Plan (Appendix E). Thus, minor leaks and spills would result in negligible to minor and temporary impacts on surface water quality. The potential impacts of an unanticipated crude oil release are discussed in Chapter 10.

Degradation of Aquatic Habitat from Instream Activities. Instream excavations may be required to repair or replace pipe segments buried beneath surface waters. This would result in impacts similar to those described for surface water crossings. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would release sediments after the dams are removed and natural waterbody flow returns. However, the sediments would readily dissipate to negligible levels in the downstream area in the vicinity of the crossing. As a result, the potential impact on aquatic habitat of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and minor for each crossing.

If the wet open-cut method is used for integrity digs, the Applicant would implement the erosion and sediment control measures discussed above for construction of surface water crossings. These measures would be implemented during and after wet open-cut integrity digs; if streambanks are disturbed, they would be restored and stabilized as soon as practical after completion of the pipe repair or replacement. As a result, instream integrity dig activities for using the wet open-cut method would result in short-term and minor impacts on aquatic habitat.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Excavation and repair or replacement of pipe may be required within surface waters or at the banks of surface waters. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would involve backfilling of the trench, after the repair or replacement is made, to the approximate contours of the river or streambed. This could result in a minor temporary change in channel morphology until the natural sedimentation processes of the waterbody return the affected area to essentially match the nearby morphology. If streambanks are affected by the digs, they would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. After reestablishing the grade, streambanks would be restored with appropriate vegetation. As a result, the potential impact on channel morphology and stability of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and negligible to minor for each crossing.

Using the wet open-cut method for instream integrity digs may require a longer period of time for natural sedimentation processes to accomplish the same result. If streambanks are affected by the digs, they would be restored as described above. As a result, the potential impact on channel morphology and stability of using the wet open-cut method for instream integrity digs is expected to be short-term and minor for each crossing.

Disturbance of Wild Rice Waterbodies. During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described under construction impacts for the Applicant's preferred route. Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity. It is likely that only a portion of the approximately 3 acres of wild rice waterbodies within the permanent right-of-way would require repair or replacement at any one time; therefore, these activities could result in short-term and negligible to minor impacts. However, if replacement of a section of pipe within the waterbody resulted in, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions, then impacts could be long term and major.

<u>Route Alternative RA-08</u>

Route alternative RA-08 would be 325 miles in total, with 285 miles in Minnesota, of which 165 miles would be from Clearbrook to Carlton. The RA-08 route would require 189 waterbody crossings in Minnesota and 106 from Clearbrook to Carlton. The RA-08 route is similar to that of RA-07 but does not involve removal of the existing Line 3.

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the surface water ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. Clearing and grading would be required along the route alternative for construction of the pipeline, MLVs, new and expanded pump stations, and cathodic protection sites—as well as for access roads and ATWS, including pipe yards in Minnesota. Newly cleared areas and impervious surfaces could cause increased stormwater runoff and erosion into nearby surface waters; however, the Applicant would comply with the requirements of applicable permit programs that are in place to manage potential impacts as addressed below.

If RA-08 is selected, the Applicant would obtain NPDES permits for the pipeline, MLVs, pump stations, cathodic protection sites, access roads and ATWS, and pipe yards prior to construction. NPDES permits would specify various stormwater and erosion control measures to be implemented, such as requiring stormwater to be routed around exposed soil areas through conveyance channels and stormwater discharges to be directed from the site to vegetated areas in order to increase sediment removal and infiltrate stormwater on the site when feasible (Minnesota PCA 2013a). With adherence to NPDES permit stipulations and implementation of appropriate BMPs similar to those described for the Applicant's preferred route, construction of the alternative would result in impacts on stormwater runoff and erosion that would be temporary to long-term and minor.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. In addition to clearing and grading, other construction activities such as blasting, trenching, waterbody crossings, ATWS and access road construction, and water discharges may cause increased suspended solids and sedimentation in the surface waters crossed. The Applicant's temporary erosion controls, SWPPP requirements, and NPDES permit requirements described for the Applicant's preferred route would be implemented during these activities to prevent sediment transport into surface waters during construction. During pipeline construction across a waterbody, the extent and duration of sedimentation and increased erosion potential depend on the soils, sediments, and topography of the crossing site and the proposed crossing method used.

RA-08 would cross 106 surface waters; however, specific crossing methods for surface waters have not been determined for the route. When using the dry crossing method, increases in TSS and sedimentation would be localized and temporary in surface waters crossed because construction of the pipeline across the waterbody would occur in a dry area created by the temporary dams upstream and downstream of the work area. TSS and sedimentation would increase when flow is returned to the dry channel but would readily dissipate to negligible levels downstream in the vicinity of the crossing. As a result, impacts would be temporary to short-term and minor.

Wet open-cut methods involve excavation of the channel and banks in the wetted channel, and excavated soils would be in direct contact with surface water. With adherence to NPDES permit stipulations and use of appropriate BMPs similar to those described for the Applicant's preferred route, impacts from increases in TSS concentrations and increased sedimentation in surface waters crossed using open-cut wet crossings would be temporary to short-term and minor.

Changes in Stream Flows from Water Withdrawals and Discharges. Construction of RA-08 would require water withdrawal for hydrostatic testing, dust control, trench dewatering, and HDD installation, which would be sourced from lakes, streams, or groundwater wells. Approximately 44 to 68 million gallons of water (11 to 17 million gallons per construction spread) would be required for hydrostatic testing during construction between Clearbrook and Carlton. The Applicant has not determined the volume of water appropriation needed for dust control, trench dewatering, and HDD installation. Prior to construction, the Applicant would need to obtain a water appropriation permit from Minnesota DNR.

As stipulated in permit requirements, the Applicant would select appropriation sites along RA-08 that would meet Minnesota DNR's criteria of "doing no harm," and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources and must not adversely affect trout streams, calcareous fens, or other significant environmental resources.

Hydrostatic test water would be discharged from a test section in one of two ways as described for the Applicant's preferred route. Discharges would adhere to all conditions set forth in NPDES and water appropriation permits, including discharge over approved energy dissipation measures (e.g., sand bags, plastic sheeting, or natural rock riprap) and the sedimentation control measures as described above. With adherence to water appropriation and NPDES permit conditions and implementation of Applicant-proposed measures, impacts on stream flows from water appropriation and discharge during construction would be temporary and minor.

Disruption of Flow Paths or Local Hydrologic Connectivity. As described for the Applicant's preferred route, pipeline construction may disrupt flow paths and groundwater-surface water interaction due to clearing and grading of riparian vegetation, water appropriation and discharge, and channel and streambank modifications caused by waterbody crossings. With implementation of measures similar to those described for the Applicant's preferred route to prevent erosion and sedimentation, to monitor stream flows during water appropriation and discharge, and to restore streambanks to their original attributes following construction, impacts on flow and hydrologic connectivity during construction of RA-08 would be temporary to permanent and minor to major. Potential impacts that are permanent and major would be associated with specific site features that are sensitive to disruption of hydrologic connectivity. Springs and other surface water features that are dependent on shallow groundwater have the potential for permanent and major impacts.

In addition, construction would involve creation of temporary and permanent access roads, which could affect hydrologic connectivity. The Applicant would restore temporary access roads, including roads that were widened and graded, to preconstruction conditions upon completion of construction. The Applicant would leave any improved roads intact if requested by the respective landowner. Impacts on hydrologic connectivity associated with temporary access roads is expected to be short-term and negligible to minor, depending on the location of the roads. Impacts from permanent access roads are discussed in the operations section below.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. Because only minor increases in stormwater runoff would occur during construction, the potential for stormwater to carry contaminants into surface waters is low.

Surface water along RA-08 could become contaminated from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities such as fuel storage, equipment refueling, and equipment maintenance. However, to protect surface water resources, NPDES permits for construction of the route would require secondary containment of hazardous materials, prohibition of engine degreasing at work sites, containment and collection of liquid and solid wastes, and a spill prevention and response plan for fueling and maintenance of vehicles (Minnesota PCA 2013b). Similar treatment/disposal or discharge measures to those described for the Applicant's preferred route would be necessary for handling concrete wash water, grindings, drilling mud and slurry, and rinse water generated by construction and hydrostatic testing.

In addition, the Applicant would be responsible for cleaning up small spills during construction of RA-08 through procedures similar to those described in the Environmental Protection Plan (Appendix E) for the Applicant's preferred route, including notifying proper personnel (e.g., the onsite spill coordinator) and agencies, stopping the work activity that caused the spill, using absorbent booms and pads to contain and recover released materials in water, and disposing of contaminated response materials at approved facilities.

In areas near sensitive or specially designated surface waters (e.g., the Clearwater River and trout streams), 100-foot buffers from the shoreline would be required during construction and as a permanent feature post-construction, except where a water crossing or other encroachment is necessary. For Section 303(d)-listed surface waters, which already have an impairment that prevents a beneficial use, degradation of water quality is of particular concern. NPDES permits for construction of RA-03AM would require identification of Section 303(d) waters with phosphorus, turbidity, dissolved oxygen, or biotic impairment within 1 mile of construction. If the impaired waters have an approved TMDL implementation plan, the plan must be incorporated into the SWPPP, and discharges must comply with specified TMDLs (Minnesota PCA 2013d). With adherence to these NPDES permit conditions and implementation of Applicant-proposed measures, impacts on surface water quality from small leaks and spills during construction would be temporary to short-term and negligible to minor.

Degradation of Aquatic Habitat from Instream Activities. Pipeline construction across surface waters has the potential to alter and degrade aquatic habitat through increased sedimentation and erosion, disruption or alteration of stream flow, and streambank disturbance. Crossing methods have not been determined for construction of RA-08 but would be selected based on various factors, including waterbody size, sensitivity (e.g., trout stream), water levels, soil/sediment stability, and anticipated season of installation. If a route permit is issued for RA-08, the Applicant would be required to obtain crossing permits from Minnesota DNR for all public waters, and the exact crossing method for each waterbody would be stated in the permits. Minnesota DNR would consider various factors, including geological, topographic, hydrographic, geotechnical, and scour depth characteristics of each crossing, after final pipeline design in determining their approval for specific waterbody crossing methods.

Similar to construction of the Applicant's preferred route, dry and wet open-crossing crossing methods would be used. Each method has advantages and disadvantages for minimizing potential impacts on aquatic habitats. Assuming that erosion and sedimentation control measures would be the same as those discussed above for the Applicant's preferred route, and that disturbed areas at crossings would be restored and stabilized as soon as practical after pipeline installation, using the dry and wet open-cut crossing methods would result in impacts on aquatic habitat that would be temporary to short-term and minor for each crossing.

If selected for certain crossings along RA-08 (e.g., roads and ditches), successful guided bore crossings would result in no impacts on aquatic habitat as described for the Applicant's preferred route. In addition, HDD crossings likely would be used to avoid impacts on certain sensitive surface waters, such as impaired waters and coldwater fishery resources; particularly deep, wide, or high-flow surface waters; and when appropriate based on subsurface substrate conditions and length of the drill path. HDD crossings are advantageous because they do not disturb streambeds or streambanks, and they maintain stream flow and fish passage. Construction of an HDD crossing is slower than a dry crossing, and there is the potential for inadvertent releases (discussed below). As described for the Applicant's preferred route, successful HDD crossings would result in no impacts on aquatic habitat during construction of RA-08.

Degradation of Water Quality and Habitat from Drilling Mud Releases during HDD Crossings. Specific locations to implement HDD crossings have not been determined for the route alternatives. Similar to the Applicant's preferred route, geotechnical surveys would need to be conducted along the route of RA-08 to determine which surface waters would benefit from use of the HDD method and which of those surface waters are in areas that are geologically suitable for HDD. During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or frac-out of this drilling fluid when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground or river bed surface. Risk of HDD frac-out is discussed above in the assessment of impacts on surface water and aquatic habitat quality from the Applicant's preferred route. If a frac-out occurred during construction of RA-08 and went undetected or was not quickly contained, impacts on surface water quality could be long-term and major. However, with implementation of measures similar to those described for the Applicant's preferred route to respond to a drilling mud release during HDD construction along RA-08, the impact of a release on surface water quality and streambank structure would be short-term and minor.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Dry and wet open-cut waterbody crossing methods involve excavation of the streambed and potential changes to streambank stability and channel morphology. To minimize impacts on surface waters, Minnesota regulations regarding water crossings would be considered for selecting RA-08 crossing methods (Minn. R. 6135.1100, Subp. 4). These regulations specify that crossings should be placed at the narrowest section of a waterbody feasible; crossing of lakes should be avoided when possible, and they should be crossed under water when necessary; and crossing on or under the beds of trout streams should be avoided unless there is no feasible alternative. The Applicant would adhere to these stipulations when feasible, and each waterbody crossing would be approved prior to construction. Similar to construction of the Applicant's preferred route, temporary erosion control measures during construction of RA-08 would be implemented as necessary during waterbody crossing activities; and rock riprap, geotextile fabric, and other bioengineering techniques would be used to stabilize sites as needed. Following crossing construction, river beds and streambeds would be restored to approximately preconstruction conditions, with no impediments to water flow, and streambanks would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. Finally, streambanks would be restored with appropriate vegetation.

The use of open-cut crossings for pipeline construction, along with the Applicant-proposed measures described above, would result in short-term to long-term and minor impacts on channel morphology and streambank stability. Successful construction of HDD crossings, where implemented for construction of RA-08, would result in no impacts on channel morphology or streambank stability.

Disturbance of Wild Rice Waterbodies. RA-08 would cross about 10 acres of the wild rice waterbodies within the construction work area at two wild rice lakes (see Table 6.3.1.2-25). Specific construction methods for crossing of wild rice waterbodies along RA-08 have not been determined. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs (see above for information on frac-outs).

Where HDD is not used, the wild rice waterbodies would be crossed using applicable wetland crossing methods for the water saturation conditions at the crossing (see Section 2.7.2 for a description of crossing methods). Trenching would remove the vegetation cover and sediments and increase sedimentation within the remainder of the waterbody. Although the Applicant would restore the hydrology and soils of the affected wild rice waterbodies after construction, rice yield could be reduced in the portion of the waterbody affected for the first growing season after construction. To minimize impacts of construction through wild rice waterbodies, the Applicant would implement applicable measures identified in the Applicant's Environmental Protection Plan (Appendix E). This plan would identify wild rice areas by milepost and contain specific measures to reduce or avoid impacts on wild rice during construction. Avoidance measures would include use of a narrower construction work area, reseeding, monitoring, and use of timber mats, and would incorporate any additional measures proposed by local and state agencies to reflect existing regional policies and procedures to protect wild rice. Wild rice stands also would be monitored for overall condition, function, and vegetative regrowth after construction until the permit conditions are met. As a result, construction through wild rice waterbodies using the wet open-cut crossing method would result in short-term minor impacts on wild rice waterbodies.

Although not anticipated, construction-related impacts on wild rice waterbodies could include longer than expected recovery time for native wild rice stands, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions—all of which could be detrimental to wild rice germination and production. These potential impacts would be reduced through Project-specific SPCC plans, invasive species management plans, and post-construction monitoring of vegetation for a period of time until permit conditions are met, as described in the Applicant's Environmental Protection Plan (Appendix E). With implementation of these measures, impacts on wild rice waterbodies are expected to be short-term and minor. However, if an HDD frac-out occurred, this could result in the introduction of contaminants, invasive aquatic plants, and non-native strains of wild rice, all considered long-term and major impacts.

Operations Impacts

Runoff and Flows

Increases in Stormwater Runoff and Erosion. After the pipeline is installed, revegetation of the permanent right-of-way may require up to several years to reestablish to approximately preconstruction conditions, except for areas where new impervious surfaces are created as addressed below. Runoff patterns along the non-impervious portions of the permanent right-of-way would therefore be altered during the first few years of operation, resulting in impacts on runoff and erosion that would be short-term and negligible to minor. After vegetation is reestablished along the permanent right-of-way, surface water runoff and erosion would return to approximately preconstruction conditions. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements.

The number, types, and locations of associated facilities that would be required for pipeline operation along each of the route alternatives have not been determined. However, based on the facility needs and spacing of the Applicant's preferred route, it was assumed that RA-08 would require four pump stations and 14 MLVs. Assuming that approximately 8 acres are required for each pump station and 0.1 acre is required for each MLV, approximately 33 acres of newly impervious surfaces would be in place for RA-08 for the life of the Project. The Applicant would be required to manage stormwater runoff at these new facilities in accordance with the stipulations of NPDES permits and SWPPPs as described above, which include the use of permanent stormwater control systems. As a result, the potential impacts on surface water due to increased stormwater runoff from impervious surfaces would be permanent and negligible to minor.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. This could result in topographical changes and loss of vegetation in localized areas for relatively short periods of time, which would alter runoff patterns and could increase erosion. The Applicant would implement measures to minimize impacts during and after these activities, similar to the measures incorporated into the Project during construction. As a result, the impacts of these integrity management activities on stormwater runoff and erosion would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project.

Increases in Total Suspended Solids Concentrations and Increased Sedimentation. As described above, during the first few years of operation, there may be a small increase in surface water runoff and erosion as revegetation continues, resulting in short-term and negligible to minor impacts related to increases in TSS and sedimentation. Similar to the Applicant's preferred route, the permanent right-of-way for RA-08 in upland areas would be maintained in an herbaceous vegetative state during operation to allow access for inspection, monitoring, and maintenance. The permanent removal of large woody vegetation also would result in permanent but minor and localized alterations in habitat, streambank stability loss and erosion, and sedimentation. Areas of the permanent right-of-way that result in permanent vegetation changes, such as forested areas, would result in permanent changes to runoff conditions. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify streambank areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would make the appropriate repairs and improvements. As a result, the impacts of these integrity management activities would be similar to those experienced from construction, but over a much smaller area. The impacts on TSS and sedimentation in nearby surface waters would be short-term and negligible to minor for each local occurrence, but would occur periodically over the life of the Project. In other portions of the permanent right-of-way, there would be a permanent but negligible impact related to increases in TSS and sediments in surface water.

Changes in Stream Flows from Water Withdrawals and Discharges. Normal operation of the route would not require withdrawal or discharge of water. However, during the repair or replacement of pipe as part of the Applicant's Integrity Management Program described above, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control are not defined. However, as described for pipeline construction, the Applicant would be required to obtain water appropriation and NPDES permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permits and implementation of existing BMPs, minor alterations in stream flows from water appropriation and discharge would be temporary and negligible.

Disruption of Flow Paths or Local Hydrologic Connectivity. Integrity management digs would result in minor alterations of topography and stormwater flows at the excavation sites. With implementation of the Applicant-proposed measures described above to avoid changes to stormwater runoff and restore streambanks to their original attributes after work is completed, impacts on flow and hydrologic connectivity during in the areas excavated for pipe repair or replacement would be temporary to short-term and negligible to minor.

Permanent access roads during operation also could affect hydrologic connectivity. It is anticipated that permanent access roads would require local or state permits, which likely would require culverts to minimize the changes to hydrologic connectivity. Although the extent of the changes in those cases would depend on the topography of the area and the design of the roadway, the impact on hydrologic connectivity likely would be permanent and minor. For access roads without culverts, the extent of changes to hydrologic connectivity could be greater, again dependent on the topography of the area and the design of the roadway. Where those roadways are present, the impact on hydrologic connectivity likely would be permanent and minor.

Other permanent aboveground facilities, such as pump stations and MLVs, also would affect hydrologic connectivity. Due to the relatively small footprints of these facilities, it is anticipated that their presence would result in permanent but negligible to minor impacts.

Surface Water and Aquatic Habitat Quality

Degradation of Surface Water Quality. The permanent right-of-way of RA-08 in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. The permanent removal of riparian vegetation in areas adjacent to waterbody crossings would allow more light to enter the waterbody and could cause long-term to permanent but negligible to minor increases in temperature at these locations.

During normal operation, there would be no other measurable changes to water quality in surface waters. The minor changes within the major drainage basins and watersheds crossed by the route alternative would not result in degradation of the average watershed health score or water quality score. As a result, water quality would not be changed in the surface waters of the basins and watershed along the route, including impaired surface waters. Therefore, watershed surface water quality would not be affected during normal operation of the Project.

Minor fuel and lubricant leaks and spills could occur from maintenance and inspection vehicles operating along RA-08. However, any refueling, fuel storage, or vehicle maintenance would follow measures similar to those in the Applicant's proposed Environmental Protection Plan (Appendix E). Thus, minor leaks and spills would result in negligible to minor and temporary impacts on surface water quality. The potential impacts of an unanticipated crude oil release are discussed in Chapter 10.

Degradation of Aquatic Habitat from Instream Activities. Instream excavations may be required to repair or replace pipe segments buried beneath surface waters. This would result in impacts similar to those described for surface water crossings. The excavations to reach the pipe segments may be accomplished using the wet open-cut method or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would release sediments after the dams are removed and natural waterbody flow returns. However, the sediments would readily dissipate to negligible levels in the downstream area in the vicinity of the crossing. As a result, the potential impact on aquatic habitat of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and minor for each crossing.

If the wet open-cut method is used for integrity digs, the Applicant would implement the erosion and sediment control measures discussed above for construction of surface water crossings. These measures would be implemented during and after wet open-cut integrity digs; if streambanks are disturbed, they would be restored and stabilized as soon as practical after completion of the pipe repair or replacement. As a result, instream integrity dig activities for using the wet open-cut method would result in short-term minor impacts on aquatic habitat.

Changes in Channel Morphology and Stability Caused by Channel and Streambank Modifications. Excavation and repair or replacement of pipe may be required within surface waters or at the banks of surface waters. The excavations to reach the pipe segments may be accomplished using the wet open-cut method, or more likely would involve use of one of the dry open-cut methods.

Integrity management excavations accomplished using either of the dry open-cut crossing methods would involve backfilling of the trench, after the repair or replacement is made, to the approximate contours of the river or streambed. This could result in a minor temporary change in channel morphology until the natural sedimentation processes of the waterbody return the affected area to essentially match the nearby morphology. If streambanks are affected by the digs, they would be restored to preconstruction grades when practicable. If the slope is determined to be unstable, the banks would be reshaped to prevent slumping. After reestablishing the grade, streambanks would be restored with appropriate vegetation. As a result, the potential impact on channel morphology and stability of using the dry open-cut method for instream integrity digs is expected to be temporary to short-term and negligible to minor for each crossing.

Using the wet open-cut method for instream integrity digs may require a longer period of time for natural sedimentation processes to accomplish the same result. If streambanks are affected by the digs, they would be restored as described above. As a result, the potential impact on channel morphology and stability of using the wet open-cut method for instream integrity digs is expected to be short-term and minor for each crossing.

Disturbance of Wild Rice Waterbodies. During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody as described under construction impacts for the Applicant’s preferred route. Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity. It is likely that only a portion of the approximately 4 acres of wild rice waterbodies within the permanent right-of-way would require repair or replacement at any one time; therefore, these activities could result in short-term negligible to minor impacts. However, if replacement of a section of pipe within the waterbody resulted in, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions, impacts could be long term and major.

6.3.1.2.5 Regional Analysis of Impacts on Quality of Existing Surface Water Conditions

For northern Minnesota streams, the conversion of forested perennial cover to grassland dominated cover can have an overall effect on local hydrology by effecting the smaller peak flows. This is the yearly bankfull flow that shapes the channel and builds the floodplain (Verry 2001). Removing permanent perennial cover along streams also reduces instream quality and habitat by increasing water temperatures, negatively affecting trout. Nutrient export from converted landscapes can also increase to lakes or streams when changing from forested to open grassland cover. The amount may be dependent on soil, slope, and other factors (Radomski 2005). The overall effects of changes in forest cover on hydrology, nutrient export, and temperature are dependent on the condition of the nearby watershed. The greater the landscape alteration, the more potential for these changes. Quantifiable estimates of impacts from land use change activities are available and have been used to predict hydrology and water quality changes to surface waters with the use of computer modeling programs.

Northern forested wetlands that are converted to open linear landscapes can allow for invasive species or other aggressive plants to develop monocultures and displace native vegetation. Corridors are often prone to infestations of narrowleaf (*Typha angustifolia*) or hybrid cattail (*Typha X glauca*), which are not listed as an invasive plant but have been an aggressive nuisance with previous pipeline development.

6.3.1.2.6 Summary and Mitigation

Summary

Impacts on surface waters, including streams, rivers, lakes, and wild rice waterbodies, watersheds, sensitive or specially designated surface waters, NRI rivers, impaired surface waters, and navigable waterways from construction of the Applicant's preferred route and the four route alternatives were assessed and found to be temporary and minor, with the exception of instances where a "frac-out" occurs while doing HDD boring. Impacts from operations were found to be potentially short-term to permanent and negligible to minor. The comparison of impacts among the alternatives focused on the pipeline routes between Clearbrook and Carlton, Minnesota, because all of the routes have the same alignments from Neche, North Dakota, to Clearbrook and from Carlton to Superior, Wisconsin.

Table 6.3.1.2-28 presents summary information on the impacts identified. For all route options, the types of impacts of construction and operations on surface water would be comparable at locations experiencing a change. However, the numbers and acreages of areas that would experience a change differ among the alternatives, as discussed below.

<u>Construction Impacts</u>

Construction of all route options would cause changes to runoff and flows that would result in temporary to short-term and minor impacts. Changes in water quality due to construction would result in impacts on surface water that would be temporary to short-term and negligible to minor for all route options, unless drilling fluids were released during HDD crossings and were uncontained or undetected. In this event, the impact could be long-term and major for all route options. The number of surface waters affected by crossings would differ among the alternatives: RA-07 would cross the fewest number of surface waters (81), followed by RA-08, the Applicant's preferred route, RA-06, and RA-03AM with 167 crossings (Table 6.3.1.2-28). RA-06 would affect the least number of impaired water crossings (1) and TMDL study areas (1), followed by RA-07, RA-08, the Applicant's preferred route, and RA-03AM with 14 crossings of impaired waters and crossings of 6 TMDL study areas (Table 6.3.1.2-28). These impacts on impaired or low-quality waterbodies may cause further degradation of the waterbody, exacerbate an existing impairment, cause additional impairments, interfere with restoration activities, and/or delay attainment of water quality standards. Impacts on high-quality waterbodies (e.g., trout streams, NRI-listed rivers, and wild rice waterbodies) may decrease the suitability of surface water as a habitat for sensitive species or degrade the existing beneficial use of the waterbody.

For channel morphology and stability, the construction impacts would be short-term to long-term and minor, except where the HDD or guided bore crossing method is used. At those locations, there would be no impact on channel morphology and stability. As noted above, the number of surface water crossings would range from 81 for RA-07 to 167 for RA-03AM (Table 6.3.1.2-28).

The construction impact on wild rice waterbodies for each location affected for each route option would be short-term and minor. The Applicant's preferred route would affect the least number of acres of wild rice waterbodies (4.9 acres), followed by RA-07, RA-03AM, RA-08, and RA-06 with 10.6 acres (Table 6.3.1.2-28).

Operations Impacts

As with construction, the types of impacts on surface water during operations would be the same at each location experiencing a change for all route options. Thus, the primary difference in impacts among the route options would be the extent of impacts and the types of resources affected. Operation would cause changes to runoff and flows from the presence of aboveground facilities, including permanent access roads; potential impacts would be temporary to permanent and minor. The increase in impervious surfaces that would cause these changes would range from 1.4 acres for RA-07 to between 30 and 50 acres for the other route options (Table 6.3.1.2-28). If integrity digs were required in or immediately adjacent to surface waters, changes in water quality from operation would result in temporary to short-term and negligible to minor impacts on surface water for all route options when they did occur and could occur periodically over the life of the Project. Permanent and minor increases in water temperature could occur from cleared vegetation around waterbodies.

Enbridge, in accordance with Minnesota PCA requirements, would designate at least one Environmental Inspector per 14,000-feet spread during pipeline construction.

Operation of all route options would result in impacts on channel morphology and stability and wild rice waterbodies that are expected to be temporary to short-term and negligible to minor due if they did occur, and would be associated with periodic integrity digs. The area of wild rice waterbodies potentially affected would be similar among the alternatives, ranging from 2.5 acres for RA-07 to 4.4 acres for RA-06; impacts would be short-term and negligible to minor (Table 6.3.1.2-27).

Mitigation

In addition to the Applicant-proposed measures to avoid or minimize impacts that would be incorporated into the Project, and the stipulations in permits required for the Project, Minnesota DNR identified the following mitigation measures for consideration by the Commission to further avoid and minimize impacts:

- Where riparian vegetation is removed at surface water crossings, revegetate the construction work area with a minimum 50-foot-wide buffer of woody vegetation to reduce runoff, erosion, water quality degradation, sunlight penetration, and water temperature warming, and increase bank stability.
- Longer term impacts of clearing in temporary work areas could be offset by reestablishing or enhancing the existing cover type within up to 500 feet of waterbodies, depending on topography.

- After construction on state forest lands or state WMAs, tree planting on all temporary workspaces could be accomplished to reduce erosion and runoff, as well as to ensure that forested areas within the riparian zone are restored to forest cover.
- Rock riprap should be considered or permitted only when infrastructure (public or private) is at risk. Natural channel design and bioengineering methods should be considered the primary means of streambed and streambank restoration and stabilization.

Table 6.3.1.2-28. Summary of Potential Impacts on Surface Waters for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Increases in stormwater runoff and erosion from newly cleared areas and impervious surfaces	Short-term/minor impacts • 109 waterbody crossings	Short-term/minor impacts • 167 waterbody crossings	Short-term/minor impacts • 137 waterbody crossings	Short-term/minor impacts • 81 waterbody crossings	Short-term/minor impacts • 106 waterbody crossings
Increases in total suspended solids concentrations and increased sedimentation	Temporary to short-term/minor impacts • 109 waterbody crossings Temporary/negligible to minor impacts • 1 blasting location	Temporary to short-term/minor impacts • 167 waterbody crossings *Need for blasting not known*	Temporary to short-term/minor impacts • 137 waterbody crossings *Need for blasting not known*	Temporary to short-term/minor impacts • 81 waterbody crossings *Need for blasting not known*	Temporary to short-term/minor impacts • 106 waterbody crossings *Need for blasting not known*
Changes in stream flows from water withdrawals and discharges	Temporary/minor impacts • 4 construction spreads (11–17 million gallons per spread)	Temporary/minor impacts • 5 construction spreads (11–17 million gallons per spread)	Temporary/minor impacts • 4 construction spreads (11–17 million gallons per spread)	Temporary/minor impacts • 4 construction spreads (11–17 million gallons per spread)	Temporary/minor impacts • 4 construction spreads (11–17 million gallons per spread)
Disruption of flow paths or local hydrologic connectivity	Temporary to permanent/ negligible to major impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing • Wet open-cut crossings • Clearing and grading of riparian vegetation • Access road construction	Temporary to permanent/ negligible to major impacts • 5 spreads requiring water appropriation and discharge for hydrostatic testing • Wet open-cut crossings • Clearing and grading of riparian vegetation • Access road construction	Temporary to permanent/ negligible to major impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing • Wet open-cut crossings • Clearing and grading of riparian vegetation • Access road construction	Temporary to permanent/ negligible to major impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing • Wet open-cut crossings • Clearing and grading of riparian vegetation • Access road construction	Temporary to permanent/ negligible to major impacts • 4 spreads requiring water appropriation and discharge for hydrostatic testing • Wet open-cut crossings • Clearing and grading of riparian vegetation • Access road construction

Table 6.3.1.2-28. Summary of Potential Impacts on Surface Waters for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Degradation of surface water quality	Temporary to short-term/ negligible to minor impacts • 13 impaired water crossings • 3 TMDL study area crossings	Temporary to short-term/ negligible to minor impacts • 14 impaired water crossings • 6 TMDL study area crossings	Temporary to short-term/ negligible to minor impacts • 1 impaired water crossing • 1 TMDL study area crossing	Temporary to short-term/ negligible to minor impacts • 2 impaired water crossings • 1 TMDL study area crossing	Temporary to short-term/ negligible to minor impacts • 5 impaired water crossings • 1 TMDL study area crossing
Degradation of aquatic habitat from instream activities	Temporary to short-term/minor impacts (*from dry and wet open-cut crossings*); no impact (*from guided bore and HDD crossings*) • 6 trout stream crossings • 7 NRI-listed river crossings	Temporary to short-term/minor impacts (*from dry and wet open-cut crossings*); no impact (*from guided bore and HDD crossings*) • 9 trout stream crossings • 1 NRI-listed river crossing	Temporary to short-term/minor impacts (*from dry and wet open-cut crossings*); no impact (*from guided bore and HDD crossings*) • 8 trout stream crossings • 2 NRI-listed river crossings	Temporary to short-term/minor impacts (*from dry and wet open-cut crossings*); no impact (*from guided bore and HDD crossings*) • 6 trout stream crossings • 1 NRI-listed river crossing	Temporary to short-term/minor impacts (*from dry and wet open-cut crossings*); no impact (*from guided bore and HDD crossings*) • 4 trout stream crossings • 1 NRI-listed river crossing
Degradation of water quality and habitat from releases of drilling mud during HDD crossings Each drilling mud additive must be identified; specific location where additive will be used; water analysis of before and after any frac-out	Short-term/minor impacts (*if quickly contained*) to long-term/major impacts (*if undetected or uncontained*) • 12 HDD crossings	Short-term/minor impacts (*if quickly contained*) to long-term/major impacts (*if undetected or uncontained*) • Number of HDD crossings not determined for route alternatives			

Table 6.3.1.2-28. Summary of Potential Impacts on Surface Waters for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Changes in channel morphology and stability caused by channel and streambank modifications	Short-term to long-term/ minor impacts (*from dry and wet open-cut crossings*); no impact (*from guided bore and HDD crossings*) • 12 HDD crossings; number of guided bore crossings not determined	Short-term to long-term/minor impacts from open-cut crossings; no impact from guided bore and HDD crossings • Crossing types not determined for route alternatives			
Disturbance of wild rice waterbodies	Short-term to long-term/minor to major impacts (*if HDD frac out occurs*). • 4.9 acres • 5 waterbodies	Short-term to long-term/minor to major impacts (*if HDD frac out occurs*). • 7.5 acres • 6 waterbodies	Short-term to long-term/minor to major impacts (*if HDD frac out occurs*). • 10.6 acres • 5 waterbodies	Short-term to long-term/minor to major impacts (*if HDD frac out occurs*). • 6.1 acres • 1 waterbody	Short-term to long-term/minor to major impacts (*if HDD frac out occurs*). • 9.8 acres • 2 waterbodies
Operations Impacts					
Increases in stormwater runoff and erosion	Short-term to permanent/ negligible to minor impacts • 30.3 acres of new impervious surfaces (4 pump stations, 18 MLVs)	Short-term to permanent/ negligible to minor impacts • 50.3 acres of new impervious surfaces (6 pump stations, 23 MLVs)	Short-term to permanent/ negligible to minor impacts • 33.6 acres of new impervious surfaces (4 pump stations, 16 MLVs)	Short-term to permanent/ negligible to minor impacts • 1.4 acres of new impervious surfaces (0 pump stations, 14 MLVs)	Short-term to permanent/ negligible to minor impacts • 33.4 acres of new impervious surfaces (4 pump stations, 14 MLVs)
Increases in total suspended solids concentrations and increased sedimentation	Short-term to permanent/ negligible to minor impacts • Removal of riparian vegetation • Increased erosion	Short-term to permanent/ negligible to minor impacts • Removal of riparian vegetation • Increased erosion	Short-term to permanent/ negligible to minor impacts • Removal of riparian vegetation • Increased erosion	Short-term to permanent/ negligible to minor impacts • Removal of riparian vegetation • Increased erosion	Short-term to permanent/ negligible to minor impacts • Removal of riparian vegetation • Increased erosion

Table 6.3.1.2-28. Summary of Potential Impacts on Surface Waters for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Changes in stream flows from water withdrawals and discharges	Temporary/negligible impacts	Temporary/negligible impacts	Temporary/negligible impacts	Temporary/negligible impacts	Temporary/negligible impacts
Disruption of flow paths or local hydrologic connectivity	Temporary to permanent/ negligible to minor impacts from access roads	Temporary to permanent/ negligible to minor impacts from access roads	Temporary to permanent/ negligible to minor impacts from access roads	Temporary to permanent/ negligible to minor impacts from access roads	Temporary to permanent/ negligible to minor impacts from access roads
Degradation of surface water quality	Temporary to permanent/ negligible to minor impacts • Minor leaks and spills during maintenance • Contaminants in runoff • Increased water temperature from cleared vegetation	Temporary to permanent/ negligible to minor impacts • Minor leaks and spills during maintenance • Contaminants in runoff • Increased water temperature from cleared vegetation	Temporary to permanent/ negligible to minor impacts • Minor leaks and spills during maintenance • Contaminants in runoff • Increased water temperature from cleared vegetation	Temporary to permanent/ negligible to minor impacts • Minor leaks and spills during maintenance • Contaminants in runoff • Increased water temperature from cleared vegetation	Temporary to permanent/ negligible to minor impacts • Minor leaks and spills during maintenance • Contaminants in runoff • Increased water temperature from cleared vegetation
Degradation of aquatic habitat from instream activities	Temporary to short-term/ minor impacts from integrity digs	Temporary to short-term/ minor impacts from integrity digs	Temporary to short-term/ minor impacts from integrity digs	Temporary to short-term/ minor impacts from integrity digs	Temporary to short-term/ minor impacts from integrity digs
Changes in channel morphology and stability caused by channel and streambank modifications	Temporary to short-term/ negligible to minor impacts from integrity digs	Temporary to short-term/ negligible to minor impacts from integrity digs	Temporary to short-term/ negligible to minor impacts from integrity digs	Temporary to short-term/ negligible to minor impacts from integrity digs	Temporary to short-term/ negligible to minor impacts from integrity digs
Disturbance of wild rice waterbodies	Short-term to long-term/minor to major impacts (*if replacement pipeline is required).* • 3.2 acres of wild rice waterbodies • 5 waterbodies	Short-term to long-term/minor to major impacts (*if replacement pipeline is required).* • 3.1 acres of wild rice waterbodies • 6 waterbodies	Short-term to long-term/minor to major impacts (*if replacement pipeline is required).* • 4.4 acres of wild rice waterbodies • 5 waterbodies	Short-term to long-term/minor to major impacts (*if replacement pipeline is required).* • 2.5 acres of wild rice waterbodies • 1 waterbody	Short-term to long-term/minor to major impacts (*if replacement pipeline is required).* • 4.1 acres of wild rice waterbodies • 2 waterbodies

Table 6.3.1.2-28. Summary of Potential Impacts on Surface Waters for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[a] No single dataset in this summary table provides a complete indication of all relevant impacts to surface water. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, water crossing counts do not consider water quality indicators that are relevant in understanding the nature of the potential impacts of construction and operation. However, data from the impaired waters dataset or wild rice and trout stream data indicating high water quality can aid the reader in understanding the the quality of the waters crossed. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.

[b] Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3), as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-240 to 6-287. This table, for example, provides counts of wild rice waterbodies and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to these waterbodies is contained in the text of this section (terms defined in Section 6.1.3).

[c] Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-240 to 6-254. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[d] Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-254 to 6-263. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[e] Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-263 to 6-271. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-271 to 6-279. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-279 to 6-287. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.3.1.2.7 References

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6.3.1.3 Wetlands

A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem. Wetlands are defined in a variety of ways for federal, state, and local regulatory protection; however, the common factors that distinguish wetlands from other landforms or waterbodies are the presence of a hydrophytic (waterlogged) vegetation community, hydric soils,[12] and hydrology. All wetlands provide a variety of functions of social significance, including: surface water storage (flood control), shoreline stabilization (wave damage protection/shoreline erosion control), stream flow maintenance (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge (some types replenish water supplies), sediment removal and nutrient cycling (water quality protection), aquatic productivity (fishing, shellfishing, and waterfowl hunting), production of trees (timber harvest), production of herbaceous growth (livestock grazing and haying), production of peaty soils (peat harvest), and wildlife habitat (hunting, trapping, plant/wildlife/nature photography, nature observation, and aesthetics) (EPA 2002, 2006).

The analysis of impacts on wetlands during construction of the Applicant's preferred route and route alternatives considered changes to wetland characteristics and functions by alteration or loss of the plant communities through removal or cover with fill, and by alteration or loss of the hydrologic conditions that maintain wetland plant communities and wetland soils. Construction and operations impacts considered included:

- Changes to forested and scrub/shrub wetland characteristics and functions;
- Changes to emergent wetland characteristics and functions;
- Changes to Minnesota Public Waters Wetland characteristics and functions;
- Changes to Minnesota calcareous fen characteristics and functions;
- Changes to Wetland Reserve Program wetland characteristics and functions; and
- Changes to wetland mitigation bank easements characteristics, functions, and availability.

This section first describes the existing wetlands, including Public Waters Wetlands, calcareous fen wetlands, and wetland conservation easements, within the area along the Applicant's preferred route and each route alternative where wetlands could be affected by construction and operation of the Project. The potential Project-related impacts of the Applicant's preferred route on wetlands during construction and operation then are discussed, along with measures the Applicant would implement to minimize impacts. Next, the potential impacts on wetlands during construction and operation are addressed for each route alternative (RA-03AM, RA-06, RA-07, and RA-08). A summary and comparison of the impacts are included at the end of the section, with potential mitigation measures to be considered.

Potential impacts on wetlands due to an unanticipated crude oil release are discussed in Chapter 10.

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[12] A soil that forms under conditions of water saturation long enough during the growing season to develop anaerobic conditions in the upper part of the soil.

6.3.1.3.1 Regulatory Context and Methodology

Regulatory Context

<u>General Wetlands</u>

Federal and State Jurisdictional Wetlands

CWA Section 404 and Rivers and Harbors Act Section 10 Individual Permits and associated state CWA Section 401 Individual Water Quality Certification for the Project in Minnesota are under the jurisdiction of USACE – St. Paul District and Minnesota PCA. USACE requires that projects avoid impacts on wetlands to the extent practicable and that potential impacts have been minimized, and that compensation be provided for all remaining unavoidable impacts.

For CWA Section 401 certification, Minnesota PCA is responsible for non-reservation wetlands in Minnesota, Wisconsin DNR is responsible for wetlands in Wisconsin, and North Dakota DH's Division of Water Quality is responsible for wetlands in North Dakota. USEPA is responsible for 401 certifications on reservation lands, with the exception of Grand Portage and Fond du Lac Bands in Minnesota, and Mole Lake and Lac du Flambeau Bands in WI, which have their own 401 programs. Permitting for route alternative RA-03AM would require obtaining a CWA Section 401 certification from Iowa DNR and Illinois DNR. Adherence to state-specific general construction and stormwater permit conditions, buffer laws, and other state and local resource protection measures also would be required, which would serve as a duplicative mechanism for oversight and protection of jurisdictional wetland resources.

In Minnesota, the Wetland Conservation Act (WCA) protects wetlands and applies to all wetlands except Public Waters Wetlands (described below). The WCA requires projects that affect wetlands to try to avoid the impact, minimize any unavoidable impacts, and replace any lost wetland functions. Responsibility for administration of the WCA is shared by local government units and Minnesota Board of Water and Soil Resources (Minnesota BWSR) (Minn. R. Ch. 8420) and is enforced by Minnesota DNR.

Compensatory Mitigation

Compensatory wetland mitigation may be required in federal and state-specific permitting for permanent impacts on forested, scrub/shrub, and emergent wetlands. The overall objective of compensatory wetland mitigation would be to compensate for wetland aquatic resource functions lost due to construction, taking into consideration what is available and feasible. Compensatory wetland mitigation would be consistent with applicable policies, regulations, and rules governing compensatory wetland mitigation for the purposes of Section 404 of the CWA, including, but not limited to:

- USACE, St. Paul District Draft Compensatory Mitigation Policy for Minnesota, dated January 23, 2009;
- Joint guidance between St. Paul District and Minnesota BWSR for Developing Mitigation Plan Performance Standards and Credit Release Schedules in Minnesota, dated December 16, 2015;
- USACE and EPA Final Rule Regarding Compensatory Mitigation for Losses of Aquatic Resources, dated April 10, 2008; and
- Minnesota Office of the Revisor of Statutes 7050.0186 Wetlands Standards and Mitigation, dated April 1, 2008 and wetland replacement regulations as described under the WCA.

Specially Designated Wetlands

Minnesota Public Waters Wetlands

Public Waters Wetlands are a subset of the State's jurisdictional wetlands regulated under Minnesota Statutes § 103G. Public Waters Wetlands are regulated as public waters under Minnesota DNR's License to Cross Public Waters program. Where Public Waters Wetlands occur, a License to Cross Public Waters would be required from Minnesota DNR.

Minnesota DNR is responsible for licensing utility crossings for any utility projects proposing to cross Public Waters Wetlands, ensuring that the crossing plans are reasonable, are practical, and will adequately protect public safety and promote the public welfare (Minn. Stat. § 84.415 and § 103G.315). The Applicant may request exemption from wetland replacement requirements (i.e., compensatory mitigation) under existing utility exemptions for those portions of the Project within Public Waters Wetlands that would be regulated under WCA standards (Minnesota WCA n.d.). Utility crossing licenses generally are required for installation of electrical, pipeline, and communication projects and are granted for a term of 25 or 50 years.

Minnesota Calcareous Fen Wetlands

Calcareous fens are wetlands characterized by a substrate of non-acidic peat and dependent on a constant supply of cold, oxygen-poor groundwater rich in calcium and magnesium bicarbonates. They are rare and typically occur on slight slopes where upwelling water eventually drains away and where surface water inputs are minimal.

Impacts on calcareous fens are regulated by Minnesota DNR under the WCA and the USACE under the CWA. Under this act, a calcareous fen may not be filled, drained, or otherwise degraded, wholly or partially, by any activity. If impacts are identified and deemed necessary by the Minnesota Commissioner of Natural Resources, a Fen Management Plan must be provided by the applicant (Minn. Stat. § 103G.223). Eight state-listed, rare plant species are known to be commonly found within calcareous fens; these plant species would be additionally protected under Minnesota's Endangered Species Act (Minn. Stat. § 84.0895).

Wetland Reserve Program

The Wetland Reserve Program, a voluntary federal program managed by the Natural Resources Conservation Service (NRCS), supported wetland conservation, restoration, and enhancement projects on private agricultural and pastoral land through easements and restoration cost-share agreements. The Wetland Reserve Program ran from 2009 and 2014 and has since been replaced by the Agricultural Act of 2014 Agricultural Conservation Easement Program, which has the same objectives and implementation tools.

Minnesota Wetland Mitigation Bank Easements

The Minnesota BWSR Mitigation Banking Program administered under the WCA (Minn. R. 8420.0700 to 8420.0820) facilitates applying for or purchasing wetland credits toward future wetland impacts. Minnesota BWSR oversees the program, with local government units involved in landowner application and monitoring. Minnesota created 10 wetland bank service areas. Bank credit ratio is reduced if the credit area used is in a different service area than the disturbance area (Minnesota BWSR 2016).

Methodology

As a part of the evaluation of potential impacts on wetlands and effects on specially designated wetland resources the following information sources were used:

- USFWS National Wetlands Inventory (NWI) database (USFWS 2016), classified using the Cowardin classification system (Cowardin et al. 1979);
- Minnesota DNR Public Waters Wetlands database (Minnesota DNR 2014), classified based on USFWS Circular No. 39 (EPA 2002);
- Minnesota DNR calcareous fens database (Minnesota DNR 2008), ranked based on the conservation status ranking (or "S-rank") methodology developed by NatureServe and its member natural heritage programs in North America (NatureServe 2016), and classified using Minnesota's native plant community classifications (Minnesota DNR 2005);
- USGS Protected Area Database – Wetland Reserve Programs (USGS 2016); and
- Minnesota wetland mitigation bank easements database (Minnesota BWSR 2015).

No single one of the datasets listed above provides a complete indication of all relevant impacts to wetlands. Together, though, these datasets provide a reasonably comprehensive indication of the potential impacts. For example, counts of NWI wetland acres impacted do not consider the unique sensitivities of certain wetland communities. However, data from the calcareous fen database can aid the reader in understanding the extent of potential impacts on these unique and highly sensitive areas.

Furthermore, the quantitative information from the analysis of these datasets should be coupled the qualitative descriptions of impacts that are contained in the text. Tables in this section provide counts, for example, of acres of wetland within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to different types of wetlands is contained in the text of this section.

The ROI for the wetland evaluation encompasses the area that could be directly or indirectly affected by pipeline construction Federal and state jurisdictional wetlands occur in the ROI, including specially designated wetlands.

Potential wetland impacts from construction of the Applicant's preferred route were evaluated by overlaying the footprints of the construction work area, ATWS, access roads, pipe yards, pipeline permanent right-of-way, MLV pads and driveways, and pump stations on the identified wetland maps. Typical wetland disturbance effects were based on the Applicant-proposed construction methods described in Chapter 2 and the special wetland construction methods described in the Applicant's November 2016 EAW (Enbridge 2016). Comparisons of construction impacts between alternatives were based on evaluation of the Applicant's preferred route, and evaluations of the impacts of alternative routes. A standardized 120-foot-wide construction work area was used for RA-03AM, RA-06, and RA-08; and a 205-foot-wide construction work area was used for RA-07. Comparisons of operations impacts were based on the Enbridge-provided footprint for the Applicant's preferred route permanent right-of-way and a standardized 50-foot-wide permanent right-of-way for each route alternative.

6.3.1.3.2 Existing Conditions

Wetland Types

Wetland types crossed by the route alternatives are grouped into three categories: forested wetland, scrub/shrub wetland, and emergent wetland.

General Wetlands

Forested wetlands are dominated by trees 20 feet or taller, including evergreen forest, deciduous forest, and mixed forest wetlands. Scrub/shrub wetlands are dominated by short or dwarfed trees and shrubs less than 20 feet tall, including tall and low-growing shrubs. Woody wetlands include both forested and scrub/shrub wetlands; the term “woody wetlands” is sometimes used in this EIS when discussing forested and scrub/shrub wetlands. Emergent wetlands that would be crossed by the Applicant’s preferred route are dominated by erect, rooted, herbaceous wetland plants such as sedges, rushes, and grasses. Most of the emergent prairie wetlands that were previously in the region have been converted to croplands. Federal and state jurisdictional wetlands occur along the pipeline route alternatives.

Detailed maps that show the locations of wetlands are in Appendix A.

Specially Designated Wetlands

Specially designated wetlands are identified as high-value wetland resources based on environmental and socioeconomic factors such as size, environmental function, and presence of high-value resources, habitat qualities, species diversity, and participation in federally and state-funded conservation programs. Specially designated wetlands and their values are of specific concern to state and local agencies. The specially designated wetlands addressed in this analysis are:

- Minnesota DNR’s Public Waters Inventory – Public Waters Wetlands,
- Calcareous fen wetlands, and
- Wetlands enrolled in the NRCS or state Wetland Reserve Programs or the Minnesota BWSR Wetland Mitigation Banking Program.

Minnesota Public Waters Wetlands

Public Waters Wetlands are categorized by type. Public Waters Wetlands crossed by the Applicant’s preferred route and route alternatives include wetland Types 3, 4, and 5 that are 10 acres or larger in unincorporated areas or 2.5 acres or larger in incorporated areas. Type 3 wetlands are inland, shallow fresh marshes; Type 4 wetlands are inland, deep fresh marshes; and Type 5 wetlands are open fresh water. Because of the size of these wetlands and their associated environmental and socioeconomic functions, they are afforded legal protection in Minnesota. Public Waters Wetlands identified near the pipeline routes are dominated by Type 3 wetlands.

Minnesota Calcareous Fen Wetlands

As noted above, calcareous fens are rare peat-accumulating wetlands formed as a result of groundwater upwelling through calcareous substrates; they are designated in Minnesota as ORVWs. Because of their regional rarity, biodiversity, and sensitivity to disturbance, calcareous fens are afforded legal protection in Minnesota.

Wetland Reserve Program and Minnesota Board of Water and Soil Resources Banking Program

Wetlands identified under the NRCS or state Wetland Reserve Programs and Minnesota BWSR Mitigation Banking Program include those wetlands that are a part of an existing federally funded or state-managed Wetland Reserve Program. These wetlands are of significance as they offer landowners the voluntary opportunity to protect, restore, enhance, and develop mitigation wetlands under a protective easement managed by NRCS (USGS 2016) or Minnesota BWSR (2015). Pipeline construction through or placement of facilities on wetland reserves or mitigation banks may prevent the wetland areas from being eligible for these programs. During pipeline operation, the permanent right-of-way and potentially some adjacent areas would be subject to disturbance (1) during activities associated with the Applicant's Integrity Management Program (e.g., excavation to repair or replace sections of pipe); and (2) during maintenance of the right-of-way (e.g., brush cutting, mowing).

Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the wetlands ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

General Wetlands

Wetlands within the ROI for the Applicant's preferred route are predominantly scrub/shrub wetlands. In Minnesota, approximately 524 acres of forested, scrub/shrub, and emergent wetlands occur within the construction footprint, and approximately 275 acres of wetlands occur within the permanent right-of-way and facility footprints (Table 6.3.1.3-1). Between Clearbrook and Carlton, approximately 445 acres of wetlands occur within the construction work area, and approximately 234 acres of wetlands occur within the permanent right-of-way (Table 6.3.1.3-2).

Table 6.3.1.3-1. Estimated Acreages of Wetlands Crossed by the Applicant's Preferred Route in Minnesota (acres)

Wetland Classification	Construction[a]	Operations[a]	Total[b]	
			Construction	Operations
Forested wetland	141.1	66.3	147.5	70.6
Scrub/shrub wetland	214.5	115.7	224.6	122.0
Emergent wetland	143.8	79.2	151.6	82.5
TOTAL	**499.3**	**261.2**	**523.7**	**275.1**

Source: USFWS 2016.

[a] Construction = Enbridge-provided footprint for construction work area; Operations = Enbridge-provided footprint for permanent right-of-way; additional temporary workspaces (ATWS), including pipe yards; and mainline valves (MLVs), including valve pads and driveways.

[b] Total Construction = sum of pipeline construction work area, ATWS, and temporary access roads; Operations = sum of pipeline permanent right-of-way, primary access roads, pump stations, and MLVs.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

Table 6.3.1.3-2. Estimated Acreages of Wetlands Crossed by the Applicant's Preferred Route (Clearbrook to Carlton) (acres)

Wetland Classification	Construction[a]	Operations[b]
Forested wetland	132.8	61.9
Scrub/shrub wetland	200.6	108.4
Emergent wetland	111.8	64.0
TOTAL	**445.2**	**234.3**

Source: USFWS 2016.

[a] Construction work area = Enbridge-provided footprint for construction work area.

[b] Permanent right-of-way = Enbridge-provided footprint for permanent right-of-way.

Specially Designated Wetlands

Public Waters Wetlands crossed by the Applicant's preferred route include wetland Types 3 and 4 in Minnesota (Table 6.3.1.3-3).

Table 6.3.1.3-3. Estimated Acreages of Public Waters Wetlands Crossed by the Applicant's Preferred Route in Minnesota (acres)

Wetland Type	Construction[a]	Operations[a]	Total[b]	
			Construction	Operations
Type 3 – Inland shallow fresh marshes	2.1	1.7	2.1	1.7
Type 4 – Inland deep fresh marshes	0.6	0.2	0.7	0.2
TOTAL	**2.7**	**1.9**	**2.8**	**1.9**

Source: Minnesota DNR 2014.

[a] Construction = Enbridge-provided footprint for construction work area; Operations = Enbridge-provided footprint for permanent right-of-way.

[b] Construction = sum of pipeline construction work area, ATWS, and temporary access roads; Operations = sum of pipeline permanent right-of-way, primary access roads, pump stations, and MLVs.

One calcareous fen would be crossed by the Applicant's preferred route, and four others are near the route (Table 6.3.1.3-4 and Figure 6.3.1.3-1). All calcareous fens near the Applicant's preferred route are located on the portion of the route between the North Dakota border and Clearbrook, Minnesota. The fen near MP 122, named Gully 30, is approximately 63 feet from the route centerline (Figure 6.3.1.3-1). Calcareous fen surveys completed in 2010 identified the presence of Gully 30 during development of the Alberta Clipper pipeline. As part of the environmental review for the Alberta Clipper pipeline, a Gully 30 Fen Management Plan was developed in coordination with Minnesota DNR (Natural Resource Group 2009). As proposed, portions of the Applicant's preferred route would be co-located with the Alberta Clipper pipeline where Gully 30 and other nearby fens occur.

No wetlands enrolled in the NRCS Wetland Reserve Program are present near the Applicant's preferred route. No wetlands that are part of the Minnesota BWSR Mitigation Banking Program would be crossed by the Applicant's preferred route.

Table 6.3.1.3-4. Estimated Acreages of Calcareous Fen Wetlands near the Applicant's Preferred Route in Minnesota

Approximate Milepost	Distance from Route	Elemental Occurrence Identifier	Primary Description	MBS Native Plant Community Code	State Rank[a]	County
APR 72.0	796 feet	14377 Viking 18	Calcareous fen (northwestern)	OPp93a	S2	Marshall
APR 73.5	2,042 feet	15297 Viking 20	Calcareous fen (northwestern)	OPp93a	S2	Marshall
APR 81.0	525 feet	34586 Norden 18	Calcareous fen (northwestern)	OPp93a	S2	Pennington
APR 120.5	2,011 feet	35384 Chester 24	Calcareous fen (northwestern)	OPp93a	S2	Polk
APR 122.0	63 feet	35382 Gully 30	Calcareous fen (northwestern)	OPp93a	S2	Polk

Source: Minnesota DNR 2008.

[a] State Rank: S1 = critically imperiled; S2 = imperiled; S3 = vulnerable to extirpation; S4 = apparently secure; S5 = secure, common, widespread, and abundant.

APR = Applicant's preferred route; MBS = Minnesota Biological Survey.

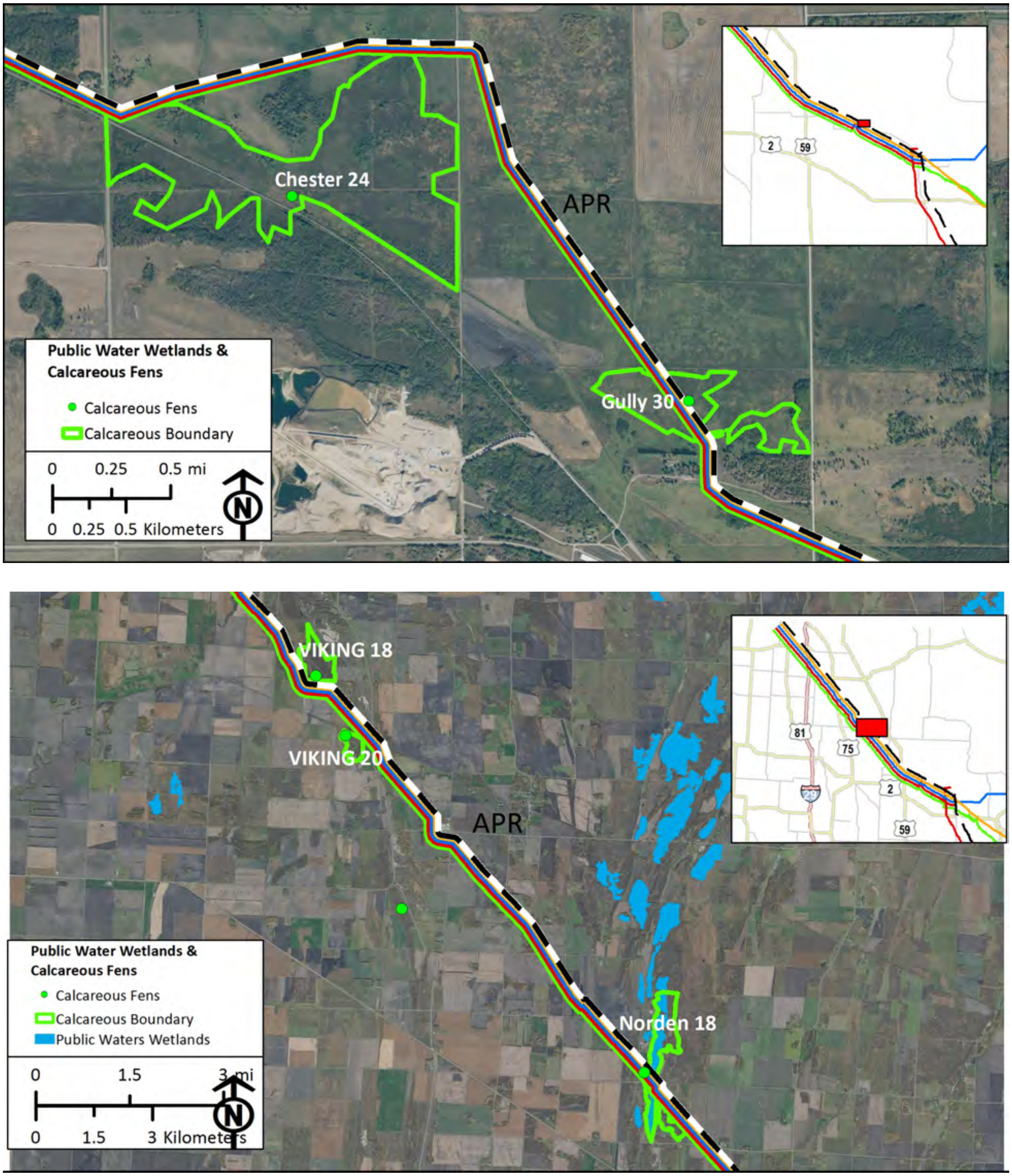
Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to wetlands for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the wetlands ROI for RA-03AM reflect the current state of resources in the environment along the existing this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Wetlands crossed by the construction work area for RA-03AM are listed in Table 6.3.1.3-5; about 80 percent of the wetlands crossed are emergent wetlands and scrub/shrub wetlands. For Public Waters Wetlands, only Type 3 – inland shallow fresh marshes would be crossed by the route, including approximately 8 acres within the construction work area and 3 acres within the permanent right-of-way (Table 6.3.1.3-6). No calcareous fens or wetlands enrolled in the NRCS Wetland Reserve Program have been identified along RA-03AM. Two Minnesota BWSR Mitigation Banking Program wetlands occur within 0.5 mile of RA-03AM. One of these (Number 3720) occurs within the construction work area and permanent right-of-way for the route (Figure 6.3.1.3-2 and Table 6.3.1.3-7).



Sources: Minnesota DNR 2014, 2008.

Figure 6.3.1.3-1. Public Waters Wetlands and Calcareous Fens Crossed by the Applicant's Preferred Route

Table 6.3.1.3-5. Estimated Acreages of Wetlands Crossed by Route Alternative RA-03AM (Clearbrook to Carlton) (acres)

Wetland Classification	Construction[a]	Operations[b]
Forested wetland	116.2	48.2
Scrub/shrub wetland	205.6	83.9
Emergent wetland	233.9	96.6
TOTAL	**555.7**	**228.7**

Source: USFWS 2016.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Table 6.3.1.3-6. Estimated Acreages of Public Waters Wetlands Crossed by RA-03AM (Clearbrook to Carlton) (acres)

Wetland Type	Construction[a]	Operations[b]
Type 3 – Inland shallow fresh marshes	7.6	3.2
TOTAL	**7.6**	**3.2**

Source: Minnesota DNR 2014.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

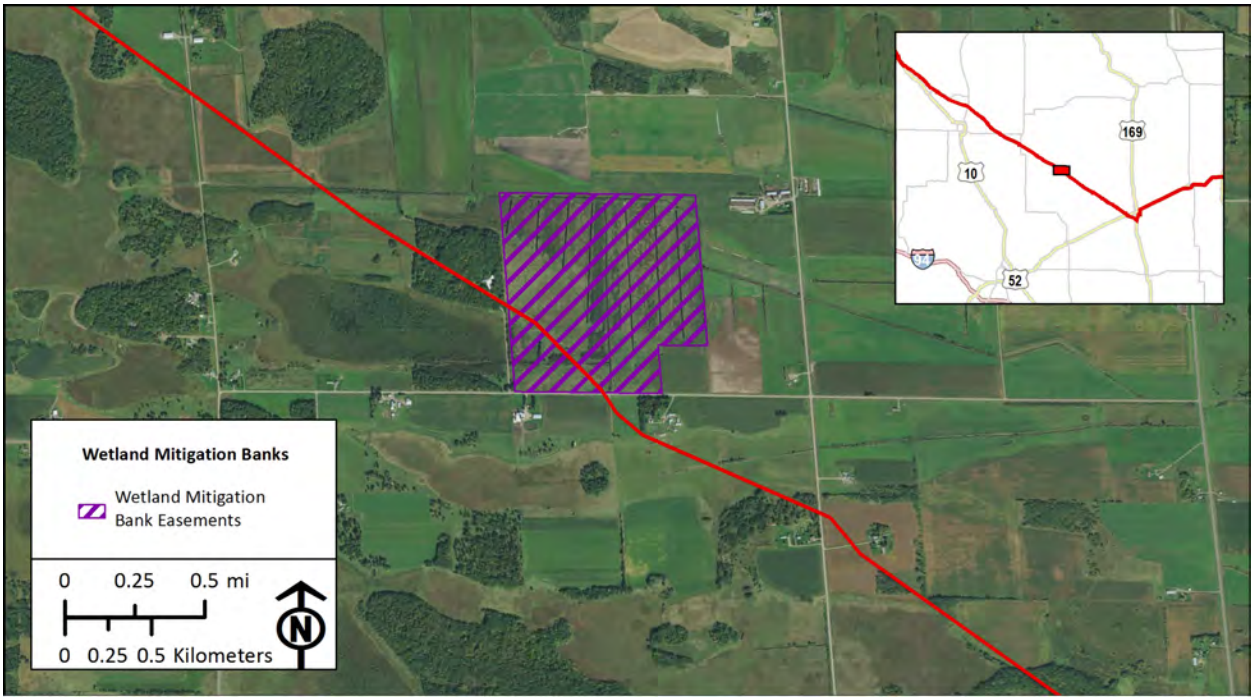
Table 6.3.1.3-7. Estimated Acreages of Wetland Mitigation Bank Easements Crossed by Route Alternative RA-03AM (Clearbrook to Carlton) (acres)

Wetland Mitigation Bank	Construction[a]	Operations[b]	Within 0.5 Mile
3720	4.7	1.9	145.1
4558	0.0	0.0	68.4
TOTAL	**4.7**	**1.9**	**213.6**

Source: Minnesota BWSR 2015.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.



Source: Minnesota BWSR 2015.

Figure 6.3.1.3-2. Wetland Mitigation Bank Crossed by Route Alternative RA-03AM

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the wetlands ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Wetlands within the construction impact area of RA-06 are predominantly forested wetlands (Table 6.3.1.3-8). Types 3 and 4 Public Waters Wetlands would be crossed by the route during construction and occur within the permanent right-of-way (Table 6.3.1.3-9). No calcareous fens, wetlands enrolled in the NRCS Wetland Reserve Program, or Minnesota BWSR Mitigation Banking Program wetlands would occur within the construction work area or within 0.5 mile of RA-06.

Table 6.3.1.3-8. Estimated Acreages of Wetlands Crossed by Route Alternative RA-06 (Clearbrook to Carlton) (acres)

Wetland Classification	Construction[a]	Operations[b]
Forested wetland	541.1	227.9
Scrub/shrub wetland	252.5	104.2
Emergent wetland	126.4	52.7
TOTAL	**920.1**	**384.8**

Source: USFWS 2016.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Table 6.3.1.3-9. Estimated Acreages of Public Waters Wetlands Crossed by Route Alternative RA-06 (Clearbrook to Carlton) (acres)

Wetland Type	Construction[a]	Operations[b]
Type 3 – Inland shallow fresh marshes	1.1	0.4
Type 4 – Inland deep fresh marshes	2.1	0.8
TOTAL	**3.2**	**1.3**

Source: Minnesota DNR 2014.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the wetlands ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Wetlands within the construction impact area of RA-07 are predominantly forested wetlands (Table 6.3.1.3-10). No Public Waters Wetlands, calcareous fens, or wetlands enrolled in the NRCS Wetland Reserve would be crossed by the construction work area. Two Minnesota BWSR Mitigation Banking Program wetlands occur near RA-07, and one easement (Number 3734) occurs within the construction work area (Figure 6.3.1.3-3 and Table 6.3.1.3-11).

Table 6.3.1.3-10. Estimated Acreages of Wetlands Crossed by Route Alternative RA-07 (Clearbrook to Carlton) (acres)

Wetland Classification	Construction[a]	Operations[b]
Forested wetland	594.9	124.1
Scrub/shrub wetland	445.7	119.5
Emergent wetland	154.0	37.4
TOTAL	**1,194.7**	**281.1**

Source: USFWS 2016.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

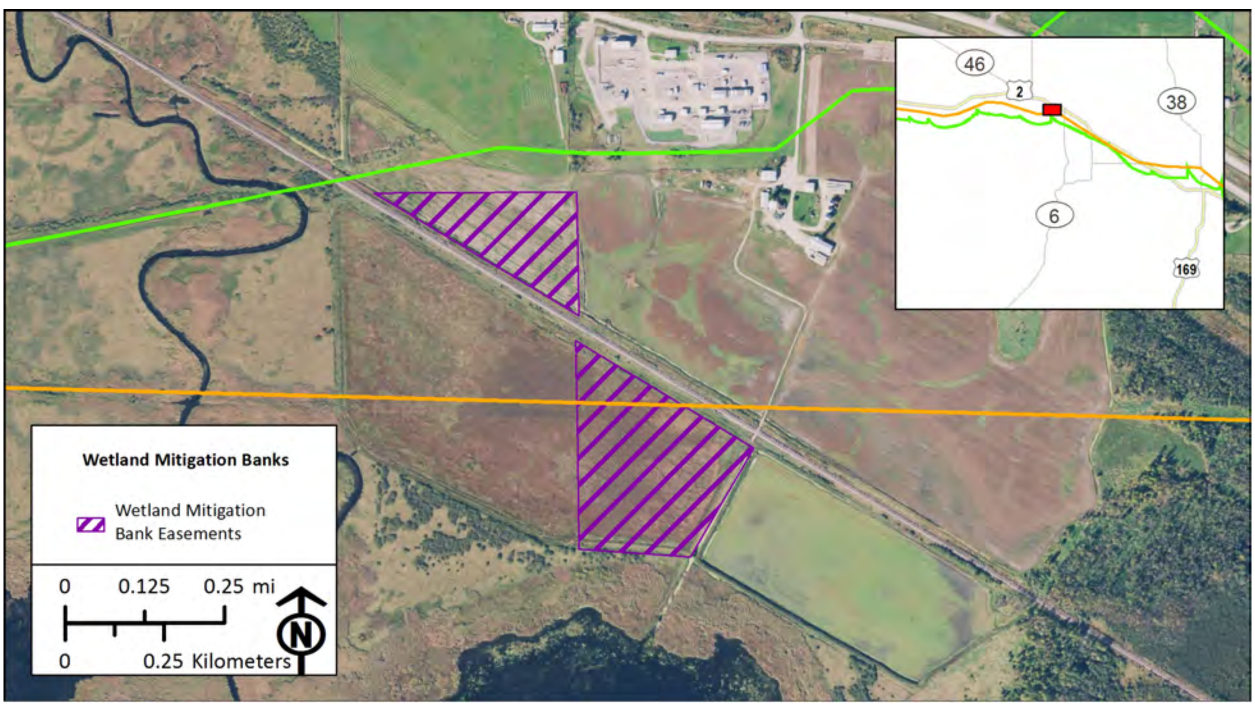
Table 6.3.1.3-11. Estimated Acreages of Wetland Mitigation Bank Easements near Route Alternative RA-07 (Clearbrook to Carlton) (acres)

Wetland Mitigation Banks	Construction[a]	Operations[b]	Within 0.5 miles
3734	0.3	0.0	26.8
5617	0.0	0.0	62.1
TOTAL	**0.3**	**0.0**	**88.9**

Source: Minnesota BWSR 2015.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.



Source: Minnesota BWSR 2015.

Figure 6.3.1.3-3. Wetland Mitigation Bank Crossed by Route Alternatives RA-07 and RA-08

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the wetlands ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Wetlands within the construction work area of RA-08 are predominantly forested and scrub/shrub wetlands (Table 6.3.1.3-12). Types 3 and 5 Public Waters Wetlands would be crossed by the construction work area and would be maintained as part of the permanent right-of-way (Table 6.3.1.3-13). No calcareous fens or wetlands enrolled in the NRCS Wetland Reserve Program have been identified along RA-08 (Minnesota DNR 2008; USGS 2016). Two Minnesota BWSR Mitigation Banking Program wetlands occur near RA-08, and one wetland mitigation bank easement (Number 3734) occurs within the construction work area and permanent right-of-way (Figure 6.3.1.3-3 and Table 6.3.1.3-14).

Table 6.3.1.3-12. Estimated Acreages of Wetlands Crossed by Route Alternative RA-08 (Clearbrook to Carlton) (acres)

Wetland Classification	Construction[a]	Operations[b]
Forested wetland	365.4	151.3
Scrub/shrub wetland	273.6	113.9
Emergent wetland	162.9	69.8
TOTAL	**802.0**	**335.0**

Source: USFWS 2016.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route

Table 6.3.1.3-13. Estimated Acreages of Public Waters Wetlands Crossed by Route Alternative RA-08 (Clearbrook to Carlton) (acres)

Wetland Type	Construction[a]	Operations[b]
Type 3 – Inland shallow fresh marshes	4.7	2.0
Type 5 – Inland open fresh water	0.7	0.3
TOTAL	**5.4**	**2.3**

Source: Minnesota DNR 2014.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Table 6.3.1.3-14. Estimated Acreages of Wetland Mitigation Bank Easements near Route Alternative RA-08 (Clearbrook to Carlton) (acres)

Wetland Mitigation Banks	Construction[a]	Operations[b]	Within 0.5 miles
3734	1.6	0.7	26.8
5617	0.0	0.0	91
TOTAL	**1.6**	**0.7**	**118.6**

Source: Minnesota BWSR 2015.

[a] Construction = estimated construction impact area in acres based on 120-foot-wide construction work area centered on the pipeline route, including the 50-foot-wide permanent right-of-way.

[b] Operations = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

6.3.1.3.3 Impact Assessment

This section addresses the potential impacts on wetlands during construction and operation of the Applicant's preferred route and the route alternatives. Wetland impacts specific to the Applicant's preferred route in Minnesota and the route alternatives between Clearbrook and Carlton are described below.

Generally, pipeline construction through wetlands can result in changes to vegetation, soils, hydrology, and wildlife habitats, including:

- Changes in wetland vegetation community composition, structure, and productivity due to modification of surface and subsurface flow patterns as a result of ground clearing and pipeline construction;
- Loss of sensitive plant species as a result of construction clearing and grading;
- Wetland soil disturbance as a result of mixing of topsoil and subsoil during trenching and backfilling;
- Changes to water-retaining substrates, thereby causing permanent alterations to their water-holding capacity;
- Alteration of surface and subsurface hydrology that is important for maintaining wetland communities and microhabitats as a result of trenching and backfilling during pipeline construction;
- Sedimentation of wetlands and fluctuations in wetland hydrology as a result of trenching, dewatering, and stockpiling activities;
- Reduction in wildlife habitat and forage productivity, and increased risk of soil erosion and weed invasion due to removal of vegetation;
- Potential spread of invasive species and noxious weed populations along the pipeline construction impact area; and
- Contamination from equipment drips or spills during refueling operations.

Generally, pipeline operations can affect wetlands by:

- Disturbance to reclaimed wetlands within the permanent right-of-way as a result of excavation to repair or replace sections of pipe as a part of the Applicant's Integrity Management Program, and as a result of right-of-way vegetation maintenance activities;
- Permanent modification of forested or scrub/shrub wetland plant community composition and structure in the permanent right-of-way as a result of vegetation management activities; and
- Establishment and spread of noxious weeds and invasive plants within the permanent right-of-way and at aboveground facilities due to ground disturbance as part of the Applicant's Integrity Management Program, and as a result of right-of-way vegetation maintenance activities.

All wetland changes would need to be approved by the authorizing agencies and are identified by milepost. In areas where permanent aboveground facilities are not proposed, construction of the pipeline through wetlands would result primarily in temporary to short-term and minor impacts on wetlands and their functions during and immediately following construction activities, until the site is reclaimed and vegetation cover is reestablished. Post-construction wetland reclamation and monitoring would be required for a period of time until reclamation standards and permit conditions are met, or otherwise could be offset through compensatory mitigation in an onsite or offsite location.

Construction impacts on wetlands would be minimized by construction methods, including reducing the width of the construction work area, cutting wetland vegetation at the soil surface to retain roots, using low ground-pressure equipment and timber mats to minimize compaction and rutting, segregating topsoil, and not mounding topsoil, as described below. The Applicant has committed to implementing the following BMPs during construction to minimize direct and indirect wetland impacts:

- Developing and adhering to the Project-specific Construction Methods and Procedures for Wetland and Waterbody Crossings and site-specific crossing plans (Enbridge 2016);
- Using wetland crossings designed and approved by engineers, reviewed onsite by the Project engineer, and approved by agencies for each crossing;
- Committing to selection of the most appropriate wetland and waterbody crossing techniques in consultation with appropriate agencies to determine site-specific approaches, including open-cut (wet trench, push-pull with excavator, push-pull with swamphoe); dry crossing methods (dry trench, dam-and-pump, or flume); trench breakers; trenchless (auger bore HDD); and those described in the Enbridge November 2016 EAW (Enbridge 2016);
- Implementing mitigation measures to protect adjacent waterbodies during construction including, but not limited to, use of a vegetated buffer, slope breakers, sediment barriers (i.e., silt fencing and sediment curtains), filtration devices during dewatering, or trench breakers;
- Conducting wetland shoreline stabilization measures, including the erosion controls identified above and erosion control blankets, mulching, seeding (with Minnesota BWSR seed mixes or other agency-approved seed mix), cat tracking, placing temporary slope breakers, and placing riprap where necessary;
- Developing and adhering to the wetland-specific avoidance measures in the Applicant's Environmental Protection Plan (Appendix E);

- Reducing temporary construction work area beyond the 50-foot-wide permanent right-of-way in wetlands areas from 70 feet to 45 feet, except in areas where trench wall failure or other construction constraints have been identified as a concern;
- Restoring wetland vegetation cover types following construction, as outlined in the Environmental Protection Plan;
- Co-locating the Project with existing rights-of-way unless co-location would result in a greater impact on wetlands or other sensitive resources;
- Minimizing impacts on sensitive wetland soils during wet conditions by use of timber mats, low-ground-weight equipment, and other methods identified in the Environmental Protection Plan;
- Designing and planning Project pipeline routes and infrastructure to reduce environmental impacts on sensitive wetland resources;
- Developing measures to describe inadvertent drilling fluid release response measures in wetlands and adjacent wetlands;
- Placing petroleum products storage, refueling, maintenance, and lubricating operations a minimum of 100 feet from wetlands;
- Placing concrete wash water, grindings, and slurry away from wetlands with no allowable discharge of these waste products into wetlands or waterbodies;
- During trench dewatering, pumping discharge water at controlled discharge rates into a filtration device located in a well-vegetated area and in a manner to prevent the migration of silt-laden water into wetlands;
- Posting signage during construction noting sensitive environmental features and wetlands;
- Cutting off wetland vegetation at ground level and removing it from wetland areas;
- Stripping the top 1 foot of topsoil or the amount of topsoil present, whichever is less, over the trench line, segregating it, and replacing it in unsaturated wetlands;
- Not applying fertilizer, lime, or mulch in wetlands;
- Complying with USACE and state wetland permits, including compliance with permit conditions and long-term monitoring plans;
- Restoring wetlands to preconstruction contours;
- Maintaining wetland hydrology by using trench breakers in any area where the potential to drain, or partially drain, a wetland exists; sufficiently compacting the pipeline trench; and placing the pipeline on native material as opposed to gravel; and
- Using construction mats, as needed, to facilitate equipment access and pipeline installation and to minimize soil compaction and/or mixing.

Wetland impacts and associated water quality certifications would be permitted or approved by the authorizing agencies and would be identified by milepost. In areas where permanent aboveground facilities are not proposed, wetland impacts resulting from construction would be temporary and minor for emergent wetlands and long-term or permanent for scrub/shrub and forested wetlands. Post-construction wetland reclamation and monitoring would be required for a period of time until reclamation standards and permit conditions are met, or otherwise mitigated entirely through compensatory mitigation in an onsite or offsite location.

The assessments presented below are discussed within the following categories:

- General wetland impacts,
- Impacts on Minnesota Public Waters Wetlands,
- Impacts on Minnesota calcareous fen wetlands, and
- Impacts on federal and state Wetland Reserves and Minnesota BWSR Mitigation Bank easements.

Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the wetlands ROI for the Applicant's Preferred Route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

General Wetlands

Pipeline construction through wetlands would result in impacts on wetland vegetation, soils, hydrology, and wildlife habitats. Construction activities may result in reduction of a wetland's ability to trap and slowly release surface water, rain, snowmelt, groundwater, and flood waters. Wetland soils would be disturbed by trenching and backfilling during pipeline construction. Impacts to wetlands outside the construction work area are not expected because sediment containment barriers would be used until construction is complete and vegetation cover has reestablished. Over time, provided that original contours are restored and hydrology is maintained, most affected wetland vegetation would regenerate and wetland function would return. In general, wetland construction impacts that do not result from placement of fill in wetlands would be returned to preconstruction contours and wetland conditions.

The Applicant's preferred route within Minnesota would affect approximately 499.3 acres of wetlands during pipeline construction (Table 6.3.1.3-1). Up to 355.6 acres of scrub/shrub and forested wetlands would be cleared during construction, after which woody vegetation would be allowed to reestablish within construction work areas outside of the permanent right-of-way. Woody vegetation and all other wetland vegetation would be permanently removed from the areas where aboveground facilities (pump stations and MLVs) and access roads would be constructed.

Until woody vegetation is reestablished, scrub/shrub and forested wetlands would be converted to emergent vegetation, resulting in long-term major impacts on both vegetation structure and wetland functions. Wetland habitats containing large mature woody growth would reestablish in temporary construction work areas within 3 to 50 years, depending on the vegetation community and vegetation structure (Jacobson 2006; Wenzel et al. 2012). Long-term to permanent major impacts on forested wetlands in the construction work area may require compensatory mitigation as these wetland types would be converted to other wetland types on a long-term or permanent basis. Forested wetlands may require from 35 to 50 years to achieve vegetation and wildlife habitat similar to mature forested wetlands (Wenzel et al. 2012).

Construction of the Applicant's preferred route would affect up to 143.8 acres of emergent wetlands. Emergent wetland vegetation would reestablish within 3 years as a community functionally similar to that of the wetland prior to construction (Jacobson 2006; Wenzel et al. 2012), provided that recommended wetland reclamation and revegetation efforts are implemented, disturbance to vegetation is minimized, and preconstruction wetland contours and wetland hydrology are maintained. In areas where the disturbance to vegetation is minimal and the root structures, preconstruction wetland contours, and wetland hydrology are maintained, the impacts would be short-term and minor. In areas where trenching occurs directly through a wetland, the impacts would be short-term to long-term and minor to major. Where emergent wetlands are cleared for construction of aboveground facilities and access roads (about 18.9 acres), impacts on these wetlands would be permanent and minor to major; however, these impacts could be offset by compensatory wetland mitigation.

Approximately 19 acres of wetlands could be affected by use as ATWS and pipe storage yards required for pipeline construction, resulting in short-term to long-term minor impacts, as these areas would be restored to wetlands after construction.

Crossings by HDD for selected waterbodies and associated wetlands generally would avoid direct impacts on wetland resources. Each crossing selected for HDD would be identified, and permitting would be carried out (including identification of BMPs) at each location. Fluid (water, bentonite clay, and possible additives) is used during drilling to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or "frac-out" of this drilling fluid when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground. If a frac-out occurred within a wetland, the vegetation and soil would be compromised. During drilling, construction personnel would monitor the crossing to detect releases of drilling mud and would implement containment, response, and clean-up procedures as outlined in the Applicant's Environmental Protection Plan (Appendix E) to limit the potential for drilling mud to reach surface water. If a frac-out occurred and went undetected or was not quickly contained, impacts on wetlands could be long-term and major. However, with implementation of the Applicant-proposed measures to respond to a drilling mud release during HDD construction, the impact of a release could be short-term and minor. Successful construction of wetland crossings using HDD (i.e., the crossing is completed without a frac-out) would not affect wetlands.

Specially Designated Wetlands

Impacts on Minnesota Public Waters Wetlands. The Applicant's preferred route would affect 2.8 acres of Public Waters Wetlands during construction (Table 6.3.1.3-3 and Figure 6.3.1.3-1). Impacts on Minnesota Public Waters Wetlands during construction would result from alteration of wetland vegetation, soils, and hydrology; however, these areas would be restored as wetlands after construction.

Minnesota DNR would be consulted regarding Public Waters Wetland crossings as part of the License to Cross Public Waters permitting process that would occur prior to construction. All impacts, BMPs, and proposed avoidance related to Public Waters Wetlands would be subject to conditions contained in a License to Cross Public Waters. Any dewatering of the trench that would be required for construction across Public Waters Wetlands would require a water appropriation permit. Implementation of the measures identified in the license would limit potential impacts on Public Waters Wetlands.

As part of permit requirements, the Applicant would identify and prepare site-specific crossing plans, avoid and minimize impacts on Public Waters Wetlands to the extent possible, and restore affected Public Waters Wetlands onsite. Restoration to the existing level of wetland function would likely take several years. As a result, the impacts on Public Waters Wetlands due to construction of the Applicant's preferred route would be short-term and minor.

Impacts on Minnesota Calcareous Fen Wetlands. Gully 30 could be affected by construction of the Applicant's preferred route (Table 6.3.1.3-4 and Figure 6.3.1.3-1). All other calcareous fens within 0.5 mile of the Applicant's preferred route (Chester 24 and Viking 18) would be unaffected by construction, as the route would avoid crossing these fens. Potential impacts on Gully 30 include alteration of hydrology, introduction of contaminants, loss of rare or unique plant species, introduction of invasive species, and altered peat formation—all of which could be detrimental to the formation and proper function of a calcareous fen.

The results of calcareous fen surveys completed in 2010 during development of the Alberta Clipper pipeline identified the presence of a single calcareous fen (Gully 30), located 63 feet away from the centerline. As part of the environmental review for the Alberta Clipper project, a Gully 30 Fen Management Plan was developed in coordination with Minnesota DNR. As proposed, portions of the Applicant's preferred route are co-located with the Alberta Clipper pipeline, including the area where this fen occurs. If it is determined that impacts on this fen could not be practicably avoided by Project construction, construction would be subject to a Fen Management Plan approved by the Commissioner of Natural Resources of Minnesota DNR.

Prior to construction, the Minnesota DNR would be consulted to aid in the identification of potential impacts on and major mitigation measures for calcareous fens. Where calcareous fens are identified, Minnesota DNR would request preparation of a Fen Management Plan, which would identify impacts and BMPs specific to the affected fen. These BMPs would include the general BMPs identified to avoid major impacts on wetlands discussed above. Overall, it is expected that the Applicant's preferred route would result in a short-term to long-term minor impact on one calcareous fen wetland.

Impacts on Wetland Reserves. No NRCS Wetland Reserves (i.e., wetlands under a Wetland Reserve Program) or Minnesota BWSR mitigation bank easements occur within the construction work area of the Applicant's preferred route; therefore, no impacts on these wetland resources would occur (USGS 2016; Minnesota BWSR 2015). A state wetland reserve is located between the North Dakota border and Clearbrook, Minnesota. Impacts on this reserve are not expected as the reserve are not crossed by the Applicant's preferred route.

<u>Operations Impacts</u>

General Wetlands

Operation of the Applicant's preferred route would affect 261.2 acres of wetlands within the permanent right-of-way and associated facilities. About 18.9 acres of wetlands would be permanently converted to developed land for aboveground facilities (pump stations and MLVs) and access roads. The impacts on these wetlands would be permanent and minor to major; however, the impacts could be offset by compensatory wetland mitigation.

Impacts to wetlands could result from maintenance activities, including vegetation management and pipeline inspections that would occur for the life of the Project. Because trees and shrubs would not be allowed to reestablish within the permanent right-of-way, vegetation management in forested and scrub/shrub wetlands would represent a permanent major impact on emergent or early-stage scrub/shrub wetlands.

A total of 182.0 acres of forested and scrub/shrub wetlands converted during construction would be maintained as emergent wetlands within the pipeline permanent right-of-way for the life of the Project. Woody vegetation within the permanent right-of-way would be managed (cut every 3 to 5 years) to prevent large shrubs and trees from reestablishing over the pipeline to allow for visual inspection of the right-of-way. This loss of woody vegetation would result in permanent and major impacts on wetland structure and functions that may require compensatory mitigation.

A total of 79.2 acres of emergent wetland vegetation in the permanent right-of-way generally would not be mowed or otherwise maintained and would not be affected by mowing or maintenance activities. Routine vegetation management would use a rubber-tracked skid-steer vehicle, or similar, with specialized cutting equipment to minimize impacts on wetlands resulting in short-term minor impacts on emergent wetlands.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. If excavation is required within a wetland, impacts would likely be short-term and minor but could occur periodically over the life of the Project.

Operation of the Applicant's preferred route may increase the potential for the introduction and spread of noxious weeds and invasive plants for the life of the Project and beyond. The Environmental Protection Plan (Appendix E) and wetland permitting documents would describe measures to prevent the spread of noxious and invasive weeds in wetlands during wetland reclamation/revegetation and during pipeline monitoring and maintenance activities. The presence of noxious weeds and potential for spread of infestations within the Project area are addressed in Section 6.3.3.2.

Potential impacts on wetlands due to an unanticipated crude oil release are discussed in Chapter 10.

Specially Designated Wetlands

Impacts on Minnesota Public Waters Wetlands. Approximately 1.9 acres of Public Waters Wetlands occur within the permanent right-of-way for the Applicant's preferred route. Although operations impacts could result from vegetation management, it is unlikely that the shallow and deep fresh marshes crossed would require vegetation management because the shrubs are unlikely to grow as long as the marsh hydrology is maintained. The Public Waters Wetlands within the permanent right-of-way are located between Clearbrook and Carlton in Minnesota. Any potential impacts would be expected to be short-term and minor, but would occur periodically over the life of the Project. In addition, pipeline maintenance activities could spread noxious weeds and invasive plants. The potential impact is expected to be short-term and minor after each maintenance activity, but would occur periodically over the life of the Project.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. Impacts on Public Wetland Waters would be limited to the pipeline segment through the 1.9 acres of these wetlands and repeated repairs or replacement at those locations are unlikely. Impacts on the Public Waters Wetlands from integrity digs likely would be short-term and minor to major.

Impacts on Minnesota Calcareous Fen Wetlands. The Applicant's preferred route would cross the Gully 30 calcareous fen and has been routed to avoid the Chester 24 and Viking 18 calcareous fens that are crossed by the existing Line 3. All activities occurring near calcareous fens would be subject to BMPs identified in a Fen Management Plan, if one needed to be developed for the Project. Impacts on calcareous fens as a result of vegetation management activities during normal operation of the Project are not expected but would be short- to long-term and minor if they did occur, and could occur periodically over the life of the Project.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. Impacts on calcareous fens would be limited to the pipeline segment through the Gully 30 fen, and repeated repairs or replacement at this location are unlikely. If excavation and repair at this locations were necessary, impacts would be similar to those for construction of the pipeline through the fen; the impact would be short- to long-term and minor but could occur periodically over the life of the Project.

Impacts on Wetland Reserves. Impacts on wetland reserves would not occur during operation of the pipeline because no wetland reserves or Minnesota BWSR mitigation bank easements are located within the permanent right-of-way.

Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the wetlands ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

General Wetlands. Construction of RA-03AM would affect approximately 555.7 acres of wetlands in Minnesota (Table 6.3.1.3-5). Approximately 116.2 acres of forested wetlands and 205.6 acres of scrub/shrub wetlands would be cleared during construction along the entire route (Table 6.3.1.3-5). After construction, woody vegetation would be allowed to reestablish within construction work areas outside of the permanent right-of-way. Until woody vegetation is reestablished, scrub/shrub and forested wetlands would be converted to emergent vegetation, resulting in long-term to permanent major impacts on both vegetation structure and wetland functions. Impacts on forested wetlands in the construction work area may require compensatory mitigation to offset long-term to permanent impacts.

About 233.9 acres of emergent wetlands would be affected by construction (Table 6.3.1.3-5). Disturbance to these wetlands would be minimized through implementation of BMPs and would be reclaimed after construction, but emergent vegetation communities would require several years to become fully reestablished. As a result, the impact of construction on emergent wetlands would be short-term and minor at each wetland.

Footprints are not available for aboveground facilities for RA-03AM at this time. If facilities are sited on wetlands, impacts during construction would be permanent and major because the wetlands would be converted to developed land. Impacts to wetlands from facilities would be avoided and minimized, and unavoidable impacts could be offset with compensatory mitigation similar to the Applicant's preferred route.

Specially Designated Wetlands. Construction of RA-03AM would result in short-term minor impacts on approximately 8 acres of Public Waters Wetlands in Minnesota. The affected Public Waters Wetlands would be reclaimed as wetlands following construction. Impacts on Public Waters Wetlands would be subject to state-specific permitting requirements, and implementation of BMPs would be required for Project approval.

No impacts on calcareous fens would be associated with the RA-03AM route, as none were identified during the calcareous fen data review within the construction work area or permanent right-of-way for the route.

No impacts on wetland reserves would be associated with the RA-03AM route, as no Wetland Reserve Program wetlands were identified near the route. Two Minnesota BWSR wetland mitigation bank easements are within 0.5 mile of RA-03AM, one of which (Number 3720) would be affected by construction and operation of RA-03AM. The affected wetland mitigation bank easement in construction work areas would be reclaimed, resulting in approximately 5 acres of short-term minor impacts.

Operations Impacts

General Wetlands. General wetland impacts associated with operation of a pipeline along RA-03AM would be similar to those described for the Applicant's preferred route. Operation of RA-03AM could affect approximately 228.7 acres of wetlands within the permanent right-of-way (Table 6.3.1.3-5). Impacts could result from maintenance activities, including vegetation management that would occur for the life of the Project. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way to allow for visual inspection of the right-of-way. About 48.2 acres of previously forested wetlands and 83.9 acres of scrub/shrub wetland would be maintained as emergent wetlands for the life of the Project (Table 6.3.1.3-5). This loss of forested and scrub/shrub wetland communities would result in permanent and major impacts on wetland structure and functions that could require compensatory mitigation to offset permanent impacts.

Emergent wetland vegetation in the permanent right-of-way generally would not be mowed or otherwise managed and would not be affected by these activities. If emergent vegetation is affected by vegetation management activities, the impact is expected to be short-term and minor.

During operation, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. If excavation is required within a wetland, impacts likely would be short-term and minor, but could occur periodically over the life of the Project.

Operation of RA-03AM may increase the potential for introduction and spread of noxious weeds and invasive plants for the life of the Project. The Applicant would implement the procedures in the Environmental Protection Plan (Appendix E), and wetland permitting documents would describe measures to prevent the spread of noxious and invasive weeds in wetlands. With implementation of those procedures, the potential impact of introduction and spread of noxious weeds and invasive plants would be short-term and minor.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. Impacts on emergent wetlands as a result of these activities would likely be short-term and minor, but would occur periodically over the life of the Project.

Facility locations are unknown for the route alternatives. If wetlands are covered by aboveground facilities, they would be permanently converted to developed land. Any potentially unavoidable impacts would be permanent and major; however, the impacts could be offset by compensatory wetland mitigation.

Specially Designated Wetlands. Short-term minor impacts on Public Waters Wetlands within the permanent right-of-way would affect approximately 3.2 acres along the RA-03AM route (Table 6.3.1.3-6). These Public Waters Wetlands would be reclaimed and would remain as wetlands for the life of the Project but would be subject to ground disturbance and restoration efforts during maintenance activities requiring pipeline inspection.

No calcareous fens would be affected during operation of RA-03AM, as they do not occur within the permanent right-of-way for the route.

No impacts on wetland reserves would occur for the RA-03AM route, as no Wetland Reserve Program wetlands were identified near the route. A total of 1.9 acres of Minnesota BWSR wetland mitigation bank easements occur within the permanent right-of-way for RA-03AM; the resultant impact would be permanent and minor, as the wetlands would be reclaimed. All wetlands within the permanent right-of-way would become ineligible as conservation easements, as the wetlands would no longer be protected from future disturbance because of required routine vegetation management and integrity management activities. However, in-kind compensatory mitigation could be used to offset wetland losses.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the wetlands ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

General Wetlands. Construction of RA-06 would affect approximately 920.1 acres of wetlands between Clearbrook and Carlton (Table 6.3.1.3-8). About 541.1 acres of forested wetlands and 252.5 acres of scrub/shrub wetlands would be cleared during construction along the Clearbrook-to-Carlton segment (Table 6.3.1.3-9). After construction, trees and shrubs would be allowed to reestablish within construction work areas outside of the permanent right-of-way. Until woody vegetation is reestablished, scrub/shrub and forested wetlands would be converted to emergent vegetation, resulting in long-term to permanent major impacts on both vegetation structure and wetland functions. Impacts on forested wetlands in the construction work area may require compensatory mitigation to offset long-term to permanent impacts. Wetlands affected by construction of RA-06 would be within a new pipeline corridor, and many of these wetlands would have experienced limited to no prior ground disturbance.

Approximately 126.4 acres of emergent wetlands would be affected by construction of RA-06 (Table 6.3.1.3-8). Wetlands would be reclaimed after construction but would require several years for the emergent vegetation community to become fully reestablished. The impact on emergent wetlands from construction would be short-term and minor at each affected wetland.

Footprints are not available for aboveground facilities for route alternative RA-06. If facilities are sited on wetlands, impacts from construction would be permanent and major because the wetlands would be converted to developed land. However, impacts on wetlands from facilities would be avoided and minimized, and unavoidable impacts could be offset with compensatory mitigation similar to the Applicant's preferred route.

Specially Designated Wetlands. Construction of RA-06 would result in short-term minor impacts on approximately 3.2 acres of Public Waters Wetlands in Minnesota (Table 6.3.1.3-9). The affected Public Waters Wetlands would be reclaimed as wetlands following construction, resulting in short-term minor impacts. Impacts on Public Waters Wetlands would be subject to state-specific permitting requirements, and implementation of BMPs would be required for Project approval.

No impacts on calcareous fens would be associated with RA-06 as none were identified during the calcareous fen data review within the construction work area or permanent right-of-way for the route.

No impacts on wetland reserves would be associated with RA-06, as no Wetland Reserve Program wetlands were identified near the route. No Minnesota BWSR wetland mitigation bank easements occur within 0.5 mile of RA-06; therefore, construction of RA-06 would not affect wetland mitigation bank easements.

Operations Impacts

General Wetlands. Operation of RA-06 could affect approximately 384.8 acres of wetlands within the permanent right-of-way (Table 6.3.1.3-8). The impacts could result from maintenance activities, including vegetation management that would occur within the permanent right-of-way for the life of the Project. Trees and shrubs would not be allowed to reestablish within the maintained right-of-way to allow for visual inspection of the right-of-way. Vegetation management would maintain previously forested and scrub/shrub wetlands as emergent or early-stage scrub/shrub wetlands. About 227.9 acres of forested wetlands and 104.2 acres of scrub/shrub wetlands would be maintained as emergent wetlands for the life of the Project (Table 6.3.1.3-8). This loss of forested wetland vegetation would result in permanent and major impacts on wetland structure and functions that could require compensatory mitigation to offset permanent major impacts.

A total of 52.7 acres of emergent wetland vegetation in the permanent right-of-way generally would not be mowed or otherwise maintained and would not be affected by mowing or maintenance activities. If emergent vegetation is affected by vegetation management activities, the impact is expected to be short-term and minor.

During operation, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. If excavation is required within a wetland, impacts likely would be short-term and minor, but could occur periodically over the life of the Project.

Operation of RA-06 may increase the potential for the introduction and spread of noxious weeds and invasive plants for the life of the Project. The Applicant would implement the procedures in the Environmental Protection Plan (Appendix E), and wetland permitting documents would describe measures to prevent the spread of noxious and invasive weeds in wetlands. With implementation of those procedures, the potential impact of introduction and spread of noxious weeds and invasive plants would be short-term and minor.

Facility locations for RA-06 are unknown. If wetlands are covered by aboveground facilities they would be permanently converted to developed land. Any potentially unavoidable impacts would be permanent and major; however, the impacts could be offset by compensatory wetland mitigation.

Specially Designated Wetlands. Short-term minor impacts on Public Waters Wetlands within the permanent right-of-way would affect approximately 1.3 acre along the RA-06 route (Table 6.3.1.3-9). Although these Public Waters Wetlands would be reclaimed and would remain as wetlands for the life of the Project, they could be subject to ground disturbance and restoration efforts as a result of maintenance activities requiring pipeline inspection.

No calcareous fens would be affected during operation, as they do not occur within the permanent right-of-way for RA-06.

No wetland reserves or wetland mitigation bank easements would be affected by operation of RA-06.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the wetlands ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

General Wetlands. Construction of RA-07 would affect approximately 1,194.7 acres of wetlands between Clearbrook and Carlton (Table 6.3.1.3-10). About 584.9 acres of forested wetlands and 445.7 acres of scrub/shrub wetlands would be cleared during construction along the entire route (Table 6.3.1.3-10). After construction, trees and shrubs would be allowed to reestablish within construction work areas outside of the permanent right-of-way. Until woody vegetation is reestablished, scrub/shrub and forested wetlands would be converted to emergent vegetation, resulting in long-term to permanent major impacts on both vegetation structure and wetland functions. Impacts on forested wetlands in the construction work area may require compensatory mitigation for loss of forested wetlands. Most of the wetlands that would be affected by removal of the existing Line 3 and replacement with new pipeline were disturbed during the original construction of the Line 3 pipeline, and were disturbed again during construction of additional pipelines through the Mainline corridor.

A total of 154.0 acres of emergent wetlands would be affected by construction of RA-07 (Table 6.3.1.3-10). Wetlands would be reclaimed after construction but would require several years to become fully reestablished. As a result, the impact of construction on emergent wetlands would be short-term and minor at each wetland. Many of these emergent wetlands were disturbed during the original construction of the Line 3 pipeline and were disturbed again during construction of additional pipelines through the Mainline corridor.

Footprints are not available for aboveground facilities for route alternative RA-07. If facilities are sited on wetlands, impacts from construction would be permanent and major because the wetlands would be converted to developed land. However, impacts on wetlands from facilities would be avoided and minimized, and unavoidable impacts could be offset with compensatory mitigation similar to the Applicant's preferred route.

Specially Designated Wetlands. Construction of RA-07 would not affect Public Waters Wetlands in Minnesota, as none occur within the construction work area.

No impacts on calcareous fens would be associated with the RA-07 route, as none were identified during the calcareous fen data review within the construction work area or permanent right-of-way for the route.

No impacts on federal or state wetland reserves would occur, as no Wetland Reserve Program wetlands were identified near RA-07. Two Minnesota BWSR wetland mitigation bank easements occur within 0.5 mile of RA-07, one of which (Number 3734) would be crossed by the construction expanded construction work area for RA-07. If it is not possible to avoid this easement, construction would result in short-term and minor impacts; however, the wetlands may become ineligible for the mitigation banking program.

Operations Impacts

General Wetlands. Operation of RA-07 would affect 281.1 acres of wetlands within the permanent right-of-way. The impacts would result from ongoing maintenance activities, including vegetation management that would occur for the life of the Project. Because trees and shrubs would not be allowed to reestablish within the maintained pipeline right-of-way, vegetation management would represent a long-term to permanent major impact because 124.1 acres of forested and 119.5 acres scrub/shrub wetlands would be maintained as emergent or early-stage scrub/shrub wetlands. This right-of-way is currently maintained through vegetation management; consequently, there would be no additional impacts.

A total of 37.4 acres of emergent wetland vegetation in the permanent right-of-way generally would not be mowed or otherwise maintained and would not be affected by these activities. If emergent vegetation is affected by vegetation management, the impact could be short-term and minor. There would be no additional impacts, however, as this right-of-way is currently managed for the existing Line 3 and adjacent pipelines.

About 124.1 acres of forested wetlands in the permanent right-of-way for RA-07 would be maintained as emergent wetlands for the life of the Project (Table 6.3.1.3-10). This loss of forested wetland vegetation could result in permanent and major impacts on wetland structure and functions that could require compensatory mitigation to offset long-term to permanent major impacts. As these impacts would be within the current Line 3 permanent right-of-way, these impacts may have been avoided previously through HDD or may already have received compensation.

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. Impacts to wetlands as a result of these activities would likely be short-term and minor but would occur periodically over the life of the Project, as is currently the case for Line 3.

Operation of RA-07 may increase the potential for introduction and spread of noxious weeds and invasive plants for the life of the Project. The Applicant would implement the procedures in the Environmental Protection Plan (Appendix E), and wetland permitting documents would describe measures to prevent the spread of noxious and invasive weeds in wetlands. With implementation of those procedures, the potential impact of introduction and spread of noxious weeds and invasive plants would be short-term and minor.

Facility locations are unknown. If wetlands were covered by aboveground facilities they would be permanently converted to developed land. Any potentially unavoidable impacts would be permanent and major; however, the impacts could be offset by compensatory wetland mitigation.

Potential impacts on wetlands due to an unanticipated crude oil release are discussed in Chapter 10.

Specially Designated Wetlands. No Public Waters Wetlands would be affected by operation of RA-07.

No calcareous fens would be affected during operation of RA-07, as none occur within the permanent right-of-way for the route.

No impacts on federal or state wetland reserves would be associated with RA-07, as no Wetland Reserve Program wetlands were identified near the route. No wetland mitigation bank easements would be affected by operation of RA-07.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the wetland ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

General Wetlands. Construction of RA-08 would affect approximately 802.0 acres of wetlands in Minnesota (Table 6.3.1.3-12). About 365.4 acres of forested wetlands and 273.6 acres of scrub/shrub wetlands would be cleared during construction along the Clearbrook-to-Carlton segment (Table 6.3.1.3-12). After construction, trees and shrubs would be allowed to reestablish within construction work areas outside of the permanent right-of-way. Until woody vegetation is reestablished, scrub/shrub and forested wetlands would be converted to emergent vegetation, resulting in long-term to permanent major impacts on both vegetation structure and wetland functions. Impacts on forested wetlands in the construction work area may require compensatory mitigation to offset long-term to permanent impacts. Many of these wetlands would have been previously disturbed during construction of other pipelines because RA-08 would be constructed within an existing pipeline corridor.

About 162.9 acres of emergent wetlands would be affected by construction of RA-08 (Table 6.3.1.3-12). Wetlands would be reclaimed after construction, but the emergent wetland community would require several years to become fully reestablished. As a result, the impact of construction on emergent wetlands within most of the construction impact area would be short-term and minor at each affected wetland. Many of these emergent wetlands would have been disturbed previously during construction of other pipelines because RA-08 would be constructed within an existing pipeline corridor.

Footprints are not available for aboveground facilities for route alternative RA-08. If facilities are sited on wetlands, impacts from construction would be permanent and major because the wetlands would be converted to developed land. However, impacts on wetlands from facilities would be avoided and minimized, and unavoidable impacts could be offset with compensatory mitigation similar to the Applicant's preferred route.

Specially Designated Wetlands. Construction of RA-08 would result in short-term minor impacts on approximately 5.4 acres of Public Waters Wetlands in Minnesota (Table 6.3.1.3-13). The affected Public Waters Wetlands would be reclaimed as wetlands following construction, resulting in short-term minor impacts. Impacts on Public Waters Wetlands would be subject to state-specific permitting requirements, and implementation of BMPs would be required for Project approval.

No impacts on calcareous fens would be associated with the RA-08 route, as none were identified during the calcareous fen data review within the construction work area or permanent right-of-way for the route.

No impacts on wetland reserves would be associated with the RA-08 route, as no Wetland Reserve Program wetlands were identified near the route. Two Minnesota BWSR wetland mitigation bank easements occur within 0.5 mile of RA-08, one of which (Number 3734) would be crossed by the construction work area for the route resulting in approximately 2 acres of impacts. These wetlands would be reclaimed, resulting in short-term and minor impacts; however, the wetlands may become ineligible for the mitigation banking program.

Operations Impacts

General Wetlands. Operation of RA-08 would affect approximately 335.0 acres of wetlands within the permanent right-of-way (Table 6.3.1.3-12). Wetland impacts would result from pipeline maintenance activities, including vegetation management that would occur for the life of the Project. Trees and shrubs would not be allowed to reestablish within the maintained right-of-way, to allow for visual inspection of the right-of-way. Vegetation management would represent a permanent conversion of previously forested and scrub/shrub wetlands to emergent or early-stage scrub/shrub wetlands. About 151.3 acres of forested wetlands and 113.9 acres of scrub/shrub wetlands would be maintained as emergent wetlands for the life of the Project (Table 6.3.1.3-12). This loss of forested and scrub/shrub wetland communities would result in permanent and major impacts on wetland structure and functions that could require compensatory mitigation to offset permanent impacts.

Emergent wetland vegetation in the permanent right-of-way generally would not be mowed or otherwise managed and would not be affected by mowing or management activities. If emergent wetlands are affected by management activities, the impacts on approximately 69.8 acres of emergent wetlands is expected to be short-term and minor.

During operation, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. If excavation is required within a wetland, impacts likely would be short-term and minor, but could occur periodically over the life of the Project.

Operation of RA-08 may increase the potential for the introduction and spread of noxious weeds and invasive plants for the life of the Project. The Applicant would implement the procedures in the Environmental Protection Plan (Appendix E), and wetland permitting documents would describe measures to prevent the spread of noxious and invasive weeds in wetlands. With implementation of those procedures, the potential impact of introduction and spread of noxious weeds and invasive plants would be short-term and minor.

Facility locations are unknown. If wetlands were covered by aboveground facilities, they would be permanently converted to developed land. Any potentially unavoidable impacts would be permanent and major; however, the impacts could be offset by compensatory wetland mitigation.

Potential impacts on wetlands due to an unanticipated crude oil release are discussed in Chapter 10.

Specially Designated Wetlands. Construction of RA-08 would result in short-term minor impacts on approximately 1.6 acres of Public Waters Wetlands in Minnesota (Table 6.3.1.3-13). The affected Public Waters Wetlands would be reclaimed as wetlands following construction, resulting in short-term minor impacts. Impacts on Public Waters Wetlands would be subject to state-specific permitting requirements, and implementation of BMPs would be required for Project approval.

No calcareous fens would be affected during operation of RA-08, as none are located within the permanent right-of-way for the route.

No impacts on wetland reserves would be associated with RA-08, as no Wetland Reserve Program wetlands were identified near the route. Approximately 0.7 acre in one Minnesota BWSR wetland mitigation bank easement would be affected by operation of RA-08 (Table 6.3.1.3-14), resulting in a permanent minor impact. In addition, the mitigation bank easement crossed by the permanent pipeline right-of-way may become ineligible for the easement program. The easement would not be protected from future disturbance, including pipeline excavation for repairs, which could occur from implementing the Applicant's Integrity Management Program.

6.3.1.3.4 Summary and Mitigation

Summary

Construction and operation of the Applicant's preferred route and any route alternative would result in permanent, major impacts on forested and scrub/shrub wetlands. Potential impacts on emergent wetlands and specially designated wetlands were found to range from no impact to short-term minor impacts for the Applicant's preferred route and all of the route alternatives (see Table 6.3.1.3-15).

Avoidance and minimization measures include Applicant-proposed measures and mitigation measures stipulated in pending state and federal permits. All wetland changes would be reviewed and approved by the appropriate authorizing agency prior to any construction being allowed. The Applicant has committed to provide compensatory wetland mitigation for permanent impacts on forested, scrub/shrub, and emergent wetlands as required in the federal and state-specific permits. The avoidance and minimization measures and standard BMPs described for the Applicant's preferred route also would apply to the route alternatives.

Beyond the general findings given above, a more detailed comparison of the Applicant's preferred route and the route alternatives shows that the effects on wetlands would vary between the Applicant's preferred route and the different route alternatives based primarily on the amount of forested and scrub/shrub wetland disturbed/filled during construction, the recovery period to reestablish forested wetlands and the permanent loss of forested wetlands to the permanently cleared right-of-way.

Construction Impacts

General Wetlands

Clearing trees and shrubs from forested and scrub/shrub wetlands would require many years for reestablishment of wetlands similar in structure and function to the original wetlands. For the route alternatives, the largest area of clearing of forested and scrub/shrub wetlands would occur for RA-07, RA-06, and RA-08 (Table 6.3.1.3-15). The overall long-term implications for these construction impacts on wetlands for these alternatives differ, however. Construction of RA-07 and RA-08 would represent an expansion along the edges of existing pipeline corridors; while construction of RA-06 would represent construction through a new corridor where many wetlands may not have been previously exposed to ground disturbance. The smallest area of clearing of forested and scrub/shrub wetlands would occur for the Applicant's preferred route and RA-03AM (Table 6.3.1.3-15).

Emergent wetlands generally reestablish more quickly after pipeline construction. Fill impacts would result in a permanent loss of emergent wetlands but, for pipeline construction through emergent wetlands, vegetation cover and wetland functions would be restored within several years. RA-03AM contains the largest area of emergent wetlands within the construction work area, while the Applicant's preferred route contains the smallest area within the construction work area (Table 6.3.1.3-15).

Specially Designated Wetlands

All of the routes, except RA-07, would affect Public Waters Wetlands between Clearbrook and Carlton during construction (Table 6.3.1.3-15). RA-03AM and RA-08 would affect the largest areas of Public Waters Wetlands, while RA-06 and the Applicant's preferred route would affect the smallest areas.

Minnesota's calcareous fens represent a rare habitat that supports several plants that are protected as threatened or endangered. No calcareous fen wetlands would be crossed by any route between Clearbrook and Carlton. Similarly, no wetlands enrolled in either federal or state Wetland Reserve Programs would be crossed by any route between Clearbrook and Carlton.

Minnesota BWSR wetland mitigation bank easements would be affected by construction of RA-03AM, RA-07, and RA-08 between Clearbrook and Carlton. The easements crossed by both RA-03AM and RA-08 would be co-located with existing pipeline corridors. The mitigation bank easement affected by construction of RA-07 may be avoidable by adjustment of the construction work area width next to the easement. Because these easements already contain existing pipelines, it is unlikely that they would become ineligible for the mitigation bank program because of an additional pipeline, although restoration would be delayed by the new construction.

Operations Impacts

General Wetlands

Fill placed in wetlands for construction of aboveground facilities represents a permanent loss of wetlands. Because the locations for aboveground facilities have not been developed for the route alternatives, a quantified comparison is not possible. New aboveground facilities generally would be sited to avoid wetlands to the extent practicable, although some impacts may be unavoidable. Pipeline operation would continue to disturb wetlands through vegetation management that prevents trees and large shrubs from reestablishing to allow visual inspection of the permanent right-of-way. In addition, the Applicant's Integrity Management Program may require excavation to repair or replace sections of pipe that could occur within wetlands. The largest areas of previously forested and scrub/shrub wetlands that would be permanently maintained as emergent wetland would be associated with RA-06, RA-07, and RA-08 (Table 6.3.1.3-15). The overall long-term implications for these operations impacts on wetlands for these route alternatives differ. Operation of RA-07 would occur within a currently maintained right-of-way, RA-08 would represent an expansion along the edges of existing pipeline corridors, and construction of RA-06 would involve construction through an entirely new corridor where many wetlands may not have been previously exposed to ground disturbance. The smallest area of previously forested and scrub/shrub wetlands would be associated with the Applicant's preferred route and RA-03AM (Table 6.3.1.3-15). Portions of both of these routes would create new rights-of-way; and other portions would be co-located with existing pipelines, transmission lines, and roads. The Applicant's preferred route would have a greater length of new pipeline corridor than RA-03AM.

All of the routes between Clearbrook and Carlton, except RA-07, would continue to affect Public Waters Wetlands during operations (Table 6.3.1.3-15). RA-03AM and RA-08 would affect the largest areas of Public Waters Wetlands, while RA-06 and the Applicant's preferred route would affect the smallest areas.

No calcareous fens or wetlands enrolled in either federal or state Wetland Reserve Programs would be affected by any of the route alternatives between Clearbrook and Carlton during operation.

Mitigation

No Minnesota BWSR wetland mitigation bank easements would be affected during operation of the RA-03AM or RA-08 route. Operations impacts could result in short-term minor impacts on these wetlands within the permanent right-of-way. The easements crossed by both RA-03AM and RA-08 would be co-located with existing pipeline corridors. Because these easements already contain existing pipelines, it is unlikely that they would become ineligible for the mitigation bank program because of an additional pipeline, although restoration would be delayed by the new construction.

All routes would result in permanent major impacts on wetlands associated with conversion of forested and scrub/shrub wetlands to emergent wetlands. The total acreage of forested/scrub/shrub conversion would be greatest for RA-06 followed RA-08, RA-07, the Applicant's preferred route, and RA-03AM. The Applicant has committed to provide compensatory wetland mitigation for permanent impacts on forested, scrub/shrub, and emergent wetlands as required in the federal and state-specific permits. No additional mitigation measures have been identified.

Table 6.3.1.3-15. Summary of Potential Impacts on Wetlands for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Changes to forested and scrub/shrub wetland characteristics and functions	Long-term to permanent/major impacts • 133 acres forested wetlands • 201 acres scrub/shrub wetlands	Long-term to permanent/ major impacts • 116 acres forested wetlands • 206 acres scrub/shrub wetlands	Long-term to permanent/major impacts • 541 acres forested wetlands • 253 acres scrub/shrub wetlands	Long-term to permanent/ major impacts • 595 acres forested wetlands • 446 acres scrub/shrub wetlands	Long-term to permanent/major impacts • 365 acres forested wetlands • 274 acres scrub/shrub wetlands
Changes to emergent wetland characteristics and functions	Short-term/minor impacts • 112 acres	Short-term/minor impacts • 234 acres	Short-term/minor impacts • 126 acres	Short-term/minor impacts • 154 acres	Short-term/minor impacts • 163 acres
Changes to Public Waters Wetlands characteristics and functions	Short-term/minor impacts • 3 acres	Short-term/minor impacts • 8 acres	Short-term/minor impacts • 3 acres	No impact	Short-term/minor impacts • 5 acres
Changes to calcareous fen characteristics and functions	No impact	No impact	No impact	No impact	No impact
Changes to Wetland Reserve Program wetland characteristics and functions	No impact	No impact	No impact	No impact	No impact
Changes to wetland mitigation bank easements characteristics and functions	No impact	Short-term/minor impacts • 5 acres	No impact	Short-term/minor impacts • 0.3 acre	Short-term/minor impacts • 2 acres

Table 6.3.1.3-15. Summary of Potential Impacts on Wetlands for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Operations Impacts					
Forested and scrub/shrub wetlands permanently converted to emergent wetlands	Permanent/major impacts • 62 acres forested wetlands • 108 acres scrub/shrub wetlands	Permanent/major impacts • 48 acres forested wetlands • 84 acres scrub/shrub wetlands	Permanent/major impacts • 228 acres forested wetlands • 104 acres scrub/shrub wetlands	Permanent/major impacts • 124 acres forested wetlands • 120 acres scrub/shrub wetlands	Permanent/major impacts • 151 acres forested wetlands • 114 acres scrub/shrub wetlands
Potential changes to emergent wetland characteristics and functions	Short-term/minor impacts • 64 acres	Short-term/minor impacts • 97 acres	Short-term/minor impacts • 53 acres	Short-term/minor impacts • 37 acres	Short-term/minor impacts • 70 acres
Potential changes to Public Waters Wetlands characteristics and functions	Short-term/minor impacts • 2 acres	Short-term/minor impacts • 3 acres	Short-term/minor impacts • 1 acre	No impact	Short-term/minor impacts • 2 acres
Changes to calcareous fen characteristics and functions	No impact	No impact	No impact	No impact	No impact
Changes to Wetland Reserve Program wetland characteristics and functions	No impact	No impact	No impact	No impact	No impact
Wetland mitigation banks within the permanent right-of-way that would become ineligible as conservation easement	No impact	Permanent/minor impacts • 2 acres	No impact	No impact	Permanent/minor impacts • 1 acre

Table 6.3.1.3-15. Summary of Potential Impacts on Wetlands for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[a] No single dataset in this summary table provides a complete indication of all relevant impacts to wetlands. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, evaluating the acreage of NWI wetland acres impacted does not consider the unique sensitivities of certain wetland communities. However, considering this data in concert with information from the calcareous fen database can aid the reader in understanding the extent of potential impacts on these unique and highly sensitive areas. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.

[b] Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3), as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-312 to 6-327. This table, for example, provides the acreage of wetlands within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to different types of wetlands is contained in the text of this section (terms defined in Section 6.1.3).

[c] Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-315 to 6-319. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[d] Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-319 to 6-321. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[e] Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-321 to 6-323. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-323 to 6-325. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-325 to 6-327. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.3.1.3.5 References

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6.3.1.4 Floodplains

Floodplains form diverse and high-quality habitats under natural conditions because of their proximity to waterbodies, intermittent flooding, rich soils, and wetland complexes. In addition, their naturally flat topography has resulted in historical development within these areas. Construction of facilities such as a pipeline in a floodplain may affect the ability of the floodplain to store excess water or may raise flood elevations upstream. Flood damage can occur when natural flooding processes are disturbed by altering a watercourse or building inappropriately in the floodplain itself (FEMA 2009).

The floodplain analysis considered both the potential impacts of the Applicant's preferred route and route alternatives on floodplains, and the potential impacts of flooding on Project elements in the floodplain. The analysis of impacts on floodplains during construction and operation of the Applicant's preferred route and route alternatives considered the following:

- Altering floodplain topography;
- Changing flow patterns of flood waters, thereby increasing flooding;
- Blocking or restricting flows;
- Reducing the area within a floodplain that carries floodwaters; and
- Increasing flood elevations upstream.

The analysis of impacts on facilities located within a floodplain and subjected to flooding for the Applicant's preferred route and route alternatives considered the following:

- Disruption of construction activities and loss of materials,
- Damage to equipment and facilities from inundation by floodwaters or flood scour, and
- Interruption of operations.

This section describes the existing conditions for floodplains along the Applicant's preferred route and route alternatives that could be affected by construction and operation of the Project. The potential impacts on floodplains or on the pipeline and associated facilities from flood events are compared for each of the five routing options (the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08). Flood-related spill hazards and potential impacts on floodplains from crude oil releases are discussed in Chapter 10.

6.3.1.4.1 Regulatory Context and Methodology

Regulatory Context

Under Minnesota state law, a "floodplain" is the land adjoining lakes and rivers that would be inundated by a 100-year flood (i.e., a flood event expected to occur only once every 100 years). Flood Insurance Rate Maps (FIRMs) produced by the FEMA define the boundaries of floodplains and floodways. These maps indicate areas of the floodplain that are critical for conveying floodwaters (the floodway), the extent of the 100-year flood or special flood hazard areas (SFHAs) (areas subject to a 1-percent annual chance of a flood event), and areas subject to the 500-year flood (areas subject to a 0.2-percent annual chance of a flood).

Development in floodplains typically is regulated by local building, floodplain development, and shoreline permit regulations and ordinances, and FEMA's National Flood Insurance Program (NFIP).[13] Development within a floodplain can be permitted with implementation of proper floodplain management measures to minimize risk from potential flood hazards (Minn. R. Ch. 6120). See Section 5.2.1.4.1 for additional detail on the regulatory context for development within floodplains.

Methodology

Impacts on floodplains were assessed by:

- Using GIS to overlay onto FEMA 100-year flood maps the construction and operations footprints for the Applicant's preferred route and the route alternatives. FEMA has not developed flood maps for some counties.
- Calculating the number of waterbody crossings for areas where FEMA has not developed maps to approximate potential floodplains. Because not all waterbodies have designated floodplains (even where floodplains have been mapped), the number of waterbody crossings was considered only as an approximation of potential floodplain impacts for comparison purposes.
- Identifying any Project features that would be located within a FEMA-designated floodplain.

Neither one of the datasets listed above provides a complete indication of all relevant impacts to floodplains. Together, though, these datasets provide a reasonably comprehensive indication of the potential impacts. Specifically, FEMA 100-year flood maps do not provide complete coverage. However, data on number of waterbody crossings can aid the reader in understanding the potential for impacts where FEMA 100-year flood information is missing.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide counts, for example, of acres of floodplain within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to floodplains is contained in the text of this section.

The ROI for the floodplains analysis consists of the pipeline rights-of-way, construction work areas, facilities, and access roads for the Applicant's preferred route and the route alternatives.

6.3.1.4.2 Existing Conditions

Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the floodplain ROI for the Applicant's preferred route reflect the current state of resources in the environment along this

[13] The general purposes of the NFIP are to offer primary flood insurance to properties with significant flood risk and to reduce flood risk through the adoption of floodplain management standards. Generally, communities volunteer to participate in the NFIP to have access to flood insurance; in return, they are required to adopt minimum standards for construction within floodplains. To participate in the NFIP, local jurisdictions (typically cities or counties) must develop local floodplain regulations that meet the NFIP standards.

existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Approximately 12 miles (154 acres) of the construction work area along the Applicant's preferred route would occur within FEMA-mapped 100-year floodplains in counties for which FEMA flood maps are available (Table 6.3.1.4-1). The Applicant's preferred route would require 192 waterbody crossings in Minnesota. An additional 30 acres of ATWS and 4 acres of one access road also would be required within the SFHA for the Applicant's preferred route in Minnesota.

Table 6.3.1.4-1. Waterbodies and Floodplains Crossed by the Applicant's Preferred Route in Minnesota

Route Segment	Total Waterbody Crossings[a]	Special Flood Hazard Areas		
		Miles of Construction Work Area[b]	Acres of Construction Work Area[b]	Percent of FEMA Flood Map Coverage
North Dakota border to Clearbrook	75	6.3	91.7	89
Clearbrook to Carlton	111	5.6	62.7	26
Carlton to Wisconsin border	6	NA	NA	0

[a] See Section 6.2.1.2 and Appendix G for details on waterbody crossings.

[b] For counties for which Federal Emergency Management Agency (FEMA) flood maps are available.

NA = FEMA flood maps are not available for Carlton County, which includes the right-of-way between Carlton and the Wisconsin border.

Between Clearbrook and Carlton, FEMA flood maps are available for only 26 percent of the Applicant's preferred route. Within this segment, approximately 5.6 miles (62.7 acres) of the construction work area would be located within SFHAs. An additional approximately 6.4 acres of ATWS and 1.8 acres of access roads also would be required within the SFHA. The route would require 111 waterbody crossings between Clearbrook and Carlton. The existing conditions relevant to floodplains along the Applicant's preferred route from Neche to Superior are described in Section 5.2.1.4.2.

For the Applicant's preferred route within Minnesota, 4 of the 8 pump stations and 16 of the 27 MLVs would be located in areas that have been mapped by FEMA. For areas with available FEMA flood mapping, no pump stations would be located in the 100-year floodplain; about 1 acre of a designated 100-year floodplain would be occupied by portions of three MLV sites, including an associated access road (Table 6.3.1.4-2). Of this total, approximately 0.4 acre associated with two MLVs would be located in the 100-year floodplain for the Clearbrook-to-Carlton segment.

Table 6.3.1.4-2. Permanent Aboveground Facilities and Access Roads within FEMA-Designated Special Flood Hazard Areas for the Applicant's Preferred Route in Minnesota

Feature	Acres[a]
Mainline valve access road	0.5
Mainline valve sites	0.5
TOTAL	**1.0**

[a] Acreage reflects counties for which Federal Emergency Management Agency (FEMA) flood maps are available.

Note:

Special flood hazard areas represent the 100-year floodplain.

Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to floodplains for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

RA-03AM would be 275 miles long between Clearbrook and Carlton. **Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the floodplain ROI for RA-03AM reflect the current state of resources in the environment along the existing this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.**

Approximately 6.7 miles (97.2 acres) of the construction work area would be located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available (64 percent of the route is mapped). The route would require 167 waterbody crossings.

Based on the spacing of pump stations along the Applicant's preferred route, it was assumed that six pump stations would be required along the route of RA-03AM between Clearbrook and Carlton. The specific locations of permanent aboveground facilities and access roads have not been determined for the route alternatives; therefore, it is unknown whether any permanent facilities associated with RA-03AM would be sited within a FEMA-designated SFHA.

Route Alternative RA-06

Route alternative RA-06 would be 197 miles long between Clearbrook and Carlton. **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the floodplain ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.**

Approximately 0.5 mile (7.2 acres) of the construction work area would be located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available (56 percent of the route). The route would require 137 waterbody crossings between Clearbrook and Carlton.

Based on the spacing of pump stations along the Applicant's preferred route, it was assumed that four pump stations would be required along the route of RA-06 between Clearbrook and Carlton. The specific locations of permanent aboveground facilities and access roads have not been determined for the route alternatives; therefore, it is unknown whether any permanent facilities associated with RA-06 would be sited within a FEMA-designated SFHA.

Route Alternative RA-07

RA-07 would replace the existing Line 3 pipeline in the existing right-of-way, using a 205-foot-wide right-of-way. It would be approximately 168 miles long between Clearbrook and Carlton. **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the floodplain ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.**

Approximately 3.4 miles (85.2 acres) of the construction work area would be located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available (42 percent of the route). The route would require 81 waterbody crossings between Clearbrook and Carlton.

It was assumed that four existing pump stations would be upgraded along the route of RA-07 between Clearbrook and Carlton. The specific pump stations to be upgraded and their associated locations have not been determined. Because the specific locations of MLVs and access roads also have not been determined for the route alternatives, it is unknown whether any permanent facilities associated with RA-07 would be sited within a FEMA-designated SFHA.

Route Alternative RA-08

RA-08 would be 165 miles long between Clearbrook and Carlton. **RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the floodplain ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.**

Approximately 3.4 miles (49.4 acres) of the construction work area would be located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available (40 percent of the route). The route would require 106 waterbody crossings between Clearbrook and Carlton.

It was assumed that four existing pump stations would be upgraded along the route of RA-08 between Clearbrook and Carlton. The specific pump stations to be upgraded and their associated locations have not been determined. Because the specific locations of MLVs and access roads also have not been determined for the route alternatives, it is unknown whether any permanent facilities associated with RA-08 would be sited within a FEMA-designated SFHA.

6.3.1.4.3 Impact Assessment

The floodplain analysis considered potential impacts of the Applicant's preferred route and route alternatives on floodplains and potential impacts of flooding on Project pipeline elements in the floodplain.

Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the floodplain ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Construction activities, including land clearing, grading, trenching, and excavating, would occur within a FEMA-mapped 100-year floodplain for 12 miles (154 acres) of the construction work area along the Applicant's preferred route (from Clearbrook to Carlton, 6 miles (63 acres) of the construction work area would occur within a designated floodplain). One construction access road (totaling approximately 4 acres) also would be located in the 100-year floodplain. These activities would temporarily alter floodplain topography, resulting in minor alterations to water flows in the event of a flood in the area. Construction activities are unlikely to block or restrict flows, reduce the area within a floodplain that carries floodwaters, or increase flood elevations upstream. The Applicant would restore temporary roadways built within the floodplain to original ground conditions to avoid permanent impacts on floodplain flow pathways, connectivity, and function. Construction impacts on floodplains generally would be short-term and minor, persisting only until construction is completed and the natural land elevations and groundcover are restored. Construction and restoration would follow the plans contained in the Environmental Protection Plan (Appendix E), which would reduce potential impacts.

Impacts on Project elements from flooding could occur during pipeline construction in floodplains and at river crossings. Although the chance of a severe flood event occurring during the relatively short construction period would be low (because severe flood events occur infrequently), storm events could cause minor to major flooding and erosion at the construction site. Applicant-proposed measures to reduce flooding impacts include limiting the amount of open trench to 3 days, which would limit the amount of open trench and soil storage subject to flooding and storm events. Following construction through smaller waterbodies (less than 100 feet wide), the trench would be filled and recontoured within 24 to 48 hours of construction. Larger rivers would be crossed using site-specific methods, including HDD, which may involve placing more equipment in the floodplain (or immediately adjacent) during construction but would not result in temporary or permanent disturbance of the floodplain for the length of the drill. (See Section 2.7.2 for details on HDD crossings.) Impacts on construction activities and equipment in a flood event generally would be temporary and negligible to minor from disruption of construction activities and damage to equipment and structures from inundation by floodwaters.

Operations Impacts

Permanent facilities such as pump stations and MLVs would be constructed aboveground and operate for the duration of the Project. No pump stations or access roads would be located in a designated floodplain; where feasible, permanent facilities would be constructed outside of the 100-year floodplain. The siting of three MLVs within a designated floodplain (1 acre total for the Applicant's preferred route) would not create a measurable impact because of their relatively small footprints. Aboveground facilities in floodplains would require floodplain development permitting, which likely would require measures to reduce impacts on floodwater conveyance (e.g., berm construction, raising the ground elevation above the floodplain) associated with permanent structures.

The pipeline would be constructed below ground surface, typically with a minimum of 48 inches of ground cover. Minimum burial depths required by USDOT are listed in Table 2.7-1. For waterbody crossings greater than 100 feet wide, the minimum burial depth is 48 inches below the channel bottom. Major river crossings (see Section 6.3.1.2 for details) would use HDD methods, generally resulting in pipeline placement 30 feet or more below the stream channel. The below ground pipeline would not affect floodplain function once construction and restoration activities have been completed. Impacts on operations activities and equipment from inundation by floodwaters in a flood event would generally be temporary and negligible to minor.

Route Alternatives (from Clearbrook to Carlton)

The types of potential impacts of the route alternatives on floodplains and the potential impacts of flooding on the route alternatives would be the same as described above for the Applicant's preferred route. The differences in impacts between route alternatives would depend on the amount of disturbance within floodplain areas. The number, type, and location of potential HDD crossings, wetlands, ATWS, access roads, and permanent aboveground facilities have not been determined for the route alternatives; therefore, potential impacts on floodplains associated with these developments for the route alternatives cannot be directly compared with those for the Applicant's preferred route.

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the floodplain ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Construction activities, including land clearing, grading, trenching, and excavating, would occur within the approximately 6.7 miles (97.2 acres) of the construction work area for RA-03AM that is located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available. Impacts from these activities would be similar to those described for the Applicant's preferred route. Impacts generally would short-term and minor, persisting only until construction is completed and the natural land elevations and groundcover are restored.

Route alternative RA-03AM would cross the greatest area of designated floodplains and would require more waterbody crossings than all other route options between Clearbrook and Carlton. The greater number of waterbody crossings (167) for this route alternative increases the potential for channel migration and scour during a flood event to expose pipe. Construction activities also could be affected by flood events, including temporary negligible to minor disruption of construction activities and damage to equipment and structures from inundation by floodwaters.

Operations Impacts

After right-of-way restoration, the pipeline would not affect floodplain function because it would be buried to at least regulatory-minimum depths. Because the locations of permanent aboveground facilities have not been determined for route alternatives, associated impacts cannot be quantified. If located within a floodplain, aboveground facilities would require floodplain development permitting that likely would require measures to reduce impacts on floodwater conveyance associated with permanent structures. The greater number of waterbody crossings for this route alternative increases the potential for channel migration and scour during a flood event to expose pipe. Routine inspection of the pipeline during operations should detect such conditions, which would be rectified during maintenance activities, resulting in temporary minor impacts. Impacts on operations activities and equipment from inundation by floodwaters in a flood event would generally be temporary and negligible to minor.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the floodplain ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Construction activities, including land clearing, grading, trenching, and excavating, would occur within the 0.5 mile (7.2 acres) of the construction work area for RA-06 that is located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available. Impacts from these activities would be similar to those described above for the Applicant's preferred route. Impacts generally would short-term and minor, persisting only until construction is completed and the natural land elevations and groundcover are restored. Construction activities also could be affected by flood events, including disruption of construction activities and damage to equipment and structures from inundation by floodwaters.

Operations Impacts

The impacts from operations and permanent facilities for RA-06 would be similar to those described above for RA-03AM, with fewer waterbody crossings (137) required.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the floodplain ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Construction activities, including land clearing, grading, trenching, and excavating, would occur within the 3.4 miles (85.2 acres) of the construction work area for RA-07 that is located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available. Impacts from these activities would be similar to those described above for the Applicant's preferred route. Impacts generally would short-term and minor, persisting only until construction is completed and the natural land elevations and groundcover are restored.

Construction activities also could be affected by flood events, including disruption of construction activities and damage to equipment and structures from inundation by floodwaters. RA-07 would require the least amount of waterbody crossings, with a corresponding reduced potential for exposure of the pipe caused by channel migration and scour during a flood event.

Operations Impacts

The impacts from operations and permanent facilities for RA-07 would be the similar to those described above for RA-03AM; however, the least number of waterbody crossings (81) would be required under this route alternative, with a corresponding reduced potential for exposure of the pipe caused by channel migration and scour during a flood event.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the floodplain ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Construction activities, including land clearing, grading, trenching, and excavating, would occur within the 3.4 miles (85.2 acres) of the construction work area for RA-08 that is located within a FEMA-mapped 100-year floodplain in the counties for which FEMA flood mapping is available. Impacts from these activities would be similar to those described above for the Applicant's preferred route. Impacts generally would short-term and minor, persisting only until construction is completed and the natural land elevations and groundcover are restored.

Construction activities also could be affected by flood events, including disruption of construction activities and damage to equipment and structures from inundation by floodwaters. Compared to the Applicant's preferred route and RA-03AM, this route alternative has fewer waterbody crossings (106) where channel migration and scour during a flood event could expose pipe.

Operations Impacts

The impacts from operations and permanent facilities for RA-08 would be the similar to those described above for RA-03AM. Compared to the Applicant's preferred route and RA-03AM, this route alternative has fewer waterbody crossings where channel migration and scour during a flood event could expose pipe.

6.3.1.4.4 Summary and Mitigation

Summary

The assessment of potential floodplain impacts for the Applicant's preferred route and the route alternatives found that impacts would range from negligible to minor and temporary to short-term for construction, and from no impact to minor and temporary impacts for operations (Table 6.3.1.4-3).

The types of potential impacts on floodplains and the potential impacts of flooding would be the same for the Applicant's preferred route and route alternatives. The differences in impacts would depend on the amount of disturbance within floodplain areas. The length of pipeline route that crosses SFHAs is much lower for RA-06, reducing potential effects on floodplain function. During operations, the length of pipeline route exposed to interruption of operations caused by flooding would be significantly greater for route alternatives RA-03AM, RA-07, and RA-08.

Construction Impacts

Construction-related impacts on floodplains, including temporary alterations of topography that could change flow patterns of flood waters and increase flooding, would be temporary and minor; impacts would last until the disturbed areas are recontoured and vegetation is reestablished. Temporary impacts on floodplains would be greatest for routes with the greatest amount of disturbance from construction in floodplains and those with the most waterbody crossings. RA-03AM would require the most waterbody crossings (167), and RA-07 would require the fewest (81). The Applicant's preferred route is intermediate to the route alternatives, with 111 waterbody crossings required between Clearbrook and Carlton.

Construction activities also could be affected by flood events, including disruption of construction activities and damage to equipment and structures from inundation by floodwaters. Flood events could range from smaller, more frequent events with negligible to minor impacts on larger, less frequent events causing major disruption to equipment and activities within the floodplain.

Operations Impacts

The Applicant's preferred route in Minnesota includes less than 1 acre of permanent facilities that would be located within a FEMA-designated 100-year floodplain in areas for which FEMA mapping is available; these facilities would be allowed under state and local floodplain regulations if the appropriate permits are obtained. The location, number, and type of permanent aboveground facilities and the number and location of access roads have not been determined for the route alternatives; therefore, a comparison of impacts on floodplains from permanent facilities between alternatives is not possible.

Mitigation

Identified mitigation measures for the Applicant's preferred route and route alternatives could include:

- In areas without available FEMA-designated floodplains, require Enbridge to site all pump stations and MLVs outside of potential floodplains.

Table 6.3.1.4-3. Summary of Potential Floodplain Impacts for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Construction activities and equipment altering floodplain function	Short-term/minor impacts • 62.7 acres within SFHAs (26% of route mapped by FEMA) • 6.4 acres of ATWS within SFHAs • 1.8 acre of access roads within SFHAs • 111 waterbody crossings	Short-term/minor impacts • 97.2 acres within SFHAs (64% of route mapped by FEMA) • 167 waterbody crossings	Short-term/minor impacts • 7.2 acres within SFHAs (56% of route mapped by FEMA) • 137 waterbody crossings	Short-term/minor impacts • 85.2 acres within SFHAs (42% of route mapped by FEMA) • 81 waterbody crossings	Short-term/minor impacts • 49.4 acres within SFHAs (40% of route mapped by FEMA) • 106 waterbody crossings
Disruption of construction activities and loss of materials caused by flooding	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts
Damage to construction equipment and facilities from inundation by floodwaters or flood scour	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts
Operations Impacts					
Pipeline and permanent facilities altering floodplain function	No impact	*Locations of aboveground facilities are not known, but they could be constructed within floodplain areas.*			
Interruption of operations caused by flooding	Temporary/negligible to minor impacts • 5.6 miles within SFHAs (26% of route mapped by FEMA)	Temporary/negligible to minor impacts • 6.7 miles within SFHAs (64% of route mapped by FEMA)	Temporary/negligible to minor impacts • 0.5 mile within SFHAs (56% of route mapped by FEMA)	Temporary/negligible to minor impacts • 3.4 miles within SFHAs (42% of route mapped by FEMA)	Temporary/negligible to minor impacts • 3.4 miles within SFHAs (40% of route mapped by FEMA)

Table 6.3.1.4-3. Summary of Potential Floodplain Impacts for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Damage to operations equipment and facilities from inundation by floodwaters or flood scour	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts	Temporary/negligible to minor impacts

FEMA = Federal Emergency Management Agency; SFHA = special flood hazard area.

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to floodplains. Each dataset contains useful information, but also has limitations. However, together the different datasets provide a reasonably comprehensive indication of the potential impacts. For example, FEMA 100-year flood maps do not provide complete coverage. However, data on number of waterbody crossings can aid the reader in understanding the potential for impacts where FEMA 100-year flood information is missing. The individual rows containing quantitative information should not be viewed in isolation; they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-339 to 6-343. The table above, for example provides counts of acres of floodplain within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to floodplains is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-340 to 6-341. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-341 to 6-342. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on page 6-342. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[f] **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-342 to 6-343. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.3.1.4-3. Summary of Potential Floodplain Impacts for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on page 6-343. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

6.3.1.4.5 References

Federal Emergency Management Agency (FEMA). 2009. NFIP Floodplain Management Guidebook. Region 10. 5th Edition. March. https://www.fema.gov/media-library-data/20130726-1647-20490-1041/nfipguidebook_5edition_web.pdf. Accessed on December 9, 2012.

6.3.2 Geology and Soils

Geologic resources, such as soil and bedrock, can be affected by construction and operation; and geologic hazards such as landslides and subsidence and sinkholes can affect pipeline integrity. Activities that disturb sensitive soils, alter topography, or introduce geologic hazards can negatively affect geology and soil resources, and the people and industries that rely on them.

The construction-related geology and soils issues to be addressed include the following:

- Soil erosion,
- Soil compaction,
- Soil mixing,
- Soil contamination,
- Presence of shallow bedrock that may require blasting,
- Impacts on paleontological resources,
- Changes to topography, and
- Subsidence and sinkhole hazards.

The operations-related geology and soils impacts addressed in this section include:

- Permanent loss of soil cover,
- Soil erosion and compaction,
- Landslide hazards, and
- Subsidence and sinkhole hazards.

This section describes the existing conditions for the geology and soils within an area along the Applicant's preferred route and route alternatives where these resources could be affected by construction and operation of the Project. Potential impacts on geology and soils are discussed and compared across each of the five route options (the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08). Potential impacts on geology and soils from an accidental release of crude oil are discussed in Chapter 10.

6.3.2.1 Regulatory Context and Methodology

6.3.2.1.1 Regulatory Context

The NPDES General Construction Stormwater Coverage Permit requires that permittees use approved protection measures to manage soil erosion and minimize soil compaction. The Applicant would be required to obtain an NPDES permit from Minnesota PCA prior to construction. In addition, Minnesota Statutes Chapter 103F, Soil Erosion Law prohibits activities that allow for excessive soil loss, as defined by NRCS guidelines. 29 Code of Federal Regulations (CFR) Part 1926, Subpart U regulates the storage and use of explosives for blasting of bedrock. Minnesota Administrative Rules Chapter 7500 also regulates the storage and use of explosives, and designates municipal supervision of compliance with federal blasting regulations. Other geologic resource guidance and regulations include design and engineering protocols for dealing with site-specific geologic hazards (such as burial or reinforcement of pipelines to protect from landslides). Federal design and engineering specifications in 49 CFR Parts 192 and 193 ensure that pipeline facilities are protected from potential landslides and unstable slopes. Because no significant seismic hazard is present in the Project area, pipeline engineering requirements to address the seismic stability of the pipeline are not applicable to the Project (USGS 2016).

6.3.2.1.2 Methodology

To assess potential construction and operations impacts on geology and soils, and to assess the potential impacts of geologic hazards on Project elements, relevant geologic resources present along the Applicant's preferred route and the route alternatives were reviewed and inventoried. These resources included soils, shallow bedrock, paleontological resources, and topography. Soil types that may be sensitive to disturbance, including prime farmland, soils highly erodible by water or wind[14], hydric soils, compaction-prone soils, stony/rocky soils and coarse-textured soils, were identified from NRCS soil data, including both SSURGO and STATSGO2 data (NRCS 2016). Other data sources included maps and publications from USGS, MGS, and the Paleontology Portal. Potential geologic hazards, including landslide hazards and subsidence- and sinkhole-prone areas, also were identified and inventoried using maps and publications from USGS and MGS.

Data for the relevant geologic resources and geologic hazards were overlain in GIS with maps of the estimated construction and operations footprints for the Applicant's preferred route and the route alternatives to determine the locations and extent of potential impacts. Potential impacts on geologic resources for the Applicant's preferred route and route alternatives were considered where construction or operation of a route could cause disturbance, loss, or modification of the resource—and where estimated footprints for these actions intersected potential geologic hazards that could cause damage or injury.

The ROI for the geology and soils impact analysis consists of areas where soils, topography, and potentially bedrock would be disturbed during Project-related construction or operations in Minnesota. For the Applicant's preferred route, this includes pipeline construction work areas; permanent rights-of-way; temporary and permanent access roads; and locations of associated facilities outside the permanent right-of-way, such as pump stations. The footprint for route alternatives include a 120-foot-wide construction work area (except for RA-07, which would have a 205-foot-wide construction footprint; see Chapter 4) and a 50-foot-wide permanent right-of-way centered on the route alignments.

No single one of the datasets discussed above provides a complete indication of all relevant impacts related to geology and soils, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, NRCS data does not provide complete coverage. However, overall data on soil types and characteristics can aid the reader in understanding the potential for erodibility or potential for soil compaction impacts where soil data is missing.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide counts, for example, of miles of the route that cross soils prone to soil erosion by water or wind within the ROI and a general assessment of the duration and magnitude of potential impacts;

[14] The SSURGO dataset had unpopulated values for 36% to 40% of wind erosion and 42% to 46% of the water erosion for the map units crossed by the Applicant's preferred route and the route alternatives.

however, a more complete discussion of the qualitative nature of impacts that could occur to highly erodible soils is contained in the text of this section.

6.3.2.2 Existing Conditions

Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the geology and soils ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Soils

Section 5.2.2.2 provides a general discussion of soils across the ROI. Specific soil types and characteristics along the Applicant's preferred route were analyzed from soil maps prepared by NRCS, including both SSURGO and STATSGO2 data (NRCS 2016). Any soil type has the potential to be affected by pipeline development, but some soils are more susceptible than others to impacts such as erosion, compaction, and contamination. Soils that may be sensitive to disturbance are those designated as prime farmland, soils highly erodible by wind or water, hydric soils, compaction-prone soils, coarse-textured soils, and stony/rocky soils, as described in Section 5.2.2.2. Table 6.3.2-1 provides the miles of occurrence of these sensitive soils along the Applicant's preferred route in Minnesota.

Table 6.3.2-1. Sensitive Soils along the Applicant's Preferred Route in Minnesota (miles)

Soil Type	North Dakota-Minnesota Border to Clearbrook	Clearbrook to Carlton	Carlton to Minnesota-Wisconsin Border	Minnesota Total
Length	109.1	220.9	9.6	339.7
Prime farmland	77.4	60.3	0.8	138.5
Highly erodible soils (by water) [a]	0.0	4.7	0.0	4.8
Highly erodible soils (by wind) [a]	16.6	47.2	0.1	63.8
Hydric soils	65.2	68.4	0.3	133.9
Compaction-prone soils	23.0	0.0	1.2	24.1
Coarse-textured soils	1.7	39.2	1.5	42.5
Stony/rocky soils	0.1	1.4	0.0	1.5

Sources: NRCS 2016; Minnesota DNR 2016a.

a) The SSURGO dataset had unpopulated values for 37% of wind erosion and 42% of the water erosion for the map units crossed

As indicated in Table 6.3.2-1, sensitive soils along the Applicant's preferred route in Minnesota are summarized as follows:

- Prime farmlands are prevalent; approximately 139 miles of prime farmland would be crossed by the Applicant's preferred route in Minnesota, of which approximately 60 miles are within the Clearbrook to Carlton segment.
- Soils that are highly erodible by water are minor, while soils prone to wind erosion are more common.
- Hydric soils are common, especially in wetland areas and near lakes. Compaction-prone soils are not very common. Both hydric soils and compaction-prone soils may require modified construction methods to avoid potential compaction by heavy machinery.
- Coarse-textured soils are present.
- Stony/rocky soils occur only in minor, isolated areas throughout the region. Because of their limited occurrence across the routes, stony/rocky soils are not anticipated to exacerbate the impact of soil disturbance, or impede pipeline installation or construction of other facilities, and therefore are not addressed further herein.

Subsurface Substrate

The characteristics of the subsurface substrate (soils and sediments deeper than the surficial soils discussed above) are important in determining the method of pipeline installation, particularly regarding the use of HDD methods for pipeline installation. Some subsurface sand and gravel layers are not conducive to HDD techniques, as the unconsolidated sediments are prone to collapse during drilling. Some of these deposits have been well mapped and serve as aquifers, as discussed in Section 6.3.1.1. Geotechnical drilling is required to determine the site-specific characteristics of these deposits in order to determine the feasibility of using HDD to install the pipeline.

Shallow Bedrock

The depth to bedrock across the ROI ranges from 0 to over 450 feet, with depths averaging approximately 200 feet along the Applicant's preferred route (MGS 2016). Where bedrock is present at or near the surface within the corridor for the Applicant's preferred route, blasting of the rock with explosives could be required for installation of buried pipeline. However, shallow bedrock is not common along most of the route. Some shallow bedrock is present in the eastern end of the ROI, including a 0.3-mile segment (approximately 1,500 feet) of the Applicant's preferred route in Carlton County, Minnesota, near the Wisconsin border.

Paleontology

The Applicant's preferred route intersects isolated sections of sedimentary rock formations that are likely to contain common marine invertebrate fossils. Along most of the length of the route, these layers are generally found at depths greater than 30 feet. Along the eastern end of the route in Carlton County, bedrock may be at the surface or near the surface, and common marine invertebrate fossils could be present in shallow bedrock. Pleistocene-age megafauna remains, such as wooly mammoths or mastodon, also could be found in the glacial sediments overlying bedrock; however, these remains are rare in the ROI.

Topography

The Upper Midwest consists of relatively flat terrain, and topographical variation is modest across the route. Elevations range from approximately 903 to 1,681 feet above sea level across the Applicant's preferred route (NED DEM 2016). The generally low relief across the Applicant's preferred route is punctuated in some areas by isolated ridges and hills, and some steep streambanks (Appendix A).

Landslide Hazards

Landslide hazard potential is generally low across the majority of the Applicant's preferred route. Near the eastern end of the route between Carlton and the Wisconsin border, 8 miles of the route intersect areas with a high susceptibility to landslides, mostly in isolated sections at stream crossings. Between Clearbrook and Carlton is an additional 0.4 mile of high landslide hazard (NPMS LSHR 2016; Enbridge 2016a).

Subsidence and Sinkhole Hazards

Karst conditions, which could lead to subsidence and sinkhole formation, are not believed to be present along the Applicant's preferred route (Minnesota DNR 2016b; USGS 2016).

6.3.2.2.1 Route Alternatives

Soils

Specific soil types and characteristics along the route alternatives were analyzed from soil maps prepared by NRCS, including both SSURGO and STATSGO2 data (NRCS 2016). Table 6.3.2-2 provides the miles of occurrence of these sensitive soils along the route alternatives between Clearbrook and Carlton.

Table 6.3.2-2. Sensitive Soils along the Route Alternatives between Clearbrook and Carlton (miles)

Soil Type	Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
Length	275.1	196.8	167.7	164.8
Prime farmland	44.0	76.7	31.6	38.9
Highly erodible soils (by water)[a]	19.5	7.3	5.8	9.5
Highly erodible soils (by wind)[a]	50.9	18.2	31.4	17.8
Hydric soils	53.3	86.2	62.1	69.4
Compaction-prone soils	0.0	7.4	2.3	2.6
Coarse-textured soils	43.5	8.0	37.0	19.3
Stony/rocky soils	1.4	0.3	2.8	5.9

Sources: NRCS 2016; Minnesota DNR 2016a.

[a] The SSURGO dataset had unpopulated values for 36% to 40% of wind erosion and 42 percent to 46 percent of the water erosion for the map units crossed.

Subsurface Substrate

The characteristics of the subsurface substrate along the route alternatives are generally similar to those along the Applicant's preferred route. Geotechnical drilling would be required to determine the site-specific characteristics of these deposits in order to determine appropriate methods of pipeline installation.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the geology and soils ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Shallow Bedrock

Bedrock is likely present at or near the surface along some eastern segments of RA-03AM, most likely in Todd, Pine, and Carlton counties. Potential bedrock blasting sites have not yet been identified for the route.

Paleontology

RA-03AM would intersect short segments of shallow sedimentary rock that is likely to contain common marine invertebrate fossils. Pleistocene-age megafauna remains also could be found in the glacial sediments along RA-03AM; however, these remains are rare throughout the ROI.

Topography

The elevation for RA-03AM ranges from 617 to 1,681 feet above sea level. The generally low relief across the route alternative is punctuated in some areas by isolated ridges and hills, and some steep streambanks (Appendix A).

Landslide Hazards

Landslide hazard potential is generally low across the majority of RA-03AM. The route would pass through minor isolated segments of high landslide hazard for a total of 0.4 mile between Clearbrook and Carlton (NPMS LSHR 2016).

Subsidence and Sinkhole Hazards

Along approximately 30 miles of the eastern portion of the RA-03AM route, relatively shallow carbonate bedrock has the potential for karst conditions. For approximately 12 miles of that segment (where the route passes through Pine County), there is a higher probability for subsidence or sinkhole formation where bedrock is at or near the surface (Minnesota DNR 2016b; USGS 2016).

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the geology and soils ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Shallow Bedrock

Bedrock is present at or near the surface in substantial portions of RA-06 where it passes through Itasca County and possibly in shorter segments in Carlton County. Potential bedrock blasting sites have not been identified for RA-06.

Paleontology

RA-06 would intersect short segments of shallow sedimentary rock that is likely to contain common marine invertebrate fossils. Pleistocene-age megafauna remains also could be found in the glacial sediments along RA-06; however, these remains are rare throughout the ROI.

Topography

The elevation for RA-06 ranges from 617 to 1,542 feet above sea level. The generally low relief across the route alternative is punctuated in some areas by isolated ridges and hills, and some steep streambanks (Appendix A).

Landslide Hazards

Landslide hazard potential is generally low across the majority of the RA-06 route. The route would pass through minor isolated segments of high landslide hazard for a total of 0.3 mile between Clearbrook and Carlton (NPMS LSHR 2016).

Subsidence and Sinkhole Hazards

Karst conditions, which could lead to subsidence and sinkhole formation, are not believed to be present along the RA-06 route.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the geology and soils ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Shallow Bedrock

Bedrock may be present at or near the surface in isolated segments of RA-07 where it crosses Itasca and Carlton counties. Potential bedrock blasting sites have not been identified for RA-07.

Paleontology

Route alternative RA-07 would intersect short segments of shallow sedimentary rock that is likely to contain common marine invertebrate fossils. Pleistocene-age megafauna remains also could be found in the glacial sediments along RA-07; however, these remains are rare throughout the ROI.

Topography

The elevation for RA-07 ranges from 617 to 1,474 feet above sea level (NED DEM 2016). The generally low relief across the route alternative is punctuated in some areas by isolated ridges and hills, and some steep streambanks (Appendix A).

Landslide Hazards

Landslide hazard potential is generally low across the majority of the RA-07 route. The route would pass through minor isolated segments of high landslide hazard for a total of 0.3 mile between Clearbrook and Carlton (NPMS LSHR 2016).

Subsidence and Sinkhole Hazards

Karst conditions, which could lead to subsidence and sinkhole formation, are not believed to be present along the RA-07 route.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the geology and soils ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Shallow Bedrock

Bedrock may be present at or near the surface in isolated segments of RA-08 where it crosses Itasca and Carlton counties. Potential bedrock blasting sites have not been identified for RA-08.

Paleontology

RA-08 would intersect short segments of shallow sedimentary rock that is likely to contain common marine invertebrate fossils. Pleistocene-age megafauna remains also could be found in the glacial sediments along RA-08; however, these remains are rare throughout the ROI.

Topography

The elevation for RA-08 ranges from 617 to 1,499 feet above sea level (NED DEM 2016). The generally low relief across the route alternative is punctuated in some areas by isolated ridges and hills, and some steep streambanks (Appendix A).

Landslide Hazards

Landslide hazard potential is generally low across the majority of RA-08. The route would pass through minor isolated segments of high landslide hazard for a total of 0.3 mile between Clearbrook and Carlton (NPMS LSHR 2016).

Subsidence and Sinkhole Hazards

Karst conditions, which could lead to subsidence and sinkhole formation, are not believed to be present along the RA-08 route.

6.3.2.3 Impact Assessment

Impacts associated with the Applicant's preferred route in Minnesota and the route alternatives between Clearbrook and Carlton are described below.

6.3.2.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's referred route will have on the existing environment within the geology

and soils ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Pipeline construction activities that can affect geology and soils include trenching and backfilling, blasting, grading, installation of permanent roads and facilities, and the use of fuels and other hazardous materials. Construction likely would cause some disturbance to soils and topography. Where present, shallow bedrock and potential fossil remains could be destroyed through blasting or excavation. In addition, the presence of landslide hazards or subsidence and sinkholes would be a potential impact on Project area safety and infrastructure for the life of the Project. Impacts from pipeline construction primarily would occur within construction work areas along the length of the route and at aboveground facilities, staging areas, and access roads.

Soil disturbance along the Applicant's preferred route during construction would total approximately 4,555 acres. Of the amount disturbed during construction, 2,057 acres would be maintained as permanent right-of-way and dedicated to aboveground facilities during operations. Between Clearbrook and Carlton, approximately 2,907 acres would be disturbed during construction and 1,337 acres would be disturbed during operations. Approximately 82 percent of the route in Minnesota and 73 percent of the route between Clearbrook and Carlton, Minnesota, would be co-located with existing infrastructure where prior disturbance to soils likely has occurred. Much of the remaining greenfield portion of the route has been disturbed by human activities, especially activities related to agriculture and timber harvesting.

<u>Soil Erosion</u>

Removal of crops, sod, and other vegetation during construction would leave soil exposed to erosion by wind and water. Heavy equipment operation on the exposed soil loosens soil and breaks up soil peds (i.e., aggregations of soil particles that make the soil surface more stable), making the soil more susceptible to erosion, especially during periods of heavy rainfall or windy conditions. Erosion could continue to be a minor impact for several years after construction is complete while plant communities stabilize in the disturbed ground. Any exposed soil would be subject to erosion by water or wind.

Soils highly prone to erosion by water are not encountered by the Applicant's preferred route in Minnesota. However, soils prone to erosion by wind intersect approximately 107 miles in Minnesota, including about 86 miles between Clearbrook and Carlton. Such soils may require protective measures during soil disturbance to avoid soil loss, such as the use of slope breakers and biodegradable erosion control blankets during construction, and mulch and revegetation to minimize potential long-term erosion. With implementation of such Applicant-proposed measures (see Section 5.2.2.3.1 for additional details) soil erosion likely would be temporary to short-term, localized, and minor.

<u>Soil Compaction</u>

Heavy equipment passage, grading of the right-of-way, and transport of pipe sections may compact soils. Compacted soils impede penetration of plant roots, which affects reestablishment of plant communities after construction activities are completed. Soil compaction also reduces pore space and infiltration within the soil, leading to increased runoff that can further promote erosion. Hydric soils and compaction-prone soils, particularly when wet, would be most susceptible to these impacts.

Hydric soils occur across 134 total miles of the Applicant's preferred route through Minnesota, with 68 of those miles between Clearbrook and Carlton. Other compaction-prone soils occur along only 7 percent of the route, with none present between Clearbrook and Carlton. If the Applicant-proposed measures are implemented, such as deep tillage and use of timber mats and/or low-ground-pressure equipment (Appendix E), soil compaction from proposed Project construction likely would be temporary, localized, and negligible to minor.

Soil Mixing

Topsoil and subsoil removal and segregation during excavation may allow some mixing of these soils. If soil is mixed during backfilling, some biological and chemical properties of the soil may be altered, which may affect reestablishment of plant communities in the short-term (several years) after reclamation. In addition, rocks from the subsoil or from potential blasting operations may become mixed into the topsoil, further reducing its productivity. The Applicant has proposed measures to reduce the potential for soil mixing, particularly removal, segregation, and replacement of soils (Appendix E). With implementation of Applicant-proposed measures, soil mixing during construction of the Applicant's preferred route likely would result in short-term and negligible to minor impacts.

Soil Contamination

Soils may become contaminated from minor spills of industrial chemicals or hazardous materials (e.g., lubricants, gasoline, oil, other fuels, coolants, and transmission fluid) during construction activities such as fuel storage, equipment refueling, and equipment maintenance. Applicant-proposed measures to reduce the potential for minor spills include training employees in proper storage and dispensing of fuels and other hazardous materials, and use of spill kits and designated Spill Coordinators to minimize impacts in the event of a spill. With implementation of such measures, potential impacts likely would be localized, temporary, and negligible to minor.

Presence of Shallow Bedrock

The Applicant has identified one 0.3-mile segment on the Applicant's preferred route in eastern Carlton County where bedrock outcrops at the surface for approximately 1,500 feet. Blasting of the bedrock with explosives would be required to break up and remove the bedrock in order to install the pipeline in this segment. The Applicant anticipates that four blasting events would be required, each event breaking up approximately 400 feet of the rock outcrop (Enbridge 2016b).

The Applicant would develop a Blasting Plan prior to construction, which would comply with all federal, state, and local regulations, including those related to the safety, use, storage, and transportation of explosives (Enbridge 2016b). Blasting debris would be used as trench backfill material, and large fragments of rock (larger than those in surrounding undisturbed areas) would be removed from the construction work area. Removal of bedrock by blasting is a permanent impact; however, unless the rock is a source of rare or unique fossils or mineral resources, the impact on geology and soils is considered minor.

Impacts on Paleontological Resources

Potential impacts on paleontological resources during construction include damage to or destruction of fossils from excavation and blasting operations, if conducted; erosion of fossil beds from grading; and unauthorized collection of fossils by construction personnel or the public. Where blasting is required, it likely would disturb and fracture any fossils potentially found in shallow bedrock. Fossils most likely to be present in shallow bedrock are common marine invertebrate fossils that are globally abundant and not considered scientifically significant. Damage to or destruction of common marine invertebrate fossils from blasting or ripping of bedrock would be a permanent minor impact.

Pleistocene-age mammal fossils are rare but may be unearthed in the glacial sediments overlying bedrock during excavation activities for the proposed Project; these fossils would be considered scientifically important. The Applicant developed a state-specific Unanticipated Discovery Plan (Appendix O) that requires work to stop in the event that important paleontological resources are discovered during construction activities. With adherence to the Unanticipated Discovery Plan, impacts on rare or unique paleontological resources would likely be negligible to minor. However, if a rare or unique paleontological resource was damaged or destroyed prior to being discovered, the impact would be permanent and major to the individual resource. The likelihood of such an occurrence, however, is low.

Changes to Topography

Modifications to topography from pipeline installation would be temporary, localized and minor. At the close of construction, the Applicant would restore the natural contour of any slopes and drainage patterns. After pipe installation is complete, backfilling and regrading of the right-of-way would return the disturbed surface to pre-Project conditions.

Minor, localized, and temporary modifications to topography may take place during construction of temporary material storage yards, contractor yards, and temporary access roads. Disturbed areas would be re-graded at the close of construction, and surfaces would be returned to their pre-Project elevations, in accordance with BMPs. Differential settling of the land surface may occur in the months following regrading, but impacts would be negligible.

Minor permanent modifications to topography (e.g., excavations for foundations, permanent road grading) may be required for some aboveground facilities (e.g., pump stations, MLVs, cathodic protection systems, and permanent access roads).

Subsidence and Sinkhole Hazards

Subsidence or sinkhole formation is not anticipated within the Applicant's preferred route, as no known shallow carbonate rocks intersect the route.

Operations Impacts

During standard operations, impacts on geologic and soil resources would be limited to permanent loss of soil cover where surface sediments would be converted to impervious surfaces on new roads and aboveground facilities; and potential erosion and compaction during permanent right-of-way maintenance and use of permanent unpaved access roads. Furthermore, along the Applicant's preferred route, there is a low potential for landslide hazards in isolated sections across the route, and no known potential for subsidence and sinkhole hazards, as detailed below.

Permanent Loss of Soil Cover

Construction of permanent access roads and associated facilities would require permanent removal or conversion of surface soil, to be replaced with materials such as cement and gravel. Loss of soil cover would total 3.4 acres for access roads and 61.4 acres for other permanent facilities along the Applicant's preferred route in Minnesota. Between Clearbrook and Carlton, loss of soil cover would total 2.2 acres for access roads and 39.4 acres for other permanent facilities. This would result in permanent minor impacts on soil. In addition, replacement of natural soil cover with less permeable cement and other materials could increase runoff and potential erosion and sedimentation outside of the construction area. See Section 5.2.1.2 for a discussion of runoff and sedimentation.

Soil Erosion and Compaction

Approximately 2,057 acres that encompass the permanent right-of-way would be subject to permanent, minor soil compaction from maintenance operations (i.e., heavy vehicles traversing the area). New permanent access roads that are unpaved would be subject to minor, localized, permanent erosion and sedimentation (sedimentation is addressed in Section 5.2.1.2). The locations of new permanent access roads also would experience negligible to minor, localized, and permanent soil compaction.

Landslide Hazards

Landslide potential is low across most of the Applicant's preferred route. There is increased potential for landslide activity in isolated sections of the Applicant's preferred route, mostly at stream crossings between Carlton and the Minnesota-Wisconsin border. Areas along the Applicant's preferred route known to have high susceptibility to landslides are limited to 0.4 mile between Clearbrook and Carlton, and 8 miles between Carlton and the Minnesota-Wisconsin border. The proposed Project also would follow existing design and engineering specifications (in accordance with 49 CFR Parts 192 and 193) to ensure that pipeline facilities are protected from potential landslides. The likelihood of a landslide affecting the pipeline or associated facilities would be low. The severity of impact on pipeline facilities for an individual landslide event depends on the nature of the slope, the geologic materials present, and the design of the facilities; such a determination is beyond the scope of this analysis. It should be noted that, although the potential is low, a landslide could occur at any time throughout the life of the Project.

Subsidence and Sinkhole Hazards

Subsidence or sinkhole formation is not anticipated within the Applicant's preferred route because no known shallow carbonate rocks intersect the route.

6.3.2.3.2 Route Alternatives (between Clearbrook and Carlton)

During construction and operations, the types of soil and geology impacts for the route alternatives between Clearbrook and Carlton would be similar to those described for the Applicant's preferred route. If any of the route alternatives are constructed, it was assumed that Enbridge would implement the same Applicant-proposed measures that were identified for the Applicant's preferred route to reduce impacts on geologic resources along the route alternatives.

The extent of soil disturbance from construction varies among the route alternatives based on the pipeline length and width of the construction work area. The length of the various routes between Clearbrook and Carlton ranges from 165 miles (RA-08) to 275 miles (RA-03AM); this represents a 40-percent difference in the extent of surface disturbance based on pipeline length (Table 6.3.2-1). The width of the construction work area varies among the routes from a standard of 120 feet (for all but RA-07) to an estimated 205 feet (for RA-07), representing almost a 60-percent difference in the extent of surface disturbance based on the width of the construction work area.

Similarly, the extent of impacts on soils during operations is influenced by the length of the route alternative. The large majority of the affected acreage would be associated with periodic mowing of the permanent right-of-way. Although the specific locations of aboveground facilities have not been identified for the route alternatives, the approximate acreage associated with permanent access roads and aboveground facilities across route alternatives is expected to be comparable to the acreage associated with the Applicant's preferred route between Clearbrook and Carlton (approximately 283 acres), except as discussed below.

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the geology and soils ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Approximately 4,000 acres of soil would be disturbed during construction of RA-03AM between Clearbrook and Carlton. Approximately 95 percent of the RA-03AM route would be co-located with existing infrastructure, where prior disturbance to soils likely has occurred.

As noted in Table 6.3.2-1, soils that are highly erodible by water and wind are encountered on the RA-03AM route. As a result, a minor, localized, and temporary to short-term increase in soil erosion likely would result from construction and restoration activities. Hydric soils are present along only 19 percent of RA-03AM, while routes farther to the north pass through slightly more hydric soils, as wetlands and lakes are more abundant. No soils considered highly susceptible to compaction are present along the RA-03AM route between Clearbrook and Carlton. With implementation of Applicant-proposed measures, soil compaction from construction disturbance along RA-03AM likely would be temporary and negligible.

Bedrock is likely present at or near the surface along some eastern segments of RA-03AM, most likely in Todd, Pine, and Carlton counties. Shallow bedrock likely would require blasting with explosives for installation of buried pipeline in some segments of the route, but the specific need for blasting cannot be determined without field-based geotechnical studies.

Known karst conditions, with potential for solution cavities at depth, are present along approximately 12 miles of the RA-03AM route where the pipeline would cross through Pine County. Subsidence or sinkhole formation from cavity collapse would be a potential impact on pipeline installation in this segment of the route. Karst topography can pose increased risks to the successful installation of pipelines by HDD techniques, in particular, due to loose unstable soils and open voids along the drill path. Potential impacts include loss of drilling fluid into open conduits and inadvertent drilling fluid returns, leading to potential contamination and turbidity in nearby wells, springs, and rivers (addressed in Section 5.2.1.1); and ground subsidence and possible sinkhole formation due to excavating zones of loose unstable soils. The probability and severity of the potential impact of subsidence or sinkhole formation on pipeline construction depend on the nature of the bedrock, the groundwater, the timing of the occurrence, and the design of the facilities. Such a determination is beyond the scope of this analysis.

Operations Impacts

Most impacts on geology and soil resources during operations for the RA-03AM route would be similar to those for the Applicant's preferred route. Route alternative RA-03AM would be significantly longer than the other routes, however, resulting in a longer permanent right-of-way, additional pump stations, and additional MLVs.

Of the acreage disturbed during construction, approximately 1,667 acres would be maintained as permanent right-of-way during operations for RA-03AM. Within the permanent right-of-way, installation of permanent access roads and facilities would cause a localized, minor, permanent loss of soil cover. In addition, replacement of natural soil cover with less permeable cement and other materials could increase runoff and associated erosion and sedimentation (addressed in Section 5.2.1.2).

Vehicle traffic associated with right-of-way maintenance would cause permanent, minor soil compaction. The locations of new permanent unpaved access roads also would experience negligible to minor, localized, and permanent soil compaction and erosion.

One key difference in potential impacts between RA-03AM and the other routes is the potential for subsidence or sinkhole formation from the presence of karst conditions along the RA-03AM route. As previously stated, the probability and severity of the potential impact of subsidence or sinkhole formation on the integrity of the pipeline or associated facilities depend on the nature of the bedrock, the groundwater, the timing of the occurrence, and the specific engineering design of the facilities. Such a determination is beyond the scope of this analysis.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the geology and soils ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Soil disturbance along RA-06 would total approximately 2,862 acres during construction. Approximately 20 percent of the RA-06 route would be co-located with existing infrastructure, where prior disturbance to soils likely has occurred. Co-location of the route is discussed in Section 6.7.2.

As noted in Table 6.3.2-2, soils that are highly erodible by water are encountered on approximately 7.3 miles of the RA-06 route between Carlton and Clearbrook, while approximately 18.2 miles contain soils that are highly erodible by wind. A localized, minor, and temporary to short-term increase in soil erosion potential likely would result from construction and restoration activities across all route options. RA-06, being the farthest north of the routes analyzed, passes through the highest percentage of hydric soils (44 percent). Other soils prone to compaction are present along only about 7 miles of this route. With implementation of the Applicant-proposed measures, impacts from soil compaction likely would be temporary and negligible to minor.

Bedrock is present at or near the surface in substantial portions of RA-06 where it passes through Itasca County and possibly in shorter segments in Carlton County. Bedrock blasting likely would be necessary in some of these segments of RA-06, but the specific need for blasting cannot be determined without field-based geotechnical studies. Because no known karst conditions are present along the RA-06 route, no impacts from subsidence or sinkhole formation are anticipated.

Operations Impacts

Impacts on geology and soil resources for operations of the RA-06 route would be similar to those for the Applicant's preferred route. Of the amount disturbed during construction, 1,192 acres would be maintained as permanent right-of-way during operations. Within the permanent right-of-way, installation of permanent access roads and facilities would cause a localized, minor, permanent loss of soil cover. In addition, replacement of natural soil cover with less permeable cement and other materials could increase runoff and associated erosion and sedimentation.

Vehicle traffic associated with right-of-way maintenance would cause permanent minor soil compaction. The locations of new permanent unpaved access roads also would experience negligible to minor, localized, and permanent soil compaction and erosion.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the geology and soils ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Because of a wider construction work area, soil disturbance along RA-07 would total approximately 4,156 acres during construction. The entire RA-07 route would be co-located along Enbridge's Mainline corridor, where prior disturbance to soils likely has occurred.

As noted in Table 6.3.2-2, soils that are highly erodible by water are encountered on approximately 5.8 miles of the RA-07 route, while approximately 31.4 miles of the route contain soils that are highly erodible by wind. If Applicant-proposed measures are implemented, soil erosion from construction activities likely would be localized, temporary to short-term, and minor. Hydric soils are present along 37 percent of this route between Clearbrook and Carlton, and other soils susceptible to compaction are present along only approximately 2 miles of the route. With implementation of the Applicant-proposed measures, impacts from soil compaction likely would be localized, temporary, and negligible to minor.

Bedrock may be present at or near the surface in isolated segments of RA-07 where it crosses Itasca and Carlton counties. It is possible that bedrock blasting with explosives would be required for installation of buried pipeline in these segments of the route, but the specific need for blasting cannot be determined without field-based geotechnical studies. Because no known karst conditions are present along the RA-07 route, no impacts from subsidence or sinkhole formation are anticipated.

Operations Impacts

Impacts on geology and soil resources for operation of the RA-07 route would be similar to those for the Applicant's preferred route. Of the acreage disturbed during construction, 1,017 acres would be maintained as permanent right-of-way during operations. Within the permanent right-of-way, installation of permanent access roads and facilities would cause a localized, minor, permanent loss of soil cover. In addition, replacement of natural soil cover with less permeable cement and other materials could increase runoff and associated erosion and sedimentation (addressed in Section 5.2.1.2).

Vehicle traffic associated with right-of-way maintenance would cause permanent, minor soil compaction. The locations of new permanent unpaved access roads also would experience negligible to minor, localized, and permanent soil compaction and erosion.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the geology and soils ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Soil disturbance along RA-08 would total approximately 2,398 acres during construction. The entire RA-08 route would be co-located with existing infrastructure, where prior disturbance to soils likely has occurred.

As noted in Table 6.3.2-1, soils that are highly erodible by water are encountered on approximately 9.5 miles of the RA-08 route; and approximately 17.8 miles of the route contain soils that are highly erodible by wind. With implementation of Applicant-proposed measures to control soil erosion, soil erosion from construction likely would be temporary to short-term and minor. Hydric soils are present along 42 percent of the RA-08 route, while other soils susceptible to compaction are present along less than 3 miles of the route. With implementation of the Applicant-proposed measures, impacts from compaction of soils along RA-08 during construction likely would be localized, temporary and negligible to minor.

Bedrock may be present at or near the surface in isolated segments of RA-08 where it crosses Itasca and Carlton counties. It is possible that bedrock blasting would be necessary in these segments, but the specific need for blasting cannot be determined without field-based geotechnical studies.

Because no known karst conditions are present along route RA-08, no impacts from subsidence or sinkhole formation are anticipated.

Operations Impacts

Impacts on geology and soil resources for operation of the RA-08 route would be similar to those for the Applicant’s preferred route. Of the acreage disturbed during construction, 999 acres would be maintained as permanent right-of-way during operations. Within the permanent right-of-way, installation of permanent access roads and facilities would cause a localized, minor, permanent loss of soil cover. In addition, replacement of natural soil cover with less permeable cement and other materials could increase runoff and associated erosion and sedimentation (addressed in Section 5.2.1.2).

Vehicle traffic associated with right-of-way maintenance would cause permanent minor soil compaction. The locations of new permanent unpaved access roads also would experience negligible to minor, localized, and permanent soil compaction and erosion.

6.3.2.4 Summary and Mitigation

6.3.2.4.1 Summary

Construction and operation of the Applicant's preferred route and all route alternatives would affect geologic and soil resources. Table 6.3.2-3 provides a summary of the occurrence and extent of potential impacts on geology and soils associated with the Applicant's preferred route and route alternatives. If the protective measures outlined in the Applicant's Environmental Protection Plan (Appendix E) are implemented, most construction impacts on geology and soils would be negligible to minor and temporary to short-term.

In general, the primary differences in the extent of impacts among the routes are associated with the pipeline length and the width of the construction work area—in terms of both general surface disturbance and sensitive geologic and soils characteristics. The length of the various routes between Clearbrook and Carlton ranges from 165 miles (RA-08) to 275 miles (RA-03AM); this represents a 40-percent difference in the extent of surface disturbance based on pipeline length (Table 6.3.2-3). Similarly, the width of the construction work area varies among the routes from a standard width of 120 feet (for all but RA-07) to an estimated width of 205 feet (for RA-07), representing almost a 60-percent difference in surface disturbance based on the width of the construction work area. Despite these differences, implementation of the Applicant-proposed measures to limit impacts on geology and soils would minimize the duration and magnitude of construction and operations impacts. Overall, both temporary and long-term effects on geology and soils are expected to be minor.

The Applicant's preferred route and all of the route alternatives cross through rich agricultural areas, with soils designated as prime farmland. The types of soil impacts along the Applicant's preferred route and the route alternatives would be similar, as all routes share similar overall soil conditions. Soils prone to erosion by water are rare across all route options, while soils prone to erosion by wind are present to similar extents across the routes. The susceptibility to soil compaction is similar for all route options, as the occurrence of hydric soils is somewhat similar among the four route alternatives and the Applicant's preferred route. The presence of other compaction-prone soils is not common (Table 6.3.2-3). The potential for soil mixing from soil removal and soil contamination from minor spills during construction would be the same for all route options.

The need for bedrock removal from blasting is likely similar across the Applicant's preferred route and the route alternatives. One minor segment of shallow bedrock along the Applicant's preferred route has been documented to require blasting. Shallow bedrock likely would require blasting in some isolated eastern segments of all four route alternatives, but the specific need for blasting along the route alternatives cannot be determined without field-specific geotechnical studies. The potential for encountering scientifically significant fossil-bearing layers is low across all routes. For the most part, the terrain is flat through all route options, and any impacts on topography would be negligible to minor for all route options.

Landslide potential is similarly low for all the route options, with an elevated hazard in only isolated minor areas for all route options. Known karst conditions are present along approximately 12 miles of RA-03AM where the pipeline would cross through Pine County, with a potential for subsidence and sinkhole formation. No known karst features are present along the Applicant's preferred route or the other three route alternatives.

The greatest impact on soils during operations would be the loss of soil cover associated with aboveground facilities; these losses would be permanent and minor for the Applicant's preferred route and all route alternatives. The extent of permanent soil conversion to an impervious surface for all route alternatives would be expected to comparable to the Applicant's preferred route (64.8 acres), although the permanent conversion of soil to an impervious surface would be slightly higher for RA-03AM because it would require additional pump stations.

6.3.2.4.2 Mitigation

Beyond the potential for an unanticipated discovery of and damage to a rare paleontological resource, no major impacts are expected on geologic and soil resources associated with the Applicant's preferred route or any route alternative. Beyond the Applicant-proposed measures described for the Applicant's preferred route, no mitigation measures have been identified to further avoid and minimize impacts on geology and soils.

Table 6.3.2-3. Summary of Potential Impacts on Geology and Soils for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

<table>
<tr><th>Impact</th><th>Applicant's Preferred Route[c]</th><th>Route Alternative RA-03AM[d]</th><th>Route Alternative RA-06[e]</th><th>Route Alternative RA-07[f]</th><th>Route Alternative RA-08[g]</th></tr>
<tr><td colspan="6">Construction Impacts</td></tr>
<tr><td>Prone to soil erosion by wind or water</td><td>Temporary to short-term/ minor localized impacts
• 86.0 miles</td><td>Temporary to short-term/ minor localized impacts
• 74.0 miles</td><td>Temporary to short-term/ minor localized impacts
• 50.8 miles</td><td>Temporary to short-term/ minor localized impacts
• 84.4 miles</td><td>Temporary to short-term/ minor localized impacts
• 64.2 miles</td></tr>
<tr><td>Prone to soil compaction, hydric, or other sensitive soils</td><td>Temporary/negligible to minor localized impacts
• 68.4 miles</td><td>Temporary/negligible localized impacts
• 53.3 miles</td><td>Temporary/negligible to minor localized impacts
• 93.6 miles</td><td>Temporary/negligible to minor localized impacts
• 64.4 miles</td><td>Temporary/negligible to minor localized impacts
• 72.0 miles</td></tr>
<tr><td>Increase in soil mixing</td><td>Short-term/negligible to minor impacts</td><td>Short-term/negligible to minor impacts</td><td>Short-term/negligible to minor impacts</td><td>Short-term/negligible to minor impacts</td><td>Short-term/negligible to minor impacts</td></tr>
<tr><td>Potential for soil contamination from minor spills</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td></tr>
<tr><td>Potential for shallow bedrock blasting[a]</td><td>Permanent/minor impacts
• 0.3 mile</td><td colspan="4">Permanent/minor impacts
• The extent of blasting required is unknown.</td></tr>
<tr><td>Potential paleontological disturbance from excavation or blasting[h]</td><td>Permanent/negligible to major impacts</td><td>Permanent/negligible to major impacts</td><td>Permanent/negligible to major impacts</td><td>Permanent/negligible to major impacts</td><td>Permanent/negligible to major impacts</td></tr>
<tr><td rowspan="2">Potential for modifications to topography</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td><td>Temporary/negligible to minor localized impacts</td></tr>
<tr><td colspan="5">Permanent/minor modifications to topography (e.g., excavations for foundations, permanent road grading) for some aboveground facilities (e.g., pump stations, mainline valves, cathodic protection systems, and permanent access roads); locations of these facilities have not been determined for the route alternatives.</td></tr>
</table>

Table 6.3.2-3. Summary of Potential Impacts on Geology and Soils for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Operations Impacts					
Permanent loss of soil cover	Permanent/minor impacts • 64.8 acres	Permanent/minor impacts[i]	Permanent/minor impacts[i]	Permanent/minor impacts[i]	Permanent/minor impacts[i]
Potential for soil erosion and compaction	Permanent/negligible to minor localized impacts	Permanent/negligible to minor localized impacts	Permanent/negligible to minor localized impacts	Permanent/negligible to minor localized impacts	Permanent/negligible to minor localized impacts
Landslide hazard?	Yes	Yes	Yes	Yes	Yes
Subsidence or sinkhole hazard?	No	Yes	No	No	No

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts related to geology and soils. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, NRCS data does not provide complete coverage. However, overall data on soils types and characteristics can aid the reader in understanding the potential for erodibility or potential for soil compaction impacts where soil data is missing. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in the tables should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3), as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-356 to 6-364. The table above provides counts, for example, of miles of the route that cross soils prone to soil erosion by water or wind within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to highly erodible soils is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-356 to 6-360. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-361 to 6-362. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-362 to 6-363. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.3.2-3. Summary of Potential Impacts on Geology and Soils for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

f As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-363 to 6-364. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

g RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on page 364. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

h Shallow bedrock likely would require blasting in some isolated eastern segments of all four route alternatives, but the specific need for blasting along the route alternatives cannot be determined without field-specific geotechnical studies.

i Permanent loss of soil cover is not quantifiable for the route alternatives because the specific locations of activities and facilities are not known.

6.3.2.5 References

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6.3.3 Vegetation

Vegetation is a critical component of ecosystem sustainability, as it supports and regulates biological and biochemical cycles, influences water quality, replenishes and stabilizes soils, provides habitat for wildlife, and contributes directly and indirectly to socioeconomic benefits. Plant species and associations themselves comprise a large portion of regional ecological richness, uniqueness, and diversity values as well as provide numerous specific habitat requirements that support the same values for wildlife.

Vegetation can be described by land cover types—predictable assemblages of plant species that grow together in similar habitat. In addition to existing land cover types, other vegetation parameters used to estimate potential Project impacts include the location and classification of native plant communities, old-growth forests, high conservation value forests (HCVFs), and distribution of noxious weed and invasive plant populations.

Potential impacts on types of vegetation that fall under specific regulatory jurisdiction are found in other sections, as detailed below:

- Wild Rice Waterbodies (see Section 6.3.1.2);
- Wetlands, including calcarious fens (see Section 6.3.1.3); and
- Special Status Plant Species and Communities (see Section 6.3.5). (Note: this included federal- and state-listed threatened and endangered species; Species of Greatest Conservation Need (SGCN); Minnesota Biological Survey Sites of Biodiversity Significance [MBS Sites]; and Scientific and Natural Areas [SNAs]); and
- Potential impacts on vegetation due to an unanticipated release of crude oil are addressed in Chapter 10.

After providing information on applicable regulations and the regulatory context for management of vegetation resources, this section describes the impact analysis methodology. This section describes the existing conditions within an area along the Applicant’s preferred route and each of the route alternatives (RA-03AM, RA-06, RA-07, and RA-08). Potential Project-related impacts of construction and operation on vegetation parameters are discussed for the five route options (the Applicant’s preferred route and the four route alternatives). The impact analysis focuses on the segments of the route alternatives between Clearbrook and Carlton, as described below. A summary and comparison of the impacts are included at the end of the section.

6.3.3.1 Regulatory Context and Methodology

6.3.3.1.1 Regulatory Context

Regulations pertaining to the conservation, protection, and management of vegetation are established at various levels of federal, state, and local government. Conservation and protection activities regarding special status plant resources are managed by federal and state agencies. As noted above, regulatory protection for wetlands, including calcareous fens are addressed Section 6.3.1.3. Regulatory measures protect federally and state-listed endangered or threatened plants, and other vegetation communities are discussed Section 6.3.5.

Native plant communities (defined under Methodology) are naturally-occurring vegetation with considerable resource value. In Minnesota, conservation and protection activities are managed by Minnesota DNR. Data collected are used to identify native plant community types, evaluate quality and quantity, assign rarity, and provide recommendations for land management practices to avoid and minimize disturbance of rare resources. Few regulations provide protection for native plant communities, although resource agencies devote considerable expense to their conservation for ecological and public values.

A “noxious weed” is “any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources of the United States, public health, or the environment” as defined in the U.S. Plant Protection Act of 2000 (7 U.S. Code 7701–7772). “Invasive plants” are non-native plants also identified as potential threats to the natural environment because of their ability to dominate and exclude other vegetation. Weed and invasive plant classifications and rules vary between regulating agencies.

In Minnesota, the Minnesota DNR is responsible for state-prohibited and state-regulated invasive aquatic plants, and the Department of Agriculture is responsible for state-prohibited and state-regulated terrestrial plants classified as noxious weeds under the Minnesota Noxious Weed Law (Minn. Stat. § 18.75 to 18.91).

6.3.3.1.2 Methodology

Existing vegetation resources were identified and analyzed using multiple information sources, starting at a broad scale and narrowing to a more localized scale. These data provided consistent classification and nomenclature of vegetation that allowed comparison of the impacts of the Applicant’s preferred route and the route alternatives on specific vegetation resources at different levels

The vegetation evaluation considered impacts on Minnesota Ecological Classification System (ECS) units, NLCD landcover types, MBS Sites and native plant communities, old-growth forests, HCVFs, and noxious weeds and invasive plants.

Minnesota’s ECS is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. Like ecoregions used in the Chapter 5 analysis, the ECS integrates biotic and environmental factors (e.g., climate, geology, topography, soils, hydrology, and vegetation) in a hierarchical framework to identify increasingly fine gradations of landscape characteristics (Minnesota DNR 2016a). The following levels of the ECS framework are referenced.

Provinces: units of land defined using major climate zones, native vegetation, and biomes such as prairies, deciduous forests, or boreal forests. There are four Provinces in Minnesota.

Sections: units within provinces that are defined by origin of glacial deposits, regional elevation, distribution of plants, and regional climate. Minnesota has 10 sections.

Subsections: units within sections that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief, and the distribution of plants, especially trees. Minnesota has 26 subsections.

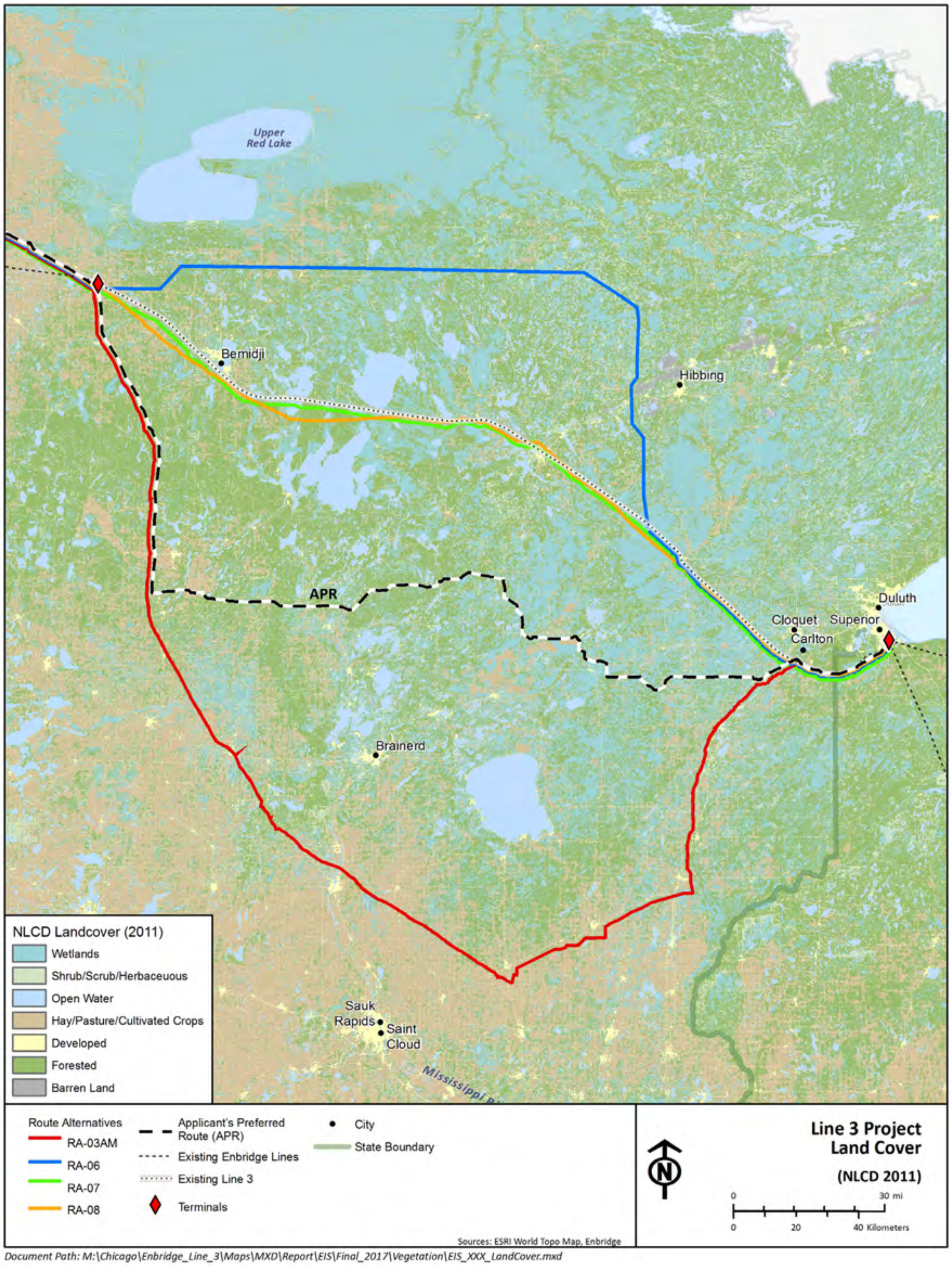
The NLCD (Homer et al. 2015) describes and delineates broad-scale land classes of vegetation cover. The NLCD uses a combination of satellite imagery, national vegetation survey data, and local vegetation survey data to provide a spatial reference and descriptive data for characteristics of the land surface by grouping similar types of land cover into a variety of classifications (e.g., developed, forested, and cultivated).

Not all of the NLCD cover classifications are appropriate for this analysis. For example, because the category of developed lands (residential, commercial, and industrial lands) primarily include artificially created landscapes with minimal naturally occurring vegetation, these lands were not included in the vegetation impact summaries.

The NLCD vegetation cover classes that are within the ROI for the Applicant's preferred route and route alternatives are defined in Table 6.3.3-1 and illustrated in Figure 6.3.3-1.

Table 6.3.3-1. National Land Cover Database Land Cover Classifications

Classification	Definition
Barren land (rock/sand/clay)	Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.
Deciduous forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
Evergreen forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.
Mixed forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.
Shrub/scrub	Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, and trees stunted from environmental conditions.
Grassland/herbaceous	Areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
Pasture/hay	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.
Cultivated crops	Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.
Woody wetlands	Areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Emergent herbaceous wetlands	Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.



Source: Homer et al. 2015.

Figure 6.3.3-1. NLCD Vegetation Cover Crossed by the Applicant's Preferred Route and Route Alternatives in Minnesota

MBS Sites are extensive landscape areas mapped and assessed by Minnesota DNR staff for context and ecological influence of the landscape; size, condition, and quality of native plant communities, and quality and rarity of individual plant species. These values are combined to assign a biodiversity significance rank for each site ranging from Outstanding, High, Moderate, or Below. Outstanding and high-ranked sites are of most concern for conservation, as they contain rare species, native plant communities, and intact landscapes. This is an on-going effort, to be considered preliminary, if available at all, for intersection with the Applicant's proposed project and CN Alternatives, illustrated in Figure 5.2.3-2.

Native vegetation in Minnesota is classified by a six-level hierarchy. This analysis references two of these levels – the ecological system and the native plant community. Ecological systems, the second highest level, are groups of native plant communities unified by strong influence from a major ecological process such as fire and hydrology. Minnesota native plant communities are groups of native plants that associate with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plant species form recognizable plant communities that re-occur in similar ecological conditions. Native plant community mapping continues across the state; all completed MBS Sites have native plant community mapping done only within outstanding and high ranked units. Native plant communities are also mapped outside of MBS Sites. Native plant communities are ranked by state conservation status, which reflects the level of rarity across the state. The conservation status ranks range from S1 – critically imperiled to S5 – secure, common, widespread, and abundant; native plant communities ranked as S1 – critically imperiled, S2 – imperiled, and S3 – vulnerable to extirpation or extinction are considered to be "rare."

Old-growth forests, identified in Minnesota DNR's Forest Stand Inventory, are designated forests in Minnesota that have not experienced severe, stand-replacing disturbance over the last 120 years. Old-growth forests are recognized as valuable resources in Minnesota and are protected from harvesting operations. They provide unique wildlife habitat, rare plant refugia, genetic reservoirs, and research opportunities.

Minnesota DNR requires designation of HCVFs as part of the Forest Stewardship Council's forest certification (Minnesota DNR 2016f). HCVFs are forest areas that contain concentrations of rare, threatened, or endangered species; natural communities; and other biodiversity values that occur in numbers, frequency, quality, and/or density that are sufficiently outstanding to be considered unique or highly important in comparison with other forest areas within the ecoregion. HCVF lands are managed for a broad set of objectives and forest resources in a manner that will maintain or enhance these values across the landscape.

Impacts related to vegetation were evaluated by overlaying construction work areas of the Applicant's preferred route and route alternatives with:

- Minnesota DNR ECS maps (Minnesota DNR 2016a) to identify and quantify broad-scale patterns of existing vegetation within the pipeline corridors;
- NLCD (Homer et al. 2015) to quantify site-specific construction and operations impacts;
- MBS Sites (Minnesota DNR 2016e) to identify areas of biological integrity and quantify construction and operations impacts;
- Locations of Minnesota native plant communities, including rare native plant communities (Minnesota DNR 2016c) to quantify site-specific construction and operations impacts;

- Minnesota DNR Forest Stand Inventory (Minnesota DNR 2016c) old-growth forest stand data to quantify site-specific construction and operations impacts;
- HCVF maps (Minnesota DNR 2016f) to identify forests of outstanding biological or cultural significance in order to quantify site-specific construction and operations impacts; and
- Minnesota noxious weed and invasive plant data layers (University of Georgia 2016; Minnesota DA 2016; Minnesota DNR 2016d) to identify infestations that could be spread by construction activities.

No single one of the datasets listed above provides a complete indication of all relevant impacts to vegetation. Together, though, these datasets provide a reasonably comprehensive indication of the potential impacts. For example, acreage counts for different NLCD land cover types crossed do not consider how unique or sensitive certain areas might be within the broad NLCD cover type classes. However, data from the MBS database can aid the reader in understanding the extent of potential impacts on unique and highly sensitive areas.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide counts, for example, of acres of the ROI containing rare native plant communities and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to native plant communities is contained in the text of this section. The ROI for this evaluation generally encompasses the area that could be directly or indirectly affected by pipeline construction within 0.5 mile of the centerline of the pipeline routes. To assess and quantify the magnitude of impacts, the analysis drew on the land cover and vegetation datasets referenced above to identify the number of acres of each vegetation type or native plant resource that could be affected.

Potential impacts on vegetation resources are estimated for activities associated both with construction and operation of the Applicant’s preferred route, as well as the route alternatives. Direct impacts on vegetation include disruption or removal of rooted vegetation resulting in a reduction in areas of existing vegetation communities, reduction of total numbers of plant species (species richness) within an area, and/or reduction or loss of total area, diversity, structure, or function of wildlife habitat. Therefore, the potential for negative impacts on vegetation is assumed to be proportional to the estimated area of surface disturbance under each alternative. The larger the area, the greater the potential for direct and indirect impacts.

A number of indirect impacts on vegetation resources are possible as a result of construction and operation activities. Potential indirect impacts include loss of habitat suitable for colonization due to surface disturbance; introduction or spread of noxious weeds and invasive plant species by various vectors or conditions; and inability to achieve full expression of natural tree and shrub growth due to vegetation management. Failed reclamation or mitigation may also cause indirect impacts on these resources. Most indirect impacts are assumed to result from direct impacts in proportion to the relative amount of surface disturbance.

Vegetation impacts for the Applicant’s preferred route were based on refined footprints provided by the Applicant that identify the construction work area, ATWS, access roads, pipe yards, pipeline permanent right-of-way, valve pads and driveways, and pump stations. Dimensions for these footprints are included in the Project description.

Construction impacts for route alternatives RA-03AM, RA-06, and RA-08 were estimated by overlaying a 120-foot-wide construction work area centered on the pipeline route alternative onto available vegetation maps. Construction impacts for route alternative RA-07 were estimated by overlaying a 205-foot-wide construction work area (this width extended 10 feet on the north side of the existing Line 3 pipeline permanent right-of-way and 195 feet on the south side of the existing Line 3 pipeline permanent right-of-way). Operations impacts for all route options were estimated by overlaying a 50-foot-wide operations right-of-way onto available vegetation maps. Results of this analysis are presented in the following sections. Appendix K, Vegetation Tables contains additional analyses details.

Impacts associated with construction activities would be common regardless of pipeline route and were identified based on construction methods described in the Project EAW (Enbridge 2016).

All of the route alternatives have the same route between the North Dakota border and Clearbrook, and from Carlton to the Wisconsin border. Therefore, the comparison of impacts among the route alternatives focuses on the segments of the routes between Clearbrook and Carlton.

6.3.3.2 Existing Conditions

Every ECS province (the largest land classification areas) is crossed by one or more of the Applicant's preferred route and pipeline route alternatives. The route alternatives largely occur within the Laurentian Mixed Forest province. Between Clearbrook and Carlton, the ECS provinces transition (west to east) from grasslands and parklands to uplands and peatlands dominated by forests. The next classification level is the ECS section. Eight ECS sections occur within the ROI for one or more of the route options (the Applicant's preferred route and the route alternatives) addressed in this chapter.

Figure 6.3.3-1 shows the distribution of NLCD vegetation in Minnesota (broad-scale vegetation cover classes, as described in the NLCD, Homer et al. 2015) along the route alternatives. Color gradations from yellow to green show landscape level changes from prairie and farmland to forest cover types.

Figure 6.3.3-2 illustrates the Minnesota native plant community systems crossed by the Applicant's preferred route and route alternatives.

6.3.3.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the vegetation ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Ecological Classifications and Vegetation Cover

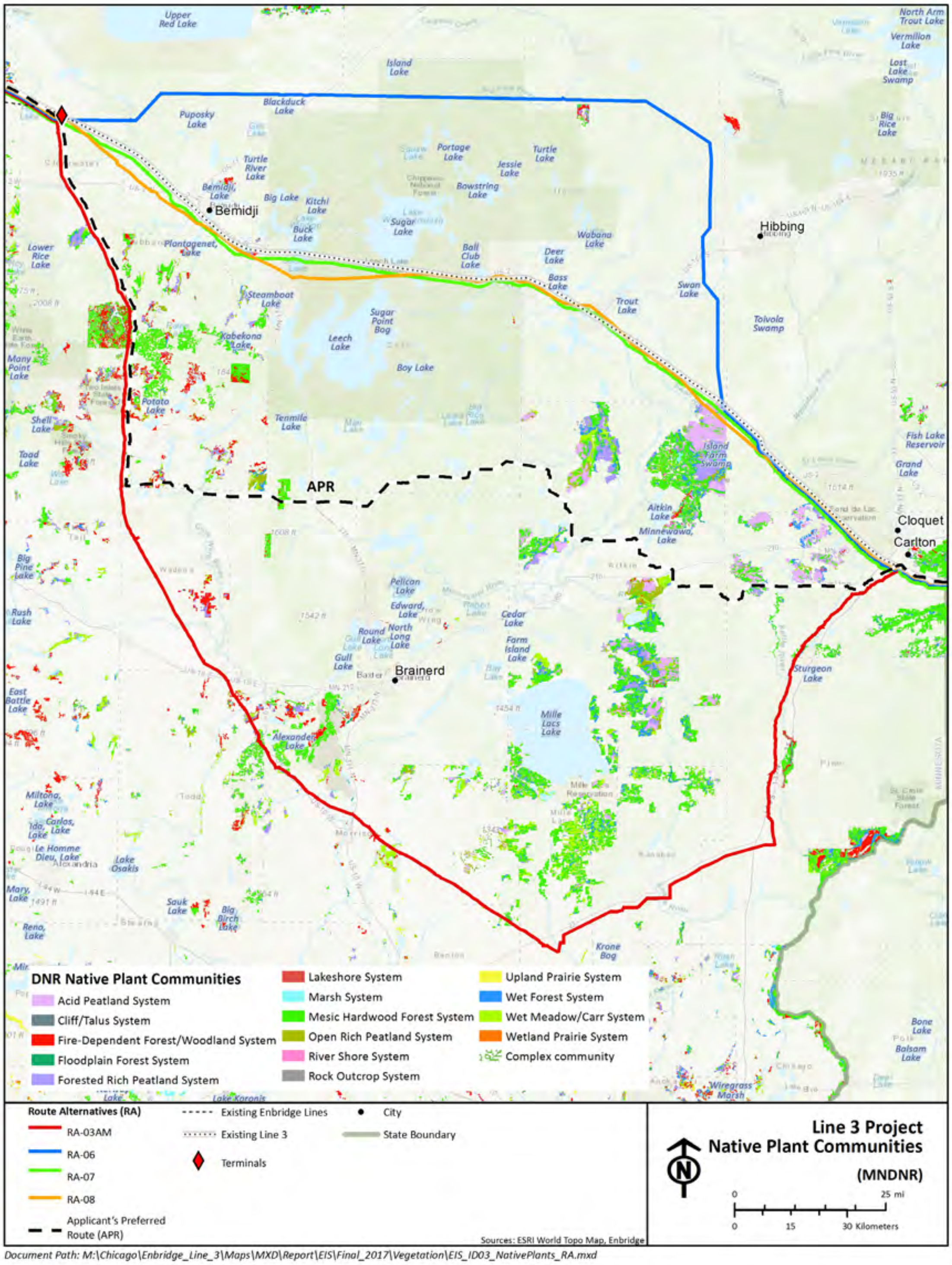
The Applicant's preferred route crosses four ECS provinces within Minnesota and two ECS provinces between Clearbrook and Carlton. The Applicant's preferred route would cross through three ECS sections before Clearbrook. From Clearbrook to Carlton, the Applicant's preferred route is almost entirely within one section; close to Carlton, the Applicant's preferred route crosses through two sections before the Wisconsin border (Table 6.3.3-2.).

Review of the NLCD land cover patterns demonstrates that the Applicant's preferred route primarily occurs within areas dominated by forests (e.g., deciduous forest, woody wetland), shorter canopied scrub/shrub, and agricultural (e.g., hay/pasture, cultivated crops) cover classes (Figure 6.3.3-1).

MBS Sites and Native Plant Communities

Native plant community systems that occur within 0.5 mile of the Applicant's preferred route include 11 sensitive prairie, wetland, and forest systems. These primarily consist of forested and wetland forested systems, including acid peatland system, complex community, fire-dependent forest/woodland system, floodplain forest system, forested rich peatland system, marsh system, mesic hardwood forest system, open rich peatland system, upland prairie system, wet forest system, and wet meadow/Carr system (Aaseng et al. 2011). Several native plant community systems contain MBS Sites that are ranked as moderate to outstanding under the MBS Sites of Biodiversity significance ranking. Specific locations for moderate- to outstanding-ranked MBS Sites and associated native plant communities relative to the location of the Applicant's preferred route are shown in detail in Appendix A.

Nineteen rare native plant community types (with S1, S2, or S3 conservation rank) were documented within 0.5 mile of the Applicant's preferred route. Three old-growth forest stands were identified within 0.5 mile of the Applicant's preferred route: two ash and one Norway pine. In addition, one HCVF was identified within 0.5 mile of the Applicant's preferred route (Kettle Lake Peatlands HCVF).



Source: Minnesota DNR 2016c.

Figure 6.3.3-2. Native Plant Community Systems Crossed by the Applicant's Preferred Route and Route Alternatives in Minnesota

Table 6.3.3-2. Minnesota Ecological Sections Crossed by the Applicant's Preferred Route

Province	Section	Subsection	Total Distance Crossed within Minnesota (miles)	Distance Crossed between Clearbrook and Carlton (miles)
Prairie Parklands	Red River Valley	Red River Prairie	35.1	--
Prairie Parklands subtotal			***35.1***	***--***
Tallgrass Aspen Parklands	Lake Agassiz, Aspen Parklands	Aspen Parklands	61.6	--
Tallgrass Aspen Parklands subtotal			***61.6***	***--***
Eastern Broadleaf Forest	Minnesota & NE Iowa Morainal	Hardwood Hills	20.9	8.5
Eastern Broadleaf Forest subtotal			***20.9***	***8.5***
Laurentian Mixed Forest	N. Minnesota Drift & Lake Plains	Chippewa Plains	31.5	31.5
		Pine Moraines & Outwash Plains	94.7	94.7
		St. Louis Moraines	36.6	36.6
		Tamarack Lowlands	31.3	31.3
	Southern Superior Uplands	Glacial Lake Superior Plain	7.1	--
	Western Superior Uplands	Mille Lacs Uplands	20.8	18.2
Laurentian Mixed Forest subtotal			***222.1***	***212.4***
TOTAL			**339.6**	**220.9**

Source: Minnesota DNR 2016a.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

See Appendix K, Table K-1 for additional detail.

"--" = no occurrence

Table 6.3.3-3. Noxious Weeds and Invasive Plants within 0.5 Mile of the Applicant's Preferred Route

Common Name	Scientific Name	Minnesota Status[a]	Occurrences within Minnesota[b]	Occurrences between Clearbrook and Carlton[c]
Hoary alyssum	*Berteroa incana*	NA	1	1
Oxeye daisy	*Leucanthemum vulgare*	NA	5	5
Reed canarygrass	*Phalaris arundinacea*	NA	66	65
Smooth brome	*Bromus inermis*	NA	14	14
Orange hawkweed	*Hieracium aurantiacum*	NA	3	3
Honeysuckle	*Lonicera* spp.	RNW	1	1
Spotted knapweed,	*Centaurea stoebe*	C	48	47
Siberian peashrub	*Caragana arborescens*	NA	1	1
Leafy spurge	*Euphorbia esula*	C	1	0
White sweetclover	*Melilotus alba*	NA	7	7
Yellow sweetclover	*Melilotus officinalis*	NA	5	5
Tansy	*Tanacetum vulgare*	C	115	107
Thistle spp.[d]	*Cirsium* spp.	NA	92	92
Bull thistle	*Cirsium vulgare*	NA	14	14
Canada thistle	*Cirsium arvense*	C	18	18
Plumeless thistle	*Carduus acanthoides*	C	1	1
Sow thistle	*Sonchus arvensis*	NA	9	9
Birdsfoot trefoil	*Lotus corniculatus*	NA	12	11
Total Number of Occurrences			**413**	**401**

Sources: Minnesota DNR 2016d; Minnesota DA 2016.

[a] Status (MN): E – Eradicate List; C – Control List; RNW – Restricted Noxious Weed; SRP – Specially Regulated Plants
Note: NA = plant species with no legal status per Minnesota Noxious Weed List (Minnesota DA 2016)

[b] Number of occurrences of infestations within 0.5 mile of the centerline of the Applicant's preferred route in Minnesota.

[c] Number of occurrences of infestations within 0.5 mile of the centerline of the Applicant's preferred route between Clearbrook and Carlton, Minnesota.

[d] May include native, non-weed thistle species

Note:

See Appendix K, Table K-2 for additional detail.

Noxious Weeds and Invasive Plants

Several noxious weed and invasive plant species have been reported near the Applicant's preferred route, totaling 413 occurrences in Minnesota and 401 occurrences between Clearbrook and Carlton (Table 6.3.3-3). Noxious and invasive weeds occurring near the Project include commonly occurring Midwest weeds such as reed canarygrass, tansy, spotted knapweed, and several thistles.

6.3.3.2.2 Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to vegetation for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the vegetation ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

<u>Ecological Classifications and Vegetation Cover</u>

Two ECS provinces would be crossed by route alternative RA-03AM: Eastern Broadleaf Forest and Laurentian Mixed Forest (Table 6.3.3-4). RA-03AM largely occurs within the Laurentian Mixed Forest province. Three ECS sections would be crossed by RA-03AM. RA-03AM crosses 10 broad-scale vegetation cover classes as described in the NLCD: evergreen forest, deciduous forest, mixed forest, scrub/shrub, grassland/herbaceous, hay/pasture, cultivated crops, woody wetlands, emergent herbaceous wetlands, and barren land (Homer et al. 2015). Figure 6.3.3-1 shows the distribution of vegetation cover along the route alternatives. Review of these broad-scale vegetation cover patterns demonstrates that RA-03AM is primarily located within areas dominated by agricultural (e.g., hay/pasture and cultivated crops) and deciduous forest cover classes.

Table 6.3.3-4. Minnesota Ecological Sections Crossed by Route Alternative RA-03AM

Province	Section	Subsection	Distance Crossed (miles)
Eastern Broadleaf Forest	Minnesota & NE Iowa Morainal	Anoka Sand Plain	10.7
		Hardwood Hills	24.0
Eastern Broadleaf Forest subtotal			***34.7***
Laurentian Mixed Forest	N. Minnesota Drift & Lake Plains	Chippewa Plains	31.5
		Pine Moraines & Outwash Plains	78.3
	Western Superior Uplands	Mille Lacs Uplands	130.2
Laurentian Mixed Forest subtotal			***240.0***
TOTAL			**274.7**

Source: Minnesota DNR 2016a.

Note:

See Appendix K, Table K-1 for additional detail.

Native Plant Communities

Between Clearbrook and Carlton, 87 acres of native plant communities have been documented within the construction work area for RA-03AM, 36 acres have been documented within the operations right-of-way, and 7,732 acres have been documented within 0.5 mile of the pipeline centerline (Minnesota DNR 2016b, 2016e). Minnesota native plant community systems that occur within 0.5 mile from RA-03AM are primarily mesic hardwood forest and fire dependent forest/ woodland. Native plant community systems crossed by RA-03AM are shown in Figure 6.3.3-2 (Minnesota DNR 2016c). Specific locations for moderate- to outstanding-ranked MBS Sites and imbedded native plant communities relative to the location of RA-03AM are shown in greater detail in Appendix A. Rare native plant community types (with S1, S2, or S3 conservation rank) also occur within the construction work area and permanent right-of-way for RA-03AM, including oak-aspen forest and black ash – (red maple) seepage swamp. One old-growth forest stand type (Norway pine) was identified within 0.5 mile of RA-03AM. No HCVFs occur within or near the route.

Noxious Weeds and Invasive Plants

Several noxious weed and invasive plant species have been reported within 0.5 mile of RA-03AM, totaling 314 occurrences between Clearbrook and Carlton (Table 6.3.3-5). Noxious and invasive weeds occurring near the route include commonly occurring Midwest weeds, such as reed canarygrass, tansy, and several thistles.

Table 6.3.3-5. Noxious Weeds and Invasive Plants within 0.5 Mile of Route Alternative RA-03AM

Common Name	Scientific Name	Minnesota Status[a]	Occurrences[b]
Hoary alyssum	*Berteroa incana*	NA	1
Common buckthorn	*Rhamnus cathartica*	RNW	18
Creeping Charlie	*Glechoma hederacea*	NA	1
Oxeye daisy	*Leucanthemum vulgare*	NA	5

Table 6.3.3-5. Noxious Weeds and Invasive Plants within 0.5 Mile of Route Alternative RA-03AM

Common Name	Scientific Name	Minnesota Status[a]	Occurrences[b]
Siberian elm	*Ulmus pumila*	NA	1
Reed canarygrass	*Phalaris arundinacea*	NA	14
Smooth brome	*Bromus inermis*	NA	14
Orange hawkweed	*Hieracium aurantiacum*	NA	7
Honeysuckle	*Lonicera* spp.	RNW	2
Spotted knapweed	*Centaurea stoebe*	C	53
Amur maple	*Acer ginnala*	NA	1
Common mullein	*Verbascum thapsus*	NA	1
Siberian peashrub,	*Caragana arborescens*	NA	4
White sweetclover	*Melilotus alba*	NA	9
Yellow sweetclover	*Melilotus officinalis*	NA	5
Tansy	*Tanacetum vulgare*	C	76
Thistle spp.[c]	*Cirsium* spp.	NA	34
Bull thistle	*Cirsium vulgare*	NA	23
Canada thistle	*Cirsium arvense*	C	29
Sow thistle	*Sonchus arvensis*	NA	1
Birdsfoot trefoil	*Lotus corniculatus*	NA	11
Cow vetch	*Vicia cracca*	NA	1
Crown vetch	*Coronilla varia*	RNW	3
TOTAL NUMBER OF OCCURRENCES			**314**

Sources: Minnesota DNR 2016d; Minnesota DA 2016.

[a] Status (MN): E – Eradicate List; C – Control List; RNW – Restricted Noxious Weed; SRP – Specially Regulated Plants
Note: NA = plant species with no legal status per Minnesota Noxious Weed List (Minnesota DA 2016)

[b] Number of occurrences of infestations within 0.5 mile of the centerline of the RA-03AM route between Clearbrook and Carlton, Minnesota.

[c] May include native, non-weed thistle species

Note:

See Appendix K, Table K-2 for additional detail.

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the vegetation ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Ecological Classifications and Vegetation Cover

Two ECS provinces would be crossed by route alternative RA-06: Eastern Broadleaf Forest and Laurentian Mixed Forest (Table 6.3.3-6). RA-06 is largely located within the Laurentian Mixed Forest province. Five ECS sections would be crossed by RA-06. RA-06 crosses 10 broad-scale vegetation cover classes, as described in the NLCD: evergreen forest, deciduous forest, mixed forest, scrub/shrub, grassland/herbaceous, hay/pasture, cultivated crops, woody wetlands, emergent herbaceous wetlands, and barren land (Homer et al. 2015). Figure 6.3.3-1 shows the distribution of vegetation cover along the route alternative. Review of these broad-scale vegetation cover patterns demonstrates that RA-06 is primarily located within areas dominated deciduous forest, and woody wetland cover classes.

Table 6.3.3-6. Minnesota Ecological Sections Crossed by Route Alternative RA-06

Province	Section	Subsection	Distance Crossed (Miles)
Eastern Broadleaf Forest	Minnesota & NE Iowa Morainal	Hardwood Hills	9.6
Eastern Broadleaf Forest subtotal			***9.6***
Laurentian Mixed Forest	N. Minnesota & Ontario Peatlands	Littlefork-Vermillion Uplands	21.2
	N. Minnesota Drift & Lake Plains	Chippewa Plains	54.9
		St. Louis Moraines	29.2
		Tamarack Lowlands	29.4
	Northern Superior Uplands	Nashwauk Uplands	30.9
		North Shore Highlands	17.0
	Western Superior Uplands	Mille Lacs Uplands	3.7
Laurentian Mixed Forest subtotal			***186.3***
TOTAL			**195.9**

Source: Minnesota DNR 2016a.

Note:

See Appendix K, Table K-1 for additional detail.

Native Plant Communities

Native plant community systems that occur within the construction work area and permanent right-of-way for RA-06 include acid peatland system, forested rich peatland system and small portions of mesic hardwood forest system and wet forest system. No rare native plant community types are documented within or near (within 0.5 mile) the construction work area or permanent right-of-way. Native plant community systems crossed by RA-06 are shown in Figure 6.3.3-2 (Minnesota DNR 2016c). Specific locations for moderate- to outstanding-ranked MBS Sites and imbedded native plant communities relative to the location of RA-06 are show in greater detail in Appendix A. Three old-growth forest stand types were identified within 0.5 mile of RA-06, including aspen, birch, and Norway pine. No HCVFs occur within 0.5 mile of the route.

Noxious Weeds and Invasive Plants

Several noxious weed and invasive plant species have been reported within 0.5 mile of RA-06, totaling 408 occurrences between Clearbrook and Carlton (Table 6.3.3-7). Noxious and invasive weeds occurring near the route include commonly occurring Midwest weeds, such as reed canarygrass, tansy, and thistles.

Table 6.3.3-7. Noxious Weeds and Invasive Plants within 0.5 Mile of Route Alternative RA-06

Common Name	Scientific Name	Minnesota Status[a]	Occurrences[b]
Oxeye daisy	*Leucanthemum vulgare*	NA	5
Reed canarygrass	*Phalaris arundinacea*	NA	106
Smooth brome	*Bromus inermis*	NA	1
Spotted knapweed	*Centaurea stoebe*	C	21
Wild parsnip	*Pastinaca sativa*	NA	6
Siberian peashrub	*Caragana arborescens*	NA	2
White sweetclover	*Melilotus alba*	NA	12
Yellow sweetclover	*Melilotus officinalis*	NA	2
Tansy	*Tanacetum vulgare*	C	108
Thistle spp.[c]	*Cirsium* spp.	NA	117
Bull thistle	*Cirsium vulgare*	NA	1
Canada thistle	*Cirsium arvense*	C	17
Birdsfoot trefoil	*Lotus corniculatus*	NA	10
TOTAL NUMBER OF OCCURRENCES			**408**

Sources: Minnesota DNR 2016d; Minnesota DA 2016.

[a] Status (MN): E – Eradicate List; C – Control List; RNW – Restricted Noxious Weed; SRP – Specially Regulated Plants
Note: NA = plant species with no legal status per Minnesota Noxious Weed List (Minnesota DA 2016)

[b] Number of occurrences of infestations within 0.5 mile of the RA-06 route between Clearbrook and Carlton, Minnesota.

[c] May include native, non-weed thistle species

Note:

See Appendix K, Table K-2 for additional detail.

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the vegetation ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Ecological Classifications and Vegetation Cover

Two ECS provinces would be crossed by route alternative RA-07: Eastern Broadleaf Forest and Laurentian Mixed Forest provinces (Table 6.3.3-8). RA-07 is largely located within the Laurentian Mixed Forest province. Four ECS sections would be crossed by RA-07. RA-07 crosses 10 broad-scale vegetation cover classes as described in the NLCD: evergreen forest, deciduous forest, mixed forest, scrub/shrub, grassland/herbaceous, hay/pasture, cultivated crops, woody wetlands, emergent herbaceous wetlands, and barren land (Homer et al. 2015). Figure 6.3.3-1 shows the distribution of vegetation cover along the route alternative. Review of these broad-scale vegetation cover patterns demonstrates that RA-07 is primarily located within areas dominated by woody wetland, deciduous forest, and emergent herbaceous wetlands cover classes.

Table 6.3.3-8. Minnesota Ecological Sections Crossed by Route Alternative RA-07

Province	Section	Subsection	Distance Crossed (Miles)
Eastern Broadleaf Forest	Minnesota & NE Iowa Morainal	Hardwood Hills	6.2
Eastern Broadleaf Forest subtotal			***6.2***
Laurentian Mixed Forest	N. Minnesota Drift & Lake Plains	Chippewa Plains	87.3
		St. Louis Moraines	16.0
		Tamarack Lowlands	37.6
	Northern Superior Uplands	North Shore Highlands	17.0
	Western Superior Uplands	Mille Lacs Uplands	3.7
Laurentian Mixed Forest subtotal			***161.6***
TOTAL			**167.7**

Source: Minnesota DNR 2016a.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

See Appendix K, Table K-1 for additional detail.

Native Plant Communities

Between Clearbrook and Carlton, 65 acres of native plant communities have been documented within the construction work area for RA-07, 4 acres have been documented within the operations permanent right-of-way, and 1,807 acres have been documented within 0.5 mile of the route. Minnesota native plant community systems that occur within the construction work area for RA-07 are primarily forested and wetland forested systems, including acid peatland system, fire-dependent forest/woodland system, forested rich peatland system, mesic hardwood forest system, open rich peatland system, wet forest system, and wet meadow/Carr system (Aaseng et al. 2011). Native plant community systems crossed by RA-07 are shown in Figure 6.3.3-2 (Minnesota DNR 2016c). Specific locations for moderate- to outstanding- ranked MBS Sites and imbedded native plant communities relative to the location of RA-07 are shown in greater detail in Appendix A. Rare native plant communities, including Jack pine – (yarrow) woodland and oak – aspen forest also occur within the construction work area and permanent right-of-way. Three old-growth forest stand types (aspen, Norway pine, and white cedar) were identified within 0.5 mile of RA-07. No HCVFs occur within 0.5 mile of the route.

Noxious Weeds and Invasive Plants

Several noxious weed and invasive plant species have been reported within 0.5 mile of RA-07, totaling 1,002 occurrences between Clearbrook and Carlton (Table 6.3.3-9). Noxious and invasive weeds occurring near the route include commonly occurring Midwest weeds, such as reed canarygrass, tansy, spotted knapweed, and thistles.

Table 6.3.3-9. Noxious Weeds and Invasive Plants within 0.5 Mile of Route Alternative RA-07

Common	Scientific Name	Minnesota Status[a]	Occurrences[b]
Oxeye daisy	*Leucanthemum vulgare*	NA	26
Amur silvergrass	*Miscanthus sacchariflorus*	NA	1
Reed canarygrass	*Phalaris arundinacea*	NA	316
Orange hawkweed	*Hieracium aurantiacum*	NA	1
Honeysuckle	*Lonicera* spp.	NA	1
Spotted knapweed	*Centaurea stoebe*	C	110
Black locust	*Robinia pseudoacacia*	RNW	4
Purple loosestrife	*Lythrum salicaria*	C	4
Amur maple	*Acer ginnala*	NA	4
Wild parsnip	*Pastinaca sativa*	NA	128
Siberian peashrub	*Caragana arborescens*	NA	5
Multi-flora rose	*Rosa multiflora*	RNW	2
Leafy spurge	*Euphorbia esula*	C	4
White sweetclover	*Melilotus alba*	NA	43
Tansy	*Tanacetum vulgare*	C	150
Thistle spp.[c]	*Cirsium* spp.	NA	117
Bull thistle	*Cirsium vulgare*	NA	1
Canada thistle	*Cirsium arvense*	C	34
Birdsfoot trefoil	*Lotus corniculatus*	NA	50
Crown vetch	*Coronilla varia*	RNW	1
Number of Taxa			**20**
TOTAL NUMBER OF OCCURRENCES			**1,002**

Sources: Minnesota DNR 2016d; Minnesota DA 2016.

[a] PNW – prohibited noxious weed, RNW – Restricted Noxious Weeds, SRP – Specially Regulated Plants, NR – not regulated

[b] Number of occurrences of infestations within 0.5 mile of the RA-07 route between Clearbrook and Carlton, Minnesota.

Note:

See Appendix K, Table K-2 for additional detail.

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the vegetation ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Ecological Classifications and Vegetation Cover

Two ECS provinces would be crossed by route alternative RA-08: Eastern Broadleaf Forest and Laurentian Mixed Forest provinces (Table 6.3.3-10). RA-08 is largely located within the Laurentian Mixed Forest province. Five ECS sections would be crossed by RA-08. RA-08 crosses 10 broad-scale vegetation cover classes as described in the NLCD: evergreen forest, deciduous forest, mixed forest, scrub/shrub, grassland/herbaceous, hay/pasture, cultivated crops, woody wetlands, emergent herbaceous wetlands, and barren land (Homer et al. 2015). Figure 6.3.3-1 shows the distribution of vegetation cover along the route alternative. Review of these broad-scale vegetation cover patterns demonstrates that RA-08 is primarily located within areas dominated by woody wetland and deciduous forest cover classes.

Table 6.3.3-10. Minnesota Ecological Sections Crossed by Route Alternative RA-08

<table>
<tr><th>Province</th><th>Section</th><th>Subsection</th><th>Total Miles</th></tr>
<tr><td>Eastern Broadleaf Forest</td><td>Minnesota & NE Iowa Morainal</td><td>Hardwood Hills</td><td>6.4</td></tr>
<tr><td colspan="3">Eastern Broadleaf Forest subtotal</td><td>6.4</td></tr>
<tr><td rowspan="6">Laurentian Mixed Forest</td><td>N. Minnesota & Ontario Peatlands</td><td rowspan="2">Chippewa Plains</td><td rowspan="2">87.9</td></tr>
<tr><td rowspan="3">N. Minnesota Drift & Lake Plains</td></tr>
<tr><td>St. Louis Moraines</td><td>13.2</td></tr>
<tr><td>Tamarack Lowlands</td><td>37.0</td></tr>
<tr><td>Northern Superior Uplands</td><td>North Shore Highlands</td><td>16.9</td></tr>
<tr><td>Western Superior Uplands</td><td>Mille Lacs Uplands</td><td>3.6</td></tr>
<tr><td colspan="3">Laurentian Mixed Forest subtotal</td><td>158.5</td></tr>
<tr><td colspan="3">TOTAL</td><td>164.8</td></tr>
</table>

Source: Minnesota DNR 2016a.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

See Appendix K, Table K-1 for additional detail.

Native Plant Communities

Between Clearbrook and Carlton, 50 acres of native plant communities have been documented within the construction work area for RA-08, 21 acres have been documented within the operations permanent right-of-way, and 4,234 acres have been documented within 0.5 mile of the route. Minnesota native plant community systems that occur within the construction work area for RA-08 are primarily forested and wetland forested systems, including acid peatland system, fire-dependent forest/woodland system, forested rich peatland system, mesic hardwood forest system, open rich peatland system, wet forest system, and wet meadow/Carr system (Aaseng et al. 2011). Native plant community systems crossed by RA-08 are shown in Figure 6.3.3-2 (Minnesota DNR 2016c). Specific locations for moderate- to outstanding- ranked MBS Sites and imbedded native plant communities relative to the location of RA-08 are shown in greater detail in Appendix A. Rare native plant communities (aspen – birch – fir forest, Jack pine – (yarrow) woodland, and oak – aspen forest) also occur within 0.5 mile of the route, but none occur within the construction work area or permanent right-of-way. Five old-growth forest stand types were identified within 0.5 mile of RA-08, including aspen, birch, northern hardwood, white pine, and white cedar. One HCVF (Floodwood Bog) is intersected by RA-08.

Noxious Weeds and Invasive Plants

Several noxious weed and invasive plant species have been reported within 0.5 mile of the RA-08 route, totaling 665 occurrences between Clearbrook and Carlton (Table 6.3.3-11). Noxious and invasive weeds occurring near the route include commonly occurring Midwest weeds, such as reed canarygrass, tansy, spotted knapweed, and thistles.

Table 6.3.3-11. Noxious Weeds and Invasive Plants within 0.5 Mile of Route Alternative RA-08

Common Name	Scientific Name	Minnesota Status[a]	Occurrences[b]
Hoary ayssum	*Berteroa incana*	NA	7
Oxeye daisy	*Leucanthemum vulgare*	NA	12
Siberian elm	*Ulmus pumila*	NA	4
Reed canarygrass	*Phalaris arundinacea*	NA	208
Smooth brome	*Bromus inermis*	NA	9
Spotted knapweed	*Centaurea stoebe*	C	56
Giant knotweed	*Polygonum sachalinense*	SRP	1
Purple loosestrife	*Lythrum salicaria*	C	2
Amur maple	*Acer ginnala*	NA	1
Wild parsnip	*Pastinaca sativa*	NA	50
Siberian peashrub	*Caragana arborescens*	NA	4
Multi-flora rose	*Rosa multiflora*	RNW	2
White sweetclover	*Melilotus alba*	NA	37
Yellow sweetclover	*Melilotus officinalis*	NA	2
Tansy	*Tanacetum vulgare*	C	152
Thistle spp.[c]	*Cirsium* spp.	NA	60
Bull thistle	*Cirsium vulgare*	NA	2
Canada thistle	*Cirsium arvense*	C	29
Birdsfoot trefoil	*Lotus corniculatus*	NA	27
Number of Taxa			**19**
TOTAL NUMBER OF OCCURRENCES			**665**

Sources: Minnesota DNR 2016d; Minnesota DA 2016.

[a] Status (MN): E – Eradicate List; C – Control List; RNW – Restricted Noxious Weed; SRP – Specially Regulated Plants
Note: NA = plant species with no legal status per Minnesota Noxious Weed List (Minnesota DA 2016)

[b] Number of occurrences of infestations within 0.5 mile of the RA-08 route between Clearbrook and Carlton, Minnesota.

[c] May include native, non-weed thistle species.

Notes:

See Appendix K, Table K-2 for additional detail.

6.3.3.3 Impact Assessment

This section describes the potential impacts on existing vegetation cover, rare native plant communities, and old-growth forests, and the potential spread of noxious and invasive plants. Vegetation cover would be temporarily or permanently altered by construction and operations within the affected ecoregions and rare plant communities, as discussed.

The effects of construction and operation of the Applicant's preferred route and route alternatives are described below within the following three categories:

- Loss or alteration of vegetation cover,
- Loss or alteration of native plant communities, and
- Spread of noxious weeds and invasive plants.

The impact assessment integrates, for all alternatives, revegetation and reclamation commitments in the Applicant's Environmental Protection Plan (Appendix E), during, and upon completion of, construction of the entire respective pipeline rights-of-way. The plan includes a full complement of BMPs and mitigation measures to protect soil resources, and conduct revegetation and monitoring activities.

6.3.3.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the vegetation ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Vegetation resources would be temporarily or permanently altered by construction and operations within the affected ecoregions, native and rare plant communities, and in terms of spread of noxious weed and invasive plant species, as discussed in the sections below.

Construction Impacts

Loss or Alteration of Vegetation Cover

As shown in Table 6.3.3-12, land cover in the construction work area of the Applicant's preferred route is comprised primarily of deciduous forest (29 percent), cultivated crops (33 percent), and hay/pasture (14 percent). The Clearbrook-to-Carlton segment is predominately deciduous forest (45 percent) followed by hay/pasture (14 percent), and woody wetlands (11 percent). Most (75 percent) of the Clearbrook-to-Carlton segment would be adjacent to pipeline, transmission line, or road corridors that previously have been disturbed by construction. From the North Dakota border to Clearbrook, the Minnesota segment of the route is predominately cultivated cropland (approximately 1,154 acres, or 80 percent), all of which would be co-located with the existing pipeline corridor. Over 70 percent of the Carlton, Minnesota to Wisconsin border segment consists of a combination of hay/pasture (58 acres) and deciduous forest (38 acres) vegetation cover types, all of which would be co-located along the existing pipeline corridor.

The Applicant's preferred route would result in short-term to permanent and minor to major impacts on up to approximately 5,082 acres of existing vegetation in Minnesota (Table 6.3.3-12). Permanent major impacts on up to 291 acres of vegetation would occur as a result of permanent conversion to aboveground facilities and access roads (Table 5.2.3-8). Vegetation removed includes deciduous forest (107 acres), hay/pasture (62 acres), and cultivated crops (44 acres), which cumulatively account for over 70 percent of the vegetation for the additional construction areas and aboveground facilities. The loss of this cover would result in a permanent minor impact.

Table 6.3.3-12. Potential Impacts on Vegetation for the Applicant's Preferred Route in Minnesota

Vegetation Cover Class	Construction Work Area[a]		Permanent Right-of-Way[b]	
	Acres	Percent	Acres	Percent
Minnesota				
Evergreen forest	198	4	86	4
Deciduous forest	1,477	29	670	30
Mixed forest	20	0	10	0
Scrub/shrub	243	5	125	6
Grassland/herbaceous	164	3	73	3
Hay/pasture	699	14	320	14
Cultivated crops	1665	33	617	28
Woody wetlands	355	7	185	8
Emergent herbaceous wetlands	249	5	132	6
Barren land	12	0	2	0
MINNESOTA TOTAL	**5,082**	**100**	**2,220**	**100**
Clearbrook to Carlton				
Evergreen forest	173	6	70	5
Deciduous forest	1,256	45	554	43
Mixed forest	18	1	7	1
Scrub/shrub	211	8	104	8
Grassland/herbaceous	94	3	45	3
Hay/pasture	388	14	175	14
Cultivated crops	173	6	76	6
Woody wetlands	317	11	159	12
Emergent herbaceous wetlands	174	6	95	7
Barren land	4	0	2	0
CLEARBROOK TO CARLTON TOTAL	**2,806**	**100**	**1,288**	**100**

Table 6.3.3-12. Potential Impacts on Vegetation for the Applicant's Preferred Route in Minnesota

Source: Homer et al. 2015.

[a] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[b] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

Note:

See Appendix K, Table K-3 for additional detail.

Short-term minor impacts are expected as a result of clearing and grading of up to 3,031 acres of non-forested vegetation communities, which would be reclaimed and would return to a similar vegetation type over time following construction. Long-term major impacts on 134 acres of forested upland and wetland vegetation would occur from ATWS and pipe yards, all of which would be reclaimed and allowed to return to forested vegetation type over time (up to 50 years for full recovery) following construction. Long-term or permanent major construction impacts would occur on 2,050 acres of forested upland and wetland vegetation, about 45 percent of which would be maintained as herbaceous vegetation within the permanent right-of-way for the life of the Project.

Additional vegetation cover impacts would occur from construction of ATWS and pipe storage yards, which would affect an additional 656 acres. Vegetation cover within these areas includes cultivated croplands (327 acres), hay/pasture (121 acres), and deciduous forest (97 acres) (Table 5.2.3-8). Cumulatively, this accounts for over 80 percent of the additional construction areas and aboveground facilities proposed for the Project.

Clearing of trees within forested communities, including evergreen forest, deciduous forest, mixed forest, and woody wetland cover types, would result in long-term minor impacts totaling approximately 2,050 acres (Applicant's preferred route plus construction work areas and aboveground facilities) within the construction work areas, as these vegetation cover classes generally are considered late-succession vegetation communities and generally regenerate over longer periods of time.

Loss or Alteration of Native Plant Communities

Construction of the Applicant's preferred route would disturb a total of approximately 164 acres within 152 individual native plant community systems associated with MBS Sites with biodiversity ranks of moderate or above (Table 6.3.3-13). Approximately 80 percent of these native plant community systems are forested uplands and wetlands; construction and operation would result in the loss of those native plant communities and habitat. Some local native plant communities may reestablish over time; however, it is expected that the quality and diversity of these communities would be lowered. Therefore, the resulting impact on the forested uplands and wetlands would be long term to permanent and major.

Most of the native plant community systems that would be affected by construction are ranked moderate for biodiversity. Construction would affect approximately 3.5 acres of outstanding forested rich peatlands (Table 6.3.3-13). Estimated impacts on native plant communities for the Clearbrook-to-Carlton segment are summarized in Table 6.3.3-14. Specific locations for moderate- to outstanding-ranked MBS Site native plant communities relative to the location of the alternatives are shown in greater detail in Appendix A.

A total of 45.5 acres that include six rare plant community systems would be affected by the Applicant's preferred route during construction (Table 6.3.3-15). These rare plant communities include calcareous fen and prairie wetlands located along the route from the North Dakota border to Clearbrook, Minnesota. Impacts on calcareous fens and other wetlands are further addressed in Section 6.3.1. Construction impacts on native prairies include the potential for alteration of prairie soils, loss of sensitive plant communities, and introduction of invasive plants. Direct impacts on previously untilled prairie soils and vegetation during construction are expected to be permanent and major. These impacts may be mitigated through several actions. Prior to construction, the lead and assisting agencies would be consulted on identification of avoidance and mitigation measures for rare plant communities that are located within the Applicant's preferred route and could be affected by construction or operation. Avoidance measures could include rerouting the pipeline, use of directional drilling, or preparation of and adherence to, an agency-approved site-specific prairie crossing plan. These communities are not expected to fully recover following restoration; however, in some circumstances, these communities may make a full recovery over time. Totals for the Clearbrook-to-Carlton segment are provided in Table 6.3.3-16.

Construction-related impacts on old-growth forest include potential indirect effects on one Norway pine and two ash old-growth forest stands that occur within 0.5 mile of the Applicant's preferred route; no old-growth forest stands occur within the construction work area or permanent right-of-way. No direct construction or operations impacts are expected to occur on old-growth forests from construction of the Applicant's preferred route. However, potential indirect impacts on these stands include the potential spread of noxious weeds and invasive plants, and potential removal of contiguous forest areas that serve as protective buffers. One HCVF (Kettle Lake Peatlands) occurs within 0.5 mile of the Applicant's preferred route; no direct construction or operations impacts on the HCVF are expected to occur.

Table 6.3.3-13 Estimated Impacts on Minnesota Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route in Minnesota

Native Plant Community System	MBS Site Biodiversity Significance Rank[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Acid peatland system	High	2.4	3	1.2	3	339.5	23
Complex community	High	--	--	--	--	135.2	7
	Moderate	5.8	2	3.1	2	288.4	5
Fire-dependent forest/woodland system	Outstanding	--	--	1.5	2	267.3	32
	High	0.3	1	--	--	276.5	24
	Moderate	32.2	28	17.2	15	1,817.4	59
Forested rich peatland system	Outstanding	3.5	2	1.8	2	27.0	1
	High	17.6	6	9.7	8	650.1	32
	Moderate	5.0	6	4.6	5	442.1	19
Marsh system	Outstanding	--	--	--	--	197.2	29
	Moderate	--	--	--	--	<0.1	1
Mesic hardwood forest system	Outstanding	--	--	--	--	128.9	30
	High	9.2	9	4.0	7	565.7	30

Table 6.3.3-13 Estimated Impacts on Minnesota Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route in Minnesota

Native Plant Community System	MBS Site Biodiversity Significance Rank[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
	Moderate	54.7	44	21.1	12	1,393.5	28
Open rich peatland system	Outstanding	--	--	--	--	49.5	3
	High	--	--	--	--	7.1	1
	Moderate	5.5	10	4.3	7	514.5	16
Upland prairie system	Outstanding	--	--	--	--	37.1	6
	High	--	--	--	--	92.5	3
	Moderate	2.0	2	0.7	1	43.9	1
Wet forest system	Outstanding	--	--	--	--	51.6	11
	High	6.8	7	2.8	4	206.2	18
	Moderate	2.9	4	1.9	3	207.2	8
Wet meadow/Carr system	Outstanding	--	--	<0.1	1	35.4	35
	High	11.0	12	0.3	1	177.3	19
	Moderate	4.7	16	4.1	11	765.2	106
Wetland prairie system	High	--	--	--	--	164.5	8
TOTAL		**163.6**	**152**	**78.4**	**84**	**8,880.9**	**555**

Sources: Minnesota DNR 2016b, 2016e.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[c] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[d] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Notes:

See Appendix K, Table K-4 for additional detail.

"--" = no occurrence

Table 6.3.3-14. Estimated Impacts on Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route between Clearbrook and Carlton

Native Plant Community System	MBS Site Biodiversity Significance Rating[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Acid peatland system	High	2.4	3	1.2	3	339.5	23
Complex community	High	--	--	--	--	24.1	3
Fire-dependent forest/ woodland system	Outstanding	--	--	--	--	133.2	16
	High	--	--	--	--	269.3	23
	Moderate	26.7	8	12.6	8	1,785.6	58
Forested rich peatland system	High	17.6	6	9.1	6	650.1	32
	Moderate	4.9	5	4.6	5	432.0	18
Marsh system	Outstanding	--	--	--	--	12.5	23
	Moderate	--	--	--	--	<0.1	1
Mesic hardwood forest system	Outstanding	--	--	--	--	128.9	30
	High	9.0	7	4.0	7	565.7	30
	Moderate	42.7	7	19.0	7	1,393.5	28
Open rich peatland system	Outstanding	--	--	--	--	1.3	1
	Moderate	5.5	7	4.3	7	514.5	16
Wet forest system	Outstanding	--	--	--	--	4.6	10
	High	6.2	4	2.8	4	190.9	17
	Moderate	2.8	3	1.9	3	164.7	7
Wet meadow/Carr system	Outstanding	--	--	--	--	35.4	35
	High	0.5	1	0.3	1	177.3	19
	Moderate	4.7	16	4.1	11	765.2	106
TOTAL		**122.9**	**67**	**63.8**	**62**	**7,588.4**	**496**

Sources: Minnesota DNR 2016b, 2016e.

See Appendix K, Table K-4 for additional detail.

a Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities), and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

b Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

c Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

d Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

"--" = no occurrence

Table 6.3.3-15. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route in Minnesota

Native Plant Community	MBS Site Biodiversity Significance Rank[a]	Conservation Rank[b]	Construction Work Area[c]		Permanent Right-of-Way[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Alder – (red currant – meadow-rue) swamp	Outstanding	S3	--	--	--	--	1.9	2
	Not ranked	S3	--	--	--	--	<0.1	1
Black ash – (red maple) seepage swamp	High	S1/S2	5.7	5	2.4	2	65.5	5
Calcareous fen (northwestern)	High	S2	--	--	--	--	7.1	1
Graminoid poor fen (basin)	High	S3	--	--	--	--	11.5	3
Jack pine – (bush honeysuckle) woodland	Moderate	S1/S2/S3	11.7	10	7.7	9	714.5	22
Jack pine – (bush honeysuckle) woodland, bracken subtype	High	S1	0.3	1	--	--	68.2	2
Jack pine – (yarrow) woodland	High	S1/S2	--	--	--	--	30.4	1
Mesic brush-prairie (northern)	High	S2	--	--	--	--	92.5	3
	Outstanding	S2	--	--	--	--	33.1	4
Mesic prairie (northern)	Outstanding	S2	--	--	--	--	4.1	2
	Moderate	S2	2.0	2	0.7	1	43.9	1
Oak – aspen forest	Outstanding	S3	--	--	0.8	1	128.1	15
	High	S3	--	--	--	--	87.8	2
	Moderate	S3	18.0	12	8.4	5	1,024.4	34
	Below	S3	7.2	5	2.6	2	60.2	1
	Not ranked	S3	--	--	--	--	0.1	2
Red pine – white pine forest	Outstanding	S2	--	--	0.7	1	5.1	1
	High	S2	--	--	--	--	49.8	13
	Moderate	S2	--	--	--	--	43.9	1
Red pine – white pine woodland, balsam fir subtype	High	S3	--	--	--	--	22.9	3
Red pine – white pine woodland, mountain maple subtype	High	S3	--	--	--	--	10.2	2
Spikerush – bur reed marsh (northern)	Outstanding	S2	--	--	--	--	12.5	23
	Moderate	S2	--	--	--	--	<0.1	1
	Not ranked	S2	--	--	--	--	0.4	7

Table 6.3.3-15. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route in Minnesota

Native Plant Community	MBS Site Biodiversity Significance Rank[a]	Conservation Rank[b]	Construction Work Area[c]		Permanent Right-of-Way[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Sugar maple – basswood – (bluebead lily) forest	High	S3	--	--	--	--	97.9	2
Tamarack seepage swamp (aspen parkland)	Outstanding	S3	--	--	--	--	27.0	1
	Moderate	S3	--	--	--	--	10.1	1
Wet brush-prairie (northern)	High	S3	--	--	--	--	64.5	5
Wet prairie (northern)	High	S3	--	--	--	--	100.0	3
White pine – white spruce – paper birch forest	High	S2	0.6	4	0.3	3	59.9	9
TOTAL			**45.5**	**39**	**23.6**	**24**	**2,877.6**	**173**

Sources: Minnesota DNR 2016b, 2016e, 2016d.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation.

[c] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[d] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[e] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-5 for additional detail.

"--" = no occurrence

Table 6.3.3-16. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route between Clearbrook and Carlton

Native Plant Communities	MBS Site Biodiversity Significance Rating[a]	Conservation Rank[b]	Construction[c]		Operations[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Alder – (red currant – meadow-rue) swamp	Outstanding	S3	--	--	--	--	1.9	2
	Not ranked	S3	--	--	--	--	<0.1	1
Black ash – (red maple) seepage swamp	High	S1S2	5.1	2	2.4	2	65.5	5
Graminoid poor fen (basin)	High	S3	--	--	--	--	11.5	3
Jack pine – (bush honeysuckle) woodland	Moderate	S1 or S3	10.3	5	5.4	5	714.5	22
Jack pine – (bush honeysuckle) woodland, bracken subtype	High	S1	--	--	--	--	68.2	2
Jack pine – (yarrow) woodland	High	S1S2	--	--	--	--	30.4	1
Oak – aspen forest	Outstanding	S3	--	--	--	--	128.1	15
	High	S3	--	--	--	--	87.8	2
	Moderate	S3	16.4	3	7.2	3	1,024.4	34
	Below	S3	6.3	1	2.6	1	60.2	1
	Not ranked	S3	--	--	--	--	0.1	2
Red pine – white pine forest	Outstanding	S2	--	--	--	--	5.1	1
	High	S2	--	--	--	--	49.8	13
	Moderate	S2	--	--	--	--	43.9	1
Red pine – white pine woodland, balsam fir subtype	High	S3	--	--	--	--	22.9	3
Red pine – white pine woodland, mountain maple subtype	High	S3	--	--	--	--	10.2	2
Spikerush – bur reed marsh (northern)	Outstanding	S2	--	--	--	--	12.5	23
	Moderate	S2	--	--	--	--	<0.1	1
	Not ranked	S2	--	--	--	--	0.4	7
Sugar maple – basswood – (bluebead lily) forest	High	S3	--	--	--	--	97.9	2

Table 6.3.3-16. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for the Applicant's Preferred Route between Clearbrook and Carlton

Native Plant Communities	MBS Site Biodiversity Significance Rating[a]	Conservation Rank[b]	Construction[c]		Operations[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
White pine – white spruce – paper birch forest	High	S2	0.6	3	0.3	3	59.9	9
TOTAL			**38.7**	**14**	**17.9**	**14**	**2,495.3**	**152**

Sources: Minnesota DNR 2016b, 2016e.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation.

[c] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[d] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[e] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-5 for additional detail.

"--" = no occurrence

Spread of Noxious Weeds and Invasive Plants

Six weed species listed as by the Minnesota Noxious Weed Act, and 12 other invasive plant species, occur near or within the Applicant's preferred route as well as within 0.5 mile of the Applicant's preferred route between Clearbrook and Carlton (Table 6.3.3-3).

Disturbed soil in cleared construction and work areas would be susceptible to invasion by noxious weeds and invasive plants that already occur within the vicinity. Establishment of these species often inhibit regeneration of native plants. Impacts associated with invasion of noxious weeds are difficult to quantify; however, impacts likely would be short-term and minor, as noxious weeds and invasive plant management measures would be in place during and after construction, as identified in the Applicant's Environmental Protection Plan (Appendix E). This plan details noxious weed and invasive plant control measures for construction, and management of noxious weeds and invasive species for the operational life of the pipeline. The Project would be required to manage all noxious weeds (including those not identified in Table 6.3.3-3) for which federal, state, or local (county or city) agency management policies or regulations exist. Measures to ensure that the spread of weeds is minimized include equipment cleaning, use of weed-free mulch, and use of weed-free seed mix. Consequently, impacts from the spread of noxious weeds and invasive plants during construction of the Project would be short term and minor.

Operations Impacts

Loss or Alteration of Vegetation Cover

Permanent major impacts would occur from operation of the project from the loss of 291 acres of existing vegetation that would be converted to aboveground facilities (pump stations and MLV sites) and access roads for the life of the Project (Table 5.2.3-9).

Right-of-way maintenance in both upland and wetland areas would include mechanical removal of woody vegetation, typically by a rubber-tracked skid-steer vehicle with specialized cutting equipment. The 766 acres of forested communities and 185 acres of woody wetlands that would be removed during construction would be subject to periodic mowing and brush clearing during operation (Table 6.3.3-12). This would result in a permanent major impact on forested vegetation. For areas of previously disturbed non-forested vegetation communities within the permanent right-of-way, routine vegetation management would result in short-term minor impacts.

Loss or Alteration of Native Plant Communities

Operations impacts on native plant community classes could include periodic maintenance of the permanent right-of-way to prevent re-growth of woody vegetation in approximately 78 acres of previous native plant communities. Upon inception of operations activities, these areas will have been previously been disturbed by construction and revegetation actions. In addition, pipeline maintenance occasionally would require excavation within the permanent right-of-way to repair or replace pipe segments, which also could affect native plant communities depending on the location of the integrity dig. Native plant communities likely would have been subjected to impacts during construction such that they are not likely to persist or reestablish within the permanent right-of-way. If they did persist, these operations activities could periodically result in short-term minor impacts on previously disturbed native plant communities for the life of the Project.

Operations impacts on 24 acres of 24 rare native plant community systems could include continued maintenance of the permanent right-of-way to prevent large woody growth and, on rare occasions, pipeline maintenance that could require excavation (Table 6.3.3-15). With the exception of red pine-white pine forest, which does not occur in the permanent right-of-way, all other vegetation communities are non-forested and would be maintained free of large woody vegetation. This has the potential to benefit the herbaceous native plant community. General impacts on rare native plant communities and mitigation are addressed in Section 5.2.3.3. These communities would have been subject to impacts during construction and are not expected to persist or reestablish within the permanent right-of-way during operations. If they did persist, short-term minor impacts could periodically occur during pipeline operation, as maintenance work may occur in previously disturbed rare native plant communities.

Spread of Noxious Weeds and Invasive Plants

For the life of the Project, surface disturbance and vehicle access during maintenance activities would continue to provide an opportunity for noxious weeds and invasive species to spread. Permanent minor impacts are expected to occur as a result of noxious weed and invasive plant infestations in some areas during operation. The noxious weed and invasive plant occurrence information provided in this analysis did not identify all noxious weed or invasive species known or documented within the region; however, routine vegetation maintenance along the permanent right-of-way may include treatment/mitigation or similar measures of mechanical or chemical management of undesirable species once they are identified. The Environmental Protection Plan (Appendix E) details control measures for noxious weeds and invasive plants for the Project. The Project would be required to manage all noxious weeds for which federal, state, or local (county or city) agency management policies or regulations exist, including but not limited to, those identified in Table 6.3.3-3. Measures implemented to ensure that the spread of weeds is minimized may include equipment cleaning, use of weed-free mulch, use of weed-free seed mix during site restoration, and ensuring that noxious weed and invasive plant species management is a continued commitment during operations involving vegetation management activities.

6.3.3.3.2 Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the vegetation ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Loss or Alteration of Vegetation Cover

Construction of RA-03AM would affect 3,579 acres of vegetation. Most (95 percent) of the Clearbrook-to-Carlton segment would be adjacent to previously disturbed existing pipeline, transmission line, or road corridors. Consequently, areas of undisturbed vegetation potentially affected by construction would be reduced. Hay/pasture (29 percent), deciduous forest (27 percent), and cultivated crops (16 percent) vegetation cover classes dominate this route alternative. Clearing trees within evergreen forest, deciduous forest, mixed forest, and woody wetlands would result in long-term to permanent major impacts on approximately 1,329 acres of forest vegetation cover within the construction work areas (Table 6.3.3-17).

Loss or Alteration of Native Plant Communities

Construction of RA-03AM would result in long-term to permanent major impacts on 86.5 acres of forested and wet meadow/peatland/fen native plant community systems and 20.3 acres within four conservation-ranked rare native plant communities, including both wetland and upland forest communities (Table 6.3.3-19). No old-growth forest or HCVFs would be affected during construction of RA-03AM.

Spread of Noxious Weeds and Invasive Plants

Six weed species listed as by the Minnesota Noxious Weed Act, and 17 other invasive plant species, occur near or within 0.5 mile of route alternative RA-03AM (Table 6.3.3-5). Disturbed soil in cleared construction and work areas would be susceptible to invasion by noxious weeds and invasive plants that already occur within the vicinity. Establishment of these species often inhibit regeneration of native plants. Impacts associated with invasion of noxious weeds are difficult to quantify; however, impacts likely would be short-term and minor, as noxious weeds and invasive plant management measures would be in place during and after construction, as identified in the Applicant's Environmental Protection Plan (Appendix E). This plan details noxious weed and invasive plant control measures for construction, and management of noxious weeds and invasive species for the operational life of the pipeline. The Project would be required to manage all noxious weeds (including those not identified in Table 6.3.3-5) for which federal, state, or local (county or city) agency management policies or regulations exist. Measures to ensure that the spread of weeds is minimized include equipment cleaning, use of weed-free mulch, and use of weed-free seed mix. Consequently, impacts from the spread of noxious weeds and invasive plants during construction of RA-03AM would be short term and minor.

Operations Impacts

Loss or Alteration of Vegetation Cover

Maintenance activities in the permanent right-of-way for the RA-03AM alternative would be the same as those described for the Applicant's preferred route. These activities would affect 1,495 acres of vegetation, primarily the hay/pasture, deciduous forest, and cultivated crops vegetation cover. Approximately 547 acres of the affected area would be forest and woody wetlands, which would be permanently maintained as scrub/shrub, grassland, or emergent herbaceous wetlands vegetation during operation. This would result in permanent major impacts on forested and woody-wetland vegetation cover types (Table 6.3.3-17). For areas of previously disturbed non-forested vegetation communities within the permanent right-of-way, routine vegetation management would result in temporary to short-term minor impacts.

Loss or Alteration of Native Plant Communities

Operations impacts associated with RA-03AM would affect 36.4 acres in six native plant community systems (Table 6.3.3-18) and 9.9 acres in three rare native plant communities (Table 6.3.3-19). No old-growth forest would be affected by operation of RA-03AM. The affected native plant communities would have been subject to permanent major impacts associated with construction and are not expected to fully recover during operations. If these rare plant communities did persist following construction, short-term minor impacts would occur to them as a result of maintenance activities during operation but would occur periodically for the life of the Project.

Spread of Noxious Weeds and Invasive Plants

Six weed species listed as by the Minnesota Noxious Weed Act, and 17 other invasive plant species, occur near or within 0.5 mile of route alternative RA-03AM (Table 6.3.3-5). Operations-related impacts associated with noxious weeds would be identical to those identified for the Applicant's preferred route (i.e., permanent and minor).

Table 6.3.3-17. Estimated Impacts on Vegetation Cover for Route Alternative RA-03AM between Clearbrook and Carlton

Vegetation Cover	Construction Work Area[a]		Permanent Right-of-Way[b]	
	Acres	Percent	Acres	Percent
Evergreen forest	145	4	60	4
Deciduous forest	975	27	403	27
Mixed forest	14	0	6	0
Scrub/shrub	191	5	80	5
Grassland/herbaceous	143	4	61	4
Hay/pasture	1,031	29	433	29
Cultivated crops	565	16	238	16
Woody wetlands	195	5	78	5
Emergent herbaceous wetlands	315	9	134	9
Barren land	5	0	2	0
TOTAL	**3,579**	**100**	**1,494**	**100**

Source: Homer et al. 2015.

[a] Estimated 120-foot-wide construction work area centered on pipeline route, includes the 50-foot-wide permanent right-of-way.

[b] Estimated operations area based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Note:

See Appendix K, Table K-6 for additional detail.

Table 6.3.3-18. Estimated Impacts on Native Plant Community Systems and MBS Sites for Route Alternative RA-03AM between Clearbrook and Carlton

Native Plant Community System	MBS Site Biodiversity Significance Rating[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Acid peatland system	High	--	--	--	--	1.1	1
	Moderate	--	--	--	--	76.6	15
Complex community	Moderate	<0.1	1	--	--	68.5	12
Fire-dependent forest/ woodland system	Outstanding	--	--	--	--	133.3	17
	High	--	--	--	--	255.9	22
	Moderate	20.2	14	8.1	10	1,777.7	66
Floodplain forest system	High	--	--	--	--	0.1	1
Forested rich peatland system	High	2.5	2	1.0	1	33.1	5
	Moderate	2.2	8	0.6	4	531.9	36
Marsh system	Outstanding	--	--	--	--	12.5	23
	High	--	--	--	--	3.2	1
	Moderate	--	--	--	--	40.7	3
Mesic hardwood forest system	Outstanding	--	--	--	--	128.9	30
	High	0.9	4	0.3	3	403.2	20
	Moderate	32.7	7	15.7	5	2,331.9	34
Open rich peatland system	Outstanding	--	--	--	--	1.3	1
	Moderate	8.4	10	3.3	7	648.5	27
Upland prairie system	High	--	--	--	--	3.7	1
Wet forest system	Outstanding	--	--	--	--	4.6	10
	High	5.6	2	2.4	2	128.4	8
	Moderate	5.3	5	2.2	5	199.7	14

Table 6.3.3-18. Estimated Impacts on Native Plant Community Systems and MBS Sites for Route Alternative RA-03AM between Clearbrook and Carlton

Native Plant Community System	MBS Site Biodiversity Significance Rating[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Wet meadow/Carr system	Outstanding	--	--	--	--	35.5	37
	High	2.6	2	1.1	2	247.1	21
	Moderate	6.1	11	1.8	9	664.4	109
TOTAL		**86.5**	**66**	**36.4**	**48**	**7,732.1**	**514**

Sources: Minnesota DNR 2016b, 2016e.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[c] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[d] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-7 for additional detail.

"--" = no occurrence

Table 6.3.3-19. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for Route Alternative RA-03AM between Clearbrook and Carlton

Native Plant Communities	MBS Site Biodiversity Significance Rating[a]	Conservation Rank[b]	Construction Work Area[c]		Permanent Right-of-Way[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Alder – (red currant – meadow-rue) swamp	Outstanding	S3	--	--	--	--	1.9	2
	Not ranked	S3	--	--	--	--	<0.1	1
Basswood – black ash forest	High	S3	--	--	--	--	41.8	1
	Moderate	S3	--	--	--	--	85.2	2
Black ash – (red maple) seepage swamp	High	S1S2	5.6	2	2.4	2	65.5	5
Black ash – silver maple terrace forest	High	S3	--	--	--	--	0.1	1
Black ash – yellow birch – red maple – basswood swamp (eastcentral)	Moderate	S3	0.2	1	<0.1	1	65.4	6
Dry sand – gravel oak savanna (southern)	High	S1S2	--	--	--	--	3.7	1
Jack pine – (bush honeysuckle) woodland	Moderate	S1 or S3	--	--	--	--	48.6	3
Jack pine – (bush honeysuckle) woodland, bracken subtype	High	S1	--	--	--	--	68.2	2
Jack pine – (yarrow) woodland	High	S1S2	--	--	--	--	30.4	1
Oak – aspen forest	Outstanding	S3	--	--	--	--	128.2	16
	High	S3	--	--	--	--	70.3	1
	Moderate	S3	13.7	3	7.2	3	1,019.6	33
	Not ranked	S3	--	--	--	--	0.1	2
Pin oak – bur oak woodland	High	S3	--	--	--	--	14.0	1
	Moderate	S3	--	--	--	--	40.3	1
Red pine – white pine forest	Outstanding	S2	--	--	--	--	5.1	1
	High	S2	--	--	--	--	49.8	13
	Moderate	S2	--	--	--	--	43.9	1
Red pine – white pine woodland, balsam fir subtype	High	S3	--	--	--	--	22.9	3

Table 6.3.3-19. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for Route Alternative RA-03AM between Clearbrook and Carlton

Native Plant Communities	MBS Site Biodiversity Significance Rating[a]	Conservation Rank[b]	Construction Work Area[c]		Permanent Right-of-Way[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Red pine – white pine woodland, mountain maple subtype	High	S3	--	--	--	--	0.3	1
Spikerush – bur reed marsh (northern)	Outstanding	S2	--	--	--	--	12.5	23
	Moderate	S2	--	--	--	--	<0.1	1
	Not ranked	S2	--	--	--	--	0.4	7
White pine – white spruce – paper birch forest	High	S2	0.7	3	0.3	3	59.9	9
TOTAL			**20.3**	**9**	**9.9**	**9**	**1,878.3**	**138**

Sources: Minnesota DNR 2016b, 2016e, 2016d.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation.

[c] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[d] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[e] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-8 for additional detail.

"--" = no occurrence

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the vegetation ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Loss or Alteration of Vegetation Cover

Construction of RA-06 would affect 2,674 acres of vegetation. All of the Clearbrook-to-Carlton segment would be within a new pipeline corridor, much of it crossing through areas with no previous ground disturbance. This route is dominated by deciduous forest (30 percent), woody wetlands (27 percent), and scrub/shrub vegetation (9 percent). Clearing trees within forested communities during construction would result in long-term to permanent major impacts on approximately 1,797 acres of forested areas within the construction work area (Table 6.3.3-20).

Loss or Alteration of Native Plant Communities

Construction of RA-06 would result in long-term to permanent major impacts on 19.5 acres in four forested and peatland/fen native plant community systems (Table 6.3.3-21). No rare native plant communities, old-growth forest (although 82 acres of old-growth forest occur within one half mile of the ROI), or HCVFs would be affected by construction of RA-06 (Table 6.3.3-22).

Table 6.3.3-20. Estimated Impacts on Vegetation Cover for Route Alternative RA-06 between Clearbrook and Carlton

Vegetation Cover	Construction Work Area[a]		Permanent Right-of-Way[b]	
	Acres	Percent	Acres	Percent
Evergreen forest	103	4	43	4
Deciduous forest	798	30	333	30
Mixed forest	164	6	68	6
Scrub/shrub	251	9	104	9
Grassland/herbaceous	116	4	49	4
Hay/pasture	213	8	89	8
Cultivated crops	43	2	18	2
Woody wetlands	732	27	304	27
Emergent herbaceous wetlands	223	8	94	8
Barren land	31	1	13	1
TOTAL	**2,674**	**100**	**1,115**	**100**

Source: Homer et al. 2015.

[a] Estimated 120-foot-wide construction work area centered on pipeline route, includes the 50-foot-wide permanent right-of-way.

[b] Estimated operations area based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Note:

Values in table may not sum to totals due to rounding.

See Appendix K, Table K-6 for additional detail.

Table 6.3.3-21. Estimated Impacts on Native Plant Community Systems and MBS Sites for Route Alternative RA-06 between Clearbrook and Carlton

Native Plant Community System	MBS Site Biodiversity Significance Rating[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Acid peatland system	High	8.6	2	3.7	2	290.1	8
Fire-dependent forest/ woodland system	High	--	--	--	--	9.5	1
Forested rich peatland system	High	9.9	4	3.5	3	429.0	19
Mesic hardwood forest system	High	0.4	2	<0.1	1	62.9	9
Wet forest system	High	0.6	2	--	--	233.0	10
Wet meadow/Carr system	High	--	--	--	--	3.3	1
TOTAL		**19.5**	**10**	**7.3**	**6**	**1,027.7**	**48**

Sources: Minnesota DNR 2016b, 2016e.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[c] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[d] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

Values in table may not sum to totals due to rounding.

See Appendix K, Table K-7 for additional detail.

“--” = no occurrence

Table 6.3.3-22. Estimated Impacts on Old-Growth Forest Communities for Route Alternative RA-06 between Clearbrook and Carlton

Main Cover Type	Construction Work Area[a]		Permanent Right-of-Way[b]		Within 0.5 Mile[c]	
	Acres	Number of Stands	Acres	Number of Stands	Acres	Number of Stands
Aspen	--	--	--	--	24.7	1
Birch	--	--	--	--	23.1	1
Norway pine	--	--	--	--	34.3	2
TOTAL	--	--	--	--	**82.1**	**4**

Sources: Minnesota DNR 2016c.

[a] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[b] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[c] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Notes:

Values in table may not sum to totals due to rounding.

Old-growth forest as identified by Timber Status = 5 (designated old-growth) and 7 (potential or future old-growth)

See Appendix K, Table K-9 for additional detail.

"--" = no occurrence

Spread of Noxious Weeds and Invasive Plants

Three weed species listed as by the Minnesota Noxious Weed Act, and 10 other invasive plant species, occur near or within 0.5 mile of route alternative RA-06 (Table 6.3.3-7). Disturbed soil in cleared construction and work areas would be susceptible to invasion by noxious weeds and invasive plants that already occur within the vicinity. Establishment of these species often inhibit regeneration of native plants. Impacts associated with invasion of noxious weeds are difficult to quantify; however, impacts likely would be short-term and minor, as noxious weeds and invasive plant management measures would be in place during and after construction, as identified in the Applicant's Environmental Protection Plan (Appendix E). This plan details noxious weed and invasive plant control measures for construction, and management of noxious weeds and invasive species for the operational life of the pipeline. The Project would be required to manage all noxious weeds (including those not identified in Table 6.3.3-5) for which federal, state, or local (county or city) agency management policies or regulations exist. Measures to ensure that the spread of weeds is minimized include equipment cleaning, use of weed-free mulch, and use of weed-free seed mix. Consequently, impacts from the spread of noxious weeds and invasive plants during construction of RA-06 would be short term and minor.

Operations Impacts

Loss or Alteration of Vegetation Cover

Operation of Alternative RA-06 would affect approximately 1,115 acres of vegetation within the permanent right of way. This route is dominated by deciduous forest, woody wetlands, and scrub/shrub vegetation cover. Approximately 748 acres of forests and woody wetlands would be permanently maintained as scrub/shrub, grassland, or emergent herbaceous wetlands vegetation during operation of the pipeline, resulting in permanent major impacts on forested vegetation (Table 6.3.3-20).

Loss or Alteration of Native Plant Communities

RA-06 would affect 7.3 acres in three native plant community systems during operations (Table 6.3.3-21). No rare native plant communities, old-growth forest, or HCVFs would be affected during operation (Table 6.3.3-22).

Spread of Noxious Weeds and Invasive Plants

Three weed species listed as by the Minnesota Noxious Weed Act, and 10 other invasive plant species, occur near or within 0.5 mile of route alternative RA-06A (Table 6.3.3-7). Operations-related impacts associated with noxious weeds would be identical to those identified for the Applicant's preferred route (i.e., permanent and minor).

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the vegetation ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Loss or Alteration of Vegetation Cover

Construction of RA-07 would affect approximately 3,833 acres of vegetation. This alternative is dominated by woody wetlands (28 percent), deciduous forest (20 percent), and emergent herbaceous wetlands vegetation (14 percent) landcover classes. Because RA-07 would be constructed within the existing Line 3 pipeline right-of-way, much of this vegetation would have been previously disturbed. Some new forest clearing for the expanded work area would be required; and some forested areas, especially near stream crossings, may be avoided by HDD. Clearing the construction work area would affect about 1,147 acres of forested communities and 1,056 acres of woody wetlands. Because most of the permanent right-of-way within the construction work area is already cleared of trees, this would result in long-term major impacts on forested communities within the construction work area but primarily outside of the permanent right-of-way (Table 6.3.3-23).

Table 6.3.3-23. Estimated Impacts on Vegetation Cover for Route Alternative RA-07 between Clearbrook and Carlton

Vegetation Cover	Construction Work Area[a]		Permanent Right-of-Way[b]	
	Acres	Percent	Acres	Percent
Evergreen forest	235	6	37	4
Deciduous forest	773	20	177	19
Mixed forest	139	4	28	3
Scrub/shrub	277	7	83	9
Grassland/herbaceous	405	11	107	11
Hay/pasture	326	8	88	9
Cultivated crops	76	2	23	2
Woody wetlands	1,056	28	236	25
Emergent herbaceous wetlands	536	14	154	16
Barren land	10	0	3	0
TOTAL	**3,832**	**100**	**936**	**100**

Source: Homer et al. 2015.

[a] Estimated 205-foot-wide construction work area, with 10-feet-wide on the north side of Line 3 and 195-feet-wide on the south side of Line 3, includes the 50-foot-wide permanent right-of-way.

[b] Estimated operations area based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Notes:

RA-07 involves removing the existing Line 3 and placing the new Line 3 in the same trench. RA-07 would be centered in the existing Enbridge Mainline, which is largely cleared of trees. However, the resolution of the GIS landcover data does not provide accurate representation of land-cover/land use the scale of the Mainline corridor right-of-way. This limitation in the data creates some uncertainty about accuracy of the landcover within the anticipated construction work zone. The numbers shown should be considered a very conservative estimate of forest impacts; the actual numbers are likely to be much lower.

See Appendix K, Table K-6 for additional detail.

Loss or Alteration of Native Plant Communities

Construction of RA-07 would result in long-term to permanent major impacts on 64.9 acres of forested and wet meadow/peatland/fen native plant community systems (Table 6.3.3-24), 2.7 acres of disturbance to one conservation-ranked rare native plant community (Jack pine woodland) (Table 6.3.3-25), and one-tenth of an acre disturbance to one Norway pine old-growth forest (Table 6.3.3-26). No HCVFs would be affected.

Table 6.3.3-24. Estimated Impacts on Native Plant Community Systems and MBS Sites for Route Alternative RA-07 between Clearbrook and Carlton

Native Plant Community System	MBS Site Biodiversity Significance Rating[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Acid peatland system	High	27.3	2	3.4	1	493.7	14
Fire-dependent forest/ woodland system	High	--	--	--	--	9.5	1
	Moderate	2.7	1	--	--	217.0	4
Forested rich peatland system	High	14.3	3	0.3	1	436.1	18
	Moderate	8.4	1	--	--	264.2	4
Mesic hardwood forest system	High	2.5	3	<0.1	1	62.9	9
Open rich peatland system	Moderate	--	--	--	--	48.4	2
Wet forest system	High	9.0	3	--	--	233.0	11
Wet meadow/Carr system	High	--	--	--	--	3.3	1
	Moderate	0.7	1	--	--	39.2	3
TOTAL		**64.9**	**14**	**3.8**	**3**	**1,807.2**	**67**

Sources: Minnesota DNR 2016b, 2016e.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[c] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[d] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-7 for additional detail.

"--" = no occurrence

Table 6.3.3-25. Estimated Impacts on Rare Native Plant Community Systems and MBS Sites for Route Alternative RA-07 between Clearbrook and Carlton

Native Plant Communities	MBS Site Biodiversity Significance Rating[a]	Conservation Rank[b]	Construction Work Area[c]		Permanent Right-of-Way[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Jack pine – (yarrow) woodland	Moderate	S1/S2	2.7	1	--	--	160.7	2
Oak – aspen forest	Moderate	S3	--	--	--	--	56.3	2
TOTAL			**2.7**	**1**	**--**	**--**	**--**	**--**

Sources: Minnesota DNR 2016b, 2016e, 2016d.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation.

[c] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[d] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[e] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-8 for additional detail.

"--" = no occurrence

Table 6.3.3-26. Estimated Impacts on Old-Growth Forest Communities for Route Alternative RA-07 between Clearbrook and Carlton

Main Cover Type	Construction Work Area[a]		Permanent Right-of-Way[b]		Within 0.5 Mile[c]	
	Acres	Number of Stands	Acres	Number of Stands	Acres	Number of Stands
Aspen	--	--	--	--	16.8	1
Norway pine	0.1	1	--	--	43.5	3
White cedar	--	--	--	--	28.3	1
TOTAL	**0.1**	**1**	--	--	**88.5**	**5**

Source: Minnesota DNR 2016c.

[a] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[b] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[c] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Notes:

Old-growth forest as identified by Timber Status = 5 (designated old-growth) and 7 (potential or future old-growth)

See Appendix K, Table K-9 for additional detail.

"--" = no occurrence

Spread of Noxious Weeds and Invasive Plants

Eight weed species listed as by the Minnesota Noxious Weed Act, and 12 other invasive plant species, occur near or within 0.5 mile of route alternative RA-07 (Table 6.3.3-9). Disturbed soil in cleared construction and work areas would be susceptible to invasion by noxious weeds and invasive plants that already occur within the vicinity. Establishment of these species often inhibit regeneration of native plants. Of all route options between Clearbrook and Carlton, RA-07 has the greatest number of potential noxious weed occurrences and would disturb the largest area of vegetation during construction activities. Impacts associated with invasion of noxious weeds are difficult to quantify; however, impacts likely would be short-term and minor, as noxious weeds and invasive plant management measures would be in place during and after construction, as identified in the Applicant's Environmental Protection Plan (Appendix E). This plan details noxious weed and invasive plant control measures for construction, and management of noxious weeds and invasive species for the operational life of the pipeline. The Project would be required to manage all noxious weeds (including those not identified in Table 6.3.3-5) for which federal, state, or local (county or city) agency management policies or regulations exist. Measures to ensure that the spread of weeds is minimized include equipment cleaning, use of weed-free mulch, and use of weed-free seed mix. Consequently, impacts from the spread of noxious weeds and invasive plants during construction of RA-07 would be short term and minor.

Operations Impacts

Loss or Alteration of Vegetation Cover

Operation of RA-07 would affect 936 acres of vegetation (Table 6.3.3-23). This alternative is dominated by woody wetlands, deciduous forest, and emergent herbaceous wetlands vegetation cover. Approximately 478 acres of forested uplands and wetlands would be permanently maintained as scrub/shrub, grassland, or emergent herbaceous wetland vegetation during operation, resulting in permanent major impacts on forested vegetation.

Loss or Alteration of Native Plant Communities

Operations associated with RA-07 would affect 3.8 acres in three native plant community systems (Table 6.3.3-24), no conservation-ranked rare native plant communities (Table 6.3.3-25), and no old-growth forest (Table 6.3.3-26). These communities would have been subjected to construction impacts and are not expected to persist or reestablish within the permanent right-of-way. If they did persist, short-term minor impacts could periodically occur during pipeline operation, as maintenance work may occur in previously disturbed rare native plant communities for the life of the Project.

Spread of Noxious Weeds and Invasive Plants

Eight weed species listed as by the Minnesota Noxious Weed Act, and 12 other invasive plant species, occur near or within 0.5 mile of route alternative RA-07 (Table 6.3.3-9). Operations-related impacts associated with noxious weeds for the route would be identical to those identified for the Applicant's preferred route (i.e., permanent and minor).

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the vegetation ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Loss or Alteration of Vegetation Cover

All of the RA-08 Clearbrook-to-Carlton segment would be co-located next to the existing pipeline corridor that has been exposed to previous pipeline construction and operation disturbances. Construction of RA-08 would affect 2,287 acres of vegetation (Table 6.3.3-27). This alternative route is dominated by woody wetlands (28 percent), deciduous forest (26 percent), emergent herbaceous wetlands (14 percent), and hay/pasture (13) landcover classes. Clearing the construction work area would affect approximately 1,424 acres of forested communities, resulting in long-term to permanent major impacts on those communities (Table 6.3.3-27).

Table 6.3.3-27. Estimated Impacts on Vegetation Cover for Route Alternative RA-08 between Clearbrook and Carlton

Vegetation Cover	Construction Work Area[a]		Permanent Right-of-Way[b]	
	Acres	Percent	Acres	Percent
Evergreen forest	106	5	44	5
Deciduous forest	592	26	246	26
Mixed forest	75	3	31	3
Scrub/shrub	124	5	52	5
Grassland/herbaceous	81	4	35	4
Hay/pasture	304	13	128	13
Cultivated crops	32	1	13	1
Woody wetlands	651	28	270	28
Emergent herbaceous wetlands	319	14	135	14
Barren land	3	0	1	0
TOTAL	**2,286**	100	**955**	100

Source: Homer et al. 2015.

[a] Estimated 120-foot-wide construction work area centered on pipeline route, includes the 50-foot-wide permanent right-of-way.

[b] Estimated operations area based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Note:

See Appendix K, Table K-6 for additional detail.

Loss or Alteration of Native Plant Communities

Construction of RA-08 would result in long-term to permanent major impacts on 50 acres of six forested and wet meadow/peatland/fen native plant community systems (Table 6.3.3-28), 2.1 acres of disturbance to one white cedar old-growth forest (Table 6.3.3-30), and one HCVF (Floodwood Bog). No conservation-ranked rare native plant communities would be affected.

Table 6.3.3-28. Estimated Impacts on Native Plant Community Systems and MBS Sites for Route Alternative RA-08 between Clearbrook and Carlton

Native Plant Community System	MBS Site Biodiversity Significance Rating[a]	Construction Work Area[b]		Permanent Right-of-Way[c]		Within 0.5 Mile[d]	
		Acres	No.	Acres	No.	Acres	No.
Acid peatland system	High	37.2	9	15.9	8	2,580.0	42
Fire-dependent forest/woodland system	High	--	--	--	--	9.5	1
	Moderate	--	--	--	--	148.2	4
Forested rich peatland system	High	2.0	2	0.6	1	330.4	14
	Moderate	2.3	1	0.4	1	412.9	9
Mesic hardwood forest system	High	3.9	3	1.6	2	229.1	26
	Moderate	--	--	--	--	3.5	1
Open rich peatland system	Moderate	2.9	2	1.2	2	168.2	4
Wet forest system	High	1.3	1	0.6	1	301.2	10
Wet meadow/Carr system	High	0.4	1	0.2	1	11.7	2
	Moderate	--	--	--	--	39.2	3
TOTAL		**50.1**	**19**	**20.6**	**16**	**4,233.9**	**116**

Sources: Minnesota DNR 2016b, 2016e.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[c] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[d] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-7 for additional detail.

“--” = no occurrence

Table 6.3.3-29. Estimated Impacts on Rare Native Plant Communities for Route Alternative RA-08 between Clearbrook and Carlton

Native Plant Communities	MBS Site Biodiversity Significance Rating[a]	Conservation Rank[b]	Construction Work Area[c]		Permanent Right-of-Way[d]		Within 0.5 Mile[e]	
			Acres	No.	Acres	No.	Acres	No.
Aspen – birch – fir forest	Moderate	S3	--	--	--	--	3.5	1
Jack pine – (yarrow) woodland	Moderate	S1 or S2	--	--	--	--	100.7	2
Oak – aspen forest	Moderate	S3	--	--	--	--	47.5	2
TOTAL			--	--	--	--	**151.8**	**5**

Sources: Minnesota DNR 2016b, 2016e, 2016d.

[a] Systems occurring within Minnesota Biological Survey Sites of Biodiversity Significance (MBS Sites) are given these ranks (Minnesota only):
Outstanding = Sites containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes.
High = Sites containing very good quality occurrences of the rarest species, high quality examples of rare native plant communities, and/or important functional landscapes.
Moderate = Sites containing occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.
Below = Sites below minimum biodiversity threshold for statewide significance. These sites lack occurrences of rare species or natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank.
(blank) = no corresponding Biodiversity Significance Rank

[b] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation.

[c] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[d] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[e] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Note:

See Appendix K, Table K-8 for additional detail.

“--” = no occurrence

Table 6.3.3-30. Estimated Impacts on Old-Growth Forest Communities for Route Alternative RA-08 between Clearbrook and Carlton

Main Cover Type	Construction Work Area[a]		Permanent Right-of-Way[b]		Within 0.5 Mile[c]	
	Acres	Number of Stands	Acres	Number of Stands	Acres	Number of Stands
Aspen	--	--	--	--	23.3	2
Birch	--	--	--	--	3.1	1
Northern hardwoods	--	--	--	--	11.5	2
White pine	--	--	--	--	22.0	3
White cedar	2.1	1	0.9	1	28.6	2
TOTAL	**2.1**	**1**	**0.9**	**1**	**88.4**	**10**

Sources: Minnesota DNR 2016c.

[a] Sum of Enbridge-provided construction work area, additional temporary workspaces (including pipe yards), and temporary access roads.

[b] Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (including valve pads and driveways).

[c] Minnesota native plant community systems within 0.5 mile of the centerline of the pipeline route.

Notes:

Old-growth forest as identified by Timber Status = 5 (designated old-growth) and 7 (potential or future old-growth

See Appendix K, Table K-9 for additional detail.

“--” = no occurrence

Spread of Noxious Weeds and Invasive Plants

Six weed species listed as by the Minnesota Noxious Weed Act, and 13 other invasive plant species, occur near or within 0.5 mile of route alternative RA-08 (Table 6.3.3-11). Disturbed soil in cleared construction and work areas would be susceptible to invasion by noxious weeds and invasive plants that already occur within the vicinity. Establishment of these species often inhibit regeneration of native plants. Impacts associated with invasion of noxious weeds are difficult to quantify; however, impacts likely would be short-term and minor, as noxious weeds and invasive plant management measures would be in place during and after construction, as identified in the Applicant’s Environmental Protection Plan (Appendix E). This plan details noxious weed and invasive plant control measures for construction, and management of noxious weeds and invasive species for the operational life of the pipeline. The Project would be required to manage all noxious weeds (including those not identified in Table 6.3.3-11) for which federal, state, or local (county or city) agency management policies or regulations exist. Measures to ensure that the spread of weeds is minimized include equipment cleaning, use of weed-free mulch, and use of weed-free seed mix. Consequently, impacts from the spread of noxious weeds and invasive plants during construction of RA-08 would be short term and minor.

<u>Operations Impacts</u>

Loss or Alteration of Vegetation Cover

Operation of RA-08 would affect 954 acres of vegetation (Table 6.3.3-27). This route is dominated by woody wetlands, deciduous forest, and emergent herbaceous wetlands vegetation cover. Approximately

591 acres of forested uplands and wetlands would be permanently maintained as scrub/shrub, grassland, or emergent wetland vegetation during operation of the pipeline, resulting in permanent major impacts on forested vegetation.

Loss of Alteration of Native Plant Communities

Operation of RA-08 would affect 20.6 acres in five native plant community systems (Table 6.3.3-28), no impacts on conservation-ranked rare native plant communities (Table 6.3.3-29), one acre of disturbance to a single stand of old-growth white cedar forest, and one HCVF (Table 6.3.3-30). These communities would have been subject to construction impacts and are not expected to persist or to reestablish within the permanent right-of-way. If they did persist, short-term minor impacts could periodically occur during pipeline operation, as maintenance work may occur in previously disturbed rare native plant communities for the life of the Project.

Spread of Noxious Weeds and Invasive Plants

Six weed species listed as by the Minnesota Noxious Weed Act, and 13 other invasive plant species, occur near or within 0.5 mile of route alternative RA-08 (Table 6.3.3-11). Operations-related impacts associated with noxious weeds would be identical to those identified for the Applicant's preferred route (i.e., permanent and minor).

6.3.3.4 Summary and Mitigation

6.3.3.4.1 Summary

The potential impacts on all vegetation types for the Applicant's preferred route and route alternatives between Clearbrook and Carlton are summarized in Table 6.3.3-31. This includes a summary of construction- and operations-related impacts on existing landcover, Minnesota MBS Sites and native plant communities, as well as potential impact from the spread of noxious weeds and invasive plants. The area from Clearbrook to Carlton was evaluated because all route options follow the same route from Neche, North Dakota, to Clearbrook and from Carlton to Superior, Wisconsin.

Avoidance and minimization measures considered in the assessment of impacts included rerouting the pipeline, use of HDD, and preparation of, and adherence to, an agency-approved site-specific crossing plan. The impact assessment also considered the effects of implementation of BMPs during construction and operation as well as revegetation and reclamation commitments for the pipeline rights-of-way, which would be similar for all route options.

The BMPs that the Applicant would incorporate into the Project to minimize impacts on vegetation are presented in the revegetation and monitoring guidance portion of the Applicant's Environmental Protection Plan (Appendix E). Following construction, the entire pipeline right-of-way would be reclaimed following the guidance presented in this document, including implementation of compaction prevention measures, seeding, plantings, application of soil amendments, and a period of monitoring to document stabilization of the right-of-way. In areas where soil quality is a concern for revegetation, applicable agencies would be consulted to develop seed mixes and seeding dates adapted to the immediate areas of concern.

In addition, the Applicant committed to preparation and implementation of the following plans, procedures, and general vegetation protection measures during construction:

- Co-locate construction within and near existing utility corridors to minimize environmental impacts;
- Develop and adhere to Project-specific construction methods and procedures for vegetation clearing methods, including treatment of existing vegetation, topsoil segregation, storage, and reapplication;
- Restore preconstruction contours and use slope breakers, sediment barriers, mulch, geotextile fabric, and other erosion control devices to stabilize the disturbed areas during the vegetation re-growth phase and reduce runoff into the adjacent environment;
- Co-locate the Project with existing rights-of-way where feasible;
- Design and plan pipeline construction (including parking, access, and temporary work areas) to reduce environmental impacts on sensitive plant communities, such as rare native plant communities, calcareous fens, wetland vegetation, old-growth forests, and prairie vegetation;
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species; and
- Use certified weed-free mulch, topsoil, and seed mix.

Impacts on rare plant communities that cannot be avoided would be addressed through implementation of the Project's approved revegetation and monitoring measures, and invasive and noxious weed control measures outlined in the Environmental Protection Plan (Appendix E). Measures that would be implemented to prevent the spread of noxious and invasive weeds during construction include minimizing the time between ground-disturbing work and site reclamation and reseeding, staking avoidance areas at known weed locations, and implementing other BMPs.

Prior to construction, the lead and assisting agencies would be consulted on identification of any additional avoidance and mitigation measures for rare plant communities, old-growth forests, and HCVFs that are within the selected route and could be affected by construction or operation. Avoidance measures could include minor pipeline route adjustments, use of directional drilling, or preparation of and adherence to an agency-approved site-specific crossing plan.

Construction Impacts

General types of construction impacts would be the same for all route options. Many impacts on vegetation would be short term and minor, while other impacts would be permanent and major within the footprint of the aboveground facilities and the permanent right-of-way. Impacts at specific locations along all the alternative routes where the existing vegetation can recover are anticipated to be minor, with appropriate use of BMP construction and operation practices. However, others will need to be maintained in a way that prohibits return to its existing state, and will be permanently altered or removed. Due to the great lengths of all alternatives, the total impact would be additive and distributed along the routes. The importance of these impacts is determined by the distance of the alternative, number of vegetation communities affected, and the quality of vegetation resources affected.

<u>Loss or Alteration of Vegetation Cover</u>

The total acreage of vegetation affected during construction would range from 5,082 acres for the Applicant's preferred route to 2,287 acres for RA-08, in the portions of the routes from Clearbrook to Carlton. The potential impacts on forested land, including woody wetlands, would be long term to permanent and major for all route options due to the long period of time required for forest regeneration. The Applicant's preferred route would affect the most forest land, RA-03AM would affect the least.

Areas cleared of other vegetation types during pipeline construction, including grassland/herbaceous, hay/pasture, cultivated crops, and emergent wetlands vegetation cover class types, would be reclaimed after construction to the specifications or conditions of the authorizing/permitting agency. The recovery period for these areas would range from a single growing season to several years. As a result, the impacts would be short term and minor. RA-07 would affect substantially more grasslands, and the Applicant's preferred route would affect more croplands and pasture, than the other route alternatives.

All of the route options except RA-06 would be co-located to varying extents with existing pipelines, electrical transmission lines, or roads, which would reduce the effects of clearing and grading since some of those areas were previously disturbed. RA-06 would be constructed within a new pipeline corridor, in many areas across previously undisturbed vegetation communities.

Loss or Alteration of Rare Native Plant Communities

Rare native plant communities would be affected due to construction of each route alternative. These impacts typically would be long term to permanent and major because these communities generally would be lost or degraded. The Applicant's preferred route would affect the largest area of rare native plant communities during construction and RA-06 would not affect such communities. This estimated effect may be underestimated, however, because the native plant communities crossed by RA-06 may not be as completely surveyed and mapped as elsewhere. Only RA-07 and RA-08 would affect old-growth forest, with RA-08 affecting the most, along with one HCVF. These impacts would be long term to permanent and major.

Spread of Noxious Weeds and Invasive Plants

Noxious weed and invasive plant management and control would be implemented during construction to minimize the effect of noxious weeds. The potential for impacts due to the spread of noxious weeds and invasive plants during construction would be about the same for all route options, although RA-07 and RA-08 support substantially more infestations than the other route alternatives. For all route options, the impact of noxious weeds and invasive species during construction would be short term and minor, with implementation of weed control BMPs and other actions included in the Applicant's Environmental Protection Plan (Appendix E).

Operations Impacts

Loss or Alteration of Vegetation Cover

Vegetation management activities during pipeline operations would prevent trees and large shrubs from reestablishing within the pipeline permanent right-of-way. The greatest effect would be on 951 acres of previously forested areas within the permanent right-of-way for the Applicant's preferred route, and the least effect would be about 478 acres of previously forested area for RA-07. The impact for all route options would be permanent and major. The forested and scrub/shrub areas cleared from the construction work area and outside of the permanent right-of-way would be allowed to regenerate, but the process would take decades to reach full recovery.

The Applicant's Integrity Management Program would require periodic excavation to repair or replace sections of pipe segments, which would affect the vegetative cover of the permanent right-of-way.

Because the Applicant's preferred route and all of the route alternatives would be new pipelines and there would not be a difference in age of the pipe, and the lengths of the routes area similar, there would not be a substantial difference anticipated in the number of integrity digs. Therefore, there would not be a substantial difference in the impacts on vegetation due to this activity.

Loss or Alteration of Rare Native Plant Communities

Potential operations impacts on rare native plant communities would be expected to be minor because these communities are unlikely to persist within the permanent right-of-way after construction activities. Vegetation management and integrity digs could result in recurring impacts on previously disturbed rare native plant communities if these communities continued to persist within the permanent right-of-way, but there likely would not be a difference in impacts among the route options due to these activities. If rare native plants persist in the permanent right-of-way after construction, the Applicant's preferred route could support the largest number of rare native plant communities within the permanent right-of-way, followed by RA-03AM. Maintenance activities for the other route alternatives would not affect rare native plant communities. RA-08 is the only route alternative for which maintenance activities during operation would affect areas of HCVF and previous old-growth forest, should they persist following construction activities.

Spread of Noxious Weeds and Invasive Plants

As a result of implementation of a Noxious Weed and Invasive Plant Management and Control Plan, in the Applicant's Environmental Protection Plan (Appendix E) for the route options, the risk of spreading infestations of noxious weeds and invasive plants during operations would be similar for all the pipeline routes. The impacts would be permanent and minor for all routes, although RA-03AM would have a slightly greater area potentially affected than the Applicant's preferred route and other route alternatives due to its greater length.

6.3.3.4.2 Mitigation

In addition to the avoidance and minimization measures and BMPs that the Applicant has identified, Minnesota DNR identified the following mitigation measures that could reduce impacts on vegetation:

- Defining equipment cleaning methods and inspection standards to ensure that equipment is free of invasive species, and on Minnesota DNR lands following Operational Order 113, would further reduce the spread of noxious weeds and invasive plants and animals.
- Replanting appropriate tree species for restoration within cleared forested areas to reduce the recovery time, prevent changes in watershed hydrology and runoff impacts that could alter stream geomorphology.
- Woody vegetation would not typically be cleared at ATWS. If clearing of woody vegetation is necessary, potential mitigation to offset the clearing could include reestablishing or enhancing the existing cover type within up to 50 feet of surface waters, depending on topography. On state forest lands or WMAs, tree planting may be desired for all temporary workspaces within the property boundary to reduce erosion and runoff, and to reestablish trees for potential future large woody habitat recruitment to streams and rivers.
- In counties where oaks are affected by oak wilt disease caused by a non-native fungus, seasonal restrictions on tree clearing would reduce the chance of sap-sucking beetles transporting fungal spores through fresh wounds during the infection period that extends from April through July.

- Removal, debarking, or chipping of cut pines and pine slash larger than 3 inches in diameter within 3 weeks of cutting during May through mid-August would prevent pine bark beetle outbreaks in pine stands.

Table 6.3.3-31 Summary of Potential Impacts on Vegetation for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Construction Impacts					
Loss or alteration of vegetation cover	Permanent minor impacts • 656 acres vegetation replaced with aboveground facilities Long-term to permanent/ major impacts • 2,050 acres of forests/woody wetlands • 243 acres of scrub/shrub Short-term/minor impacts • 164 acres of grasslands • 2,364 acres of croplands and pasture • 249 acres of herbaceous wetlands No impacts • 12 acres of barren land • 5,082 acres total • 72% adjacent to existing corridors	Long-term to permanent/ major impacts • 1,329 acres of forests/woody wetlands • 191 acres of scrub/shrub Short-term/minor impacts • 143 acres of grasslands • 1,596 acres of croplands and pasture • 315 acres of herbaceous wetlands No impacts • 5 acres of barren land • 3,579 acres total • 95% adjacent to existing corridors	Long-term to permanent/ major impacts • 1,797 acres of forests/woody wetlands • 251 acres of scrub/shrub Short-term/minor impacts • 116 acres of grasslands • 256 acres of croplands and pastures • 223 acres of herbaceous wetlands No impacts • 31 acres of barren land • 2,674 acres total • All new corridor	Long-term to permanent/ major impacts • 2,203 acres of forests/woody wetlands • 277 acres of scrub/shrub Short-term/minor impacts • 405 acres of grasslands • 402 acres of croplands and pasture • 536 acres of herbaceous wetlands No impacts • 10 acres of barren land • 3,833 acres total • All within existing corridor	Long-term to permanent/ major impacts • 1,424 acres of forests/woody wetlands • 124 acres of scrub/shrub Short-term/minor impacts • 81 acres of grasslands • 336 acres of croplands and pasture • 319 acres of herbaceous wetlands No impacts • 3 acres of barren land • 2,287 acres total • All adjacent to existing corridor

Table 6.3.3-31 Summary of Potential Impacts on Vegetation for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Loss or alteration of rare native plant communities	Long-term to permanent/ major impacts • 45.5 acres of rare native plant communities No impact • Old-growth forests or HCVFs	Long-term to permanent/ major impacts • 20.3 acres of rare native plant communities No impact • Old-growth forests or HCVFs	No impacts to rare native plant communities, old-growth forests, or HCVFs	Long-term to permanent/ major impacts • 2.7 acres of rare native plant communities • 0.1 acre old-growth forest No impact • HCVFs	Long-term to permanent/ major impacts • 2.1 acres of old-growth forest • One HCVF
Spread of noxious weeds and invasive plants	Short-term/minor impacts • 6 MN-listed species, 12 invasive species • 413 occurrences	Short-term/minor impacts • 6 MN-listed species, 17 invasive species • 314 occurrences	Short-term/minor impacts • 3 MN-listed species, 10 invasive species • 408 occurrences	Short-term/minor impacts • 8 MN-listed species, 12 invasive species • 1,002 occurrences	Short-term/minor impacts • 6 MN-listed species, 13 invasive species • 665 occurrences

Table 6.3.3-31 Summary of Potential Impacts on Vegetation for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Operations Impacts					
Loss or alteration of vegetation cover	Permanent minor impacts • 291 acres vegetation replaced with aboveground facilities Permanent/major impacts • 951 acres of forests/woody wetlands Short-term/minor impacts • 125 acres of scrub/shrub • 73 acres of grasslands • 937 acres of croplands/pasture • 132 acres of herbaceous wetlands No impacts • 2 acres of barren land • 2,220 acres total	Permanent/major impacts • 547 acres of forests/woody wetlands Short-term/minor impacts • 80 acres of scrub/shrub • 61acres of grasslands • 671 acres of croplands and pasture • 134 acres of herbaceous wetlands No impacts • 2 acres of barren land • 1,495 acres total	Permanent/major impacts • 748 acres of forests/woody wetlands Short-term/minor impacts • 104 acres of scrub/shrub • 49 acres of grasslands • 107 acres of croplands and pasture • 94 acres of herbaceous wetlands No impacts • 13 acres of barren land • 1,115 acres total	Permanent/major impacts • 478 acres of forests/woody wetlands Short-term/minor impacts • 83 acres of scrub/shrub • 107 acres of grasslands • 111 acres of croplands and pasture • 154 acres of herbaceous wetlands No impacts • 3 acres of barren land • 936 acres total	Permanent/major impacts • 591 acres of forests/woody wetlands Short-term/minor impacts • 52 acres of scrub/shrub • 35 acres of grasslands • 141 acres of croplands and pasture • 135 acres of herbaceous wetlands No impacts • 1 acre of barren land • 955 acres total
Loss or alteration of rare native plant communities	Short-term/minor impacts from maintenance • 17.9 acres of rare native plant communities No impact • old-growth forests or HCVFs	Short-term/minor impacts from maintenance • 9.9 acres of rare native plant communities No impact • old-growth forests or HCVFs	No impact • rare native plant communities, old-growth forests, or HCVFs	No impact • rare native plant communities, old-growth forests, or HCVFs	Short-term/minor impacts from maintenance • 0.9 acre of old-growth forest • 1 HCVF No impact • rare native plant communities

Table 6.3.3-31 Summary of Potential Impacts on Vegetation for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Spread of noxious weeds and invasive plants	Permanent/minor impacts	Permanent/minor impacts	Permanent/minor impacts	Permanent/minor impacts	Permanent/minor impacts

HCVF = high conservation value forest

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to vegetation. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, acreage counts for the broad land cover types crossed do not consider how unique or sensitive certain areas might be within the broad cover type classes. However, data about rare native plant communities can aid the reader in understanding the extent of potential impacts on unique and highly sensitive areas. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in the tables should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-391 to 6-422. The table above, for example provides acreages of rare native plant communities identified within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to rare native plant communities is contained in the impacts discussion in the text (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-391 to 6-402. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-402 to 6-408. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-408 to 6-412. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-412 to 6-417. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-417 to 6-422. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[h] Enbridge-provided footprint for construction work area, Enbridge-provided footprint for permanent right-of-way.

Table 6.3.3-31 Summary of Potential Impacts on Vegetation for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]

i Estimated 120-foot-wide construction work area centered on pipeline route, includes the 50-foot-wide permanent right-of-way; estimated operations area based on 50-foot-wide permanent right-of-way centered on pipeline route.

j Estimated 205-foot-wide construction work area, with 10-feet-wide on the north side of Line 3 and 195-feet-wide on the south side of Line 3, includes the permanent right-of-way; estimated operations area based on 50-foot-wide permanent right-of-way centered on pipeline route.

6.3.3.5 *References*

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6.3.4 Fish and Wildlife

Fish and wildlife provide important social and cultural resources; they are managed by federal and state agencies for consumption and conservation. The general Project area supports a diversity of fish and wildlife, including coldwater, coolwater, and warmwater fisheries; reptiles, amphibians, and mammals including big and small game mammals; fur-bearing mammals; and nongame mammal species; and various bird species, including both game and non-game species. Lakes, rivers, streams, and wetlands provide habitat for fish as well as for aquatic and terrestrial wildlife. Wildlife habitats include a variety of vegetation communities that provide forage opportunities, shelter, overwintering, migration stopover, and breeding habitats for a wide variety of wildlife.

This section identifies the common and abundant fish and wildlife resources that may be affected by construction or operation of the Applicant's preferred route or the other alternative routes in Minnesota. It also presents the assessment of the potential for construction and operation of the preferred route or other alternative routes to affect those resources.

This section first describes the regulations relevant to assessing impacts on fish and wildlife resources, the methods used to conduct the impact assessment, and the existing conditions within the defined ROIs (identified below). The potential construction- and operations-related impacts on fish and wildlife for the Applicant's preferred route and the route alternatives (RA-03AM, RA-06, RA-07, and RA-08) are presented next. A summary and comparison of the impacts for the route alternatives between Clearbrook and Carlton are included at the end of the section, along with potential mitigation measures that could minimize impacts.

Wildlife protected under state and federal endangered species regulations are addressed in Section 6.3.5. ORVWs are addressed in Section 6.3.1.2. Potential impacts on fish and wildlife resources from an unanticipated crude oil release are addressed in Chapter 10.

6.3.4.1 Regulatory Context and Methodology

6.3.4.1.1 Regulatory Context

Regulations pertaining to fish and wildlife are managed by federal (e.g., USFWS) and state (e.g., Minnesota DNR) natural resources agencies. The goal of these agencies is to conserve, protect, and enhance fish, wildlife, and other natural resources for the benefit of the public. Fish, wildlife, and their habitats that are protected under federal and state endangered species or other protective regulations for special or unique resources are discussed in Section 6.3.5. Other federally enacted regulations provide protection for fish and wildlife not otherwise protected under the Endangered Species Act of 1973 (ESA), as amended. These include the Migratory Bird Treaty Act of 1918 (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). USFWS has statutory authority and responsibility for enforcing the MBTA (16 U.S.C. 703–712; 40 Stat. 755 as amended), and the BGEPA (16 U.S.C. 66-8-668d).

The MBTA makes it illegal for anyone to capture, kill, or possess migratory birds, or any parts, nests, or eggs of any migratory bird except under terms of a valid permit issued pursuant to federal regulations. In addition to the MBTA, Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," further directs executive departments and agencies to promote migratory bird conservation conventions to protect migratory birds and their habitats, including migratory waterfowl and game birds. The MBTA prohibits the take of any migratory bird without prior authorization from USFWS. "Migratory birds" are all species native to the United States or its territories. Non-native birds (e.g., house sparrow [*Passer domesticus*], European starling [*Sturnus vulgaris*]) are not protected under the MBTA (USFWS 2016a).

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are additionally protected under the BGEPA. This act prohibits anyone from taking (i.e., pursuing, shooting or shooting at, poisoning, wounding, killing, capturing, trapping, molesting, or disturbing) eagles, including their parts (e.g., feathers), nests, or eggs (USFWS 2016b). This definition also covers impacts from human-induced alterations at nest sites when eagles are not present; therefore, if removal, relocation, or destruction of an eagle nest is necessary and unavoidable, a permit and consultation with USFWS would be required. Minnesota also issues permits for removal or disturbance of active and inactive bald eagle and osprey (*Pandion haliaetus*) nests per its statutory authority as provided by Chapter 97A (Game and Fish), Part 97A.045 (Commissioner, General Powers and Duties), Subdivision 2 (Power to Protect Wild Animals).

The National Invasive Species Act (16 U.S.C. 4701) is a federal law that requires state management plans along with regional panels to actively fight the spread of aquatic invasive species in U.S. waterways. Minnesota DNR regulates the state's invasive species laws (Minn. Stat. § 84D and Minn. R. 6216).

Minnesota DNR regulates potential effects on Minnesota's public lands and waters; crossing these areas requires a license, which could in turn require mitigation measures. Minnesota DNR has jurisdiction over wildlife in Minnesota and administers the Minnesota outdoor recreation system, including WMAs, Scientific Natural Areas, state parks, and state forests. As with USFWS, Minnesota DNR encourages project applicants to consult with them to ascertain a project's potential to affect state-listed threatened and endangered species and to identify possible mitigation measures. Minnesota DNR also regulates water withdrawals from both groundwater and surface water sources, and requires a permit for withdrawals in excess of 10,000 gpm or 1 million gallons per year. A detailed discussion of the regulatory framework for all aspects of the Project is provided in Chapter 3.

6.3.4.1.2 Methodology

The methods used to assess potential impacts on fish and wildlife resources and their habitats from construction and operation of the Applicant's preferred route and route alternatives are described in this section. The ROI for this evaluation encompassed the area that could be affected, including indirectly, by pipeline construction and operation within 0.5 mile of the route centerlines. As described below, the assessment of potential direct impacts focused on the areas directly affected by construction and operation activities. Where appropriate, a larger region was considered to describe existing resources and evaluate activities that would occur more than 0.5 mile from the route. Invasive species locations were identified within 1 mile from the route centerlines. Additional information specific to the Applicant's preferred route in Minnesota and the route alternatives between Clearbrook and Carlton are provided below.

The impact analysis identified changes to fish and wildlife resources and their habitats, including consideration of the following:

- Fish and aquatic habitats
  - Fish distribution and habitat use, muskellunge (*Esox masquinongy*) waters, designated trout streams and lakes, and mussel concentration areas; and
  - Lakes, rivers, and streams, AMAs, Fish Index of Biotic Integrity (Fish IBI) Lakes, waters infested with aquatic invasive species, Lakes of Biological Significance, and Sentinel Lakes.

- Wildlife and wildlife habitats
  - Wildlife distribution and habitat use, raptor nests and colonial waterbird colonies; and
  - Vegetated land cover, designated wildlife conservation areas (e.g., WMAs, waterfowl production areas, wetland management districts, U.S. Bureau of Land Management (BLM) land, federal and state forests, state parks, recreation areas, natural areas, nature preserves, scenic trails, and private conservation areas), and Audubon Important Bird Areas (IBAs).

The methods used to evaluate potential impacts on fisheries and aquatic habitats, and on wildlife and wildlife habitats are described below.

Fisheries and Aquatic Habitat

Descriptions of fish, fisheries, aquatic habitats, and aquatic invasive species were obtained from publicly available sources published by federal and state agencies, including data from USFWS, USGS, and Minnesota DNR.

Minnesota has several methods of classification used to identify, manage, or rate waterbodies in relation to water quality or habitat. The analysis of Project impacts considered the proximity of the Applicant's preferred route and the route alternatives to classified waterbodies or areas, including AMAs, Sentinel Lakes, Lakes of Biological Significance, designated wildlife lakes, and waterbodies assigned an IBI. These management units are described below. Additional waterbody classifications specific to individual species (e.g., trout streams and muskellunge lakes) also were included in the analysis.

<u>Management Units Considered</u>

Aquatic Management Areas were established by the State of Minnesota to "protect, develop and manage lakes, rivers, streams, and adjacent wetlands and lands that are critical for fish and other aquatic life for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses" (Minn. Stat. 86A, Subd. 14). In Minnesota, the demand for shoreline property is high, and such areas are rapidly being developed. Minnesota DNR acquires riparian shoreline parcels to designate as AMAs in order to (1) establish protections for critical fish and wildlife habitat; (2) ensure that non-boat public access to water resources will always be available; and (3) ensure that habitat can be developed in previously disturbed areas (Minnesota DNR 2016a). North Dakota and Wisconsin do not specifically designate AMAs but manage more general wildlife areas for hunting, fishing, trapping, and other recreational activities (see Section 5.2.4.2.3).

Sentinel Lakes were designated to model and monitor Minnesota Lake ecosystems for detection and better understanding of environmental stressors in order to guide management that sustains fisheries and water resources for future generations (Minnesota DNR 2016b).

Lakes of Biological Significance were identified and classified by Minnesota DNR subject matter experts based on objective criteria for four community types (aquatic plants, fish, amphibians, and birds). Unique plant or animal presence is the primary measure of a lake's biological significance. Lakes are assigned one of three biological significance classes:

- Outstanding – Plants: high aquatic plant richness, high floristic quality, and a population of an endangered or threatened plant; important wild rice lakes. Fish: exceptional fishery for selected game fish or an outstanding nongame fish community. Birds: endangered or threatened colonial waterbird nesting area; presence of several endangered, threatened or special concern lake bird species; or six or more lake bird SGCN.[15]

- High – Plants: high aquatic plant richness, high floristic quality, or a population of an endangered or threatened plant. Fish: populations of more than one fish of special concern or SGCN. Birds: colonial waterbird nesting area; history of endangered or threatened colonial waterbird nesting; presence of endangered, threatened, or special concern lake bird species or five lake bird SGCN. Amphibians – mudpuppy presence.
- Moderate – Plants: high aquatic plant richness, high floristic quality, or a population of an endangered or threatened plant. Fish: populations of one fish species of special concern or fish SGCN. Birds: history of colonial waterbird nesting; presence of an endangered, threatened or special concern lake bird species; or several lake bird SGCN (Minnesota DNR 2015a).

Designated Wildlife Lakes in Minnesota include 56 public lakes covering over 56,000 acres that are designated, reserved, and managed for wildlife. Most of the 56 lakes are located in the southern portion of the state where watersheds have been highly modified to improve drainage. Management of designated wildlife lakes includes temporary lowering of lake levels to improve wildlife habitat, and includes regulation of motorized watercraft and recreational vehicles.

Index of Biotic Integrity is a biologically based method for measuring the integrity of aquatic systems that incorporates fish data on species richness, community assemblage, and trophic composition. Each metric represents an aspect of the biological assemblage structure, function, or other measurable characteristic that changes in some predictable way with increased human-induced stress. Fish IBI scores respond to differences in land use patterns, trophic state, and aquatic vegetation.

Other waterbodies evaluated include DNR fish hatcheries, muskellunge waters, and designated trout streams and lakes. In Minnesota, trout streams and lakes are designated to protect and foster the propagation of trout and provide fishing opportunities and angler access. Further detail for these waterbody classification systems is included in the discussions of existing conditions below.

<u>Data Sources and Potential Impact Areas</u>

Specific geospatial data sources evaluated for impacts on fish and aquatic habitats included:

- USGS National Hydrography Dataset;
- Minnesota DNR and Minnesota PCA geospatial data for:
  - AMAs (Minnesota DNR 2016a),
  - Sentinel Lakes (Minnesota PCA 2016),
  - Lakes with Fish IBI scores (Minnesota DNR 2014a),
  - Lakes of Biological Significance (Minnesota DNR 2015b),
  - Trout lakes and streams (Minnesota DNR 2015c),
  - Muskie lakes (Minnesota DNR 2008),

15 Animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability (Minnesota DNR 2006).

  - Infested Waters List (Minnesota DNR 2016d), and
  - Minnesota Natural Heritage Information System (NHIS) mussel concentration areas (Minnesota DNR 2016e); and

- USGS nonindigenous aquatic species (USGS NAS 2016).

No single one of the datasets listed above provides a complete indication of all relevant impacts to fisheries and aquatic habitat, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, data from the USGS National Hydrography Dataset can be used to gain a broad understanding of the types and number of waters crossed. However, information from other datasets, like the Sentinel Lakes and LBS and datasets, helps to define the extent of potential impacts on high quality habitats.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide counts, for example, of streams crossed by the applicant's pipeline route and alternatives and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to stream habitats is contained in the text of this section.

Impacts on fish and aquatic habitats from construction of the Applicant's preferred route were evaluated within the Project footprints provided by the Applicant for the construction work area, ATWS, access roads, pipe yards, pipeline permanent right-of-way, valve pads and driveways, and pump stations. Using GIS, these footprints were overlain on the resource maps to identify the resources potentially affected. The potentially affected areas during operation of the Applicant's preferred route were identified in a similar manner, using a 50-foot-wide permanent right-of-way.

The resources potentially affected by route alternatives RA-03AM, RA-06, and RA-08 were estimated using a 120-foot-wide construction work area centered on the route alternative. For RA-07, a 205-foot-wide construction work area was used, with 10 feet on the north side of the existing Line 3 pipeline permanent right-of-way and 195 feet on the south side of the existing Line 3 pipeline permanent right-of-way. Operations comparisons for all route alternatives used a 50-foot-wide permanent right-of-way overlain on the available resource maps.

Additional analyses were performed to compare the aquatic habitat value of waters along the route alternatives between Clearbrook and Carlton. These comparisons were developed using Minnesota PCA's Watershed Health Assessment parameters for species richness, stream species quality, and habitat quality and connectivity (Minnesota DNR 2016f). Values for each of these parameters were compared for the Applicant's preferred route and route alternatives by calculating the mean weighted average for the index of interest of the watersheds crossed by each alternative. Results are presented below in Section 6.3.4.3.

The ROI for the fisheries and aquatic habitat evaluation encompasses the area that could be directly or indirectly affected by pipeline construction within 0.5 mile from the route centerlines because some construction activities and indirect effects may occur within areas beyond the construction work areas.

Wildlife and Wildlife Habitat

Descriptions of common wildlife (e.g., abundance, distribution, and seasonal sensitivity) and wildlife habitats were obtained from publicly available information published by Minnesota DNR, USFWS, USGS, and the National Audubon Society. Information on raptor nest locations was obtained from reports on raptor nest surveys completed for the Project (Merjent 2015a, 2015b); data were not collected for the route alternatives. Colonial waterbird nesting locations were evaluated based on NHIS data (Minnesota DNR 2016e).

<u>Designated Management Units</u>

The impacts analysis considered the proximity of the Applicant's preferred route and route alternatives to areas considered significant for conservation of wildlife or for preservation of wildlife habitat.

Wildlife conservation lands are presented under various naming conventions, including but not limited to, WMAs, waterfowl production areas, wetland management districts, BLM land, federal and state forests, state parks, recreation areas, natural areas, nature preserves, scenic trails, and private conservation areas. USGS Gap Analysis Program (GAP) data provide a compilation of these conservation areas. Each area is assigned a status codes (1, 2, or 3) to indicate the level of protection and management objectives. All three of these GAP status codes include permanent protection from conversion of natural land cover over all or most of their area (USGS GAP 2013). GAP status 1 and 2 lands are managed for biodiversity, while GAP status 3 lands include areas managed for multiple uses. Minnesota's WMAs were established to protect lands and waters with productive habitat for fish and wildlife, as well as fish- and wildlife-oriented recreation (e.g., hunting, fishing, and bird watching) (Minnesota DNR 2016f).

Audubon IBAs established by the National Audubon Society (rather than by state or federal agencies) are a useful management tool to identify areas that contain vital resources for birds and may concentrate birds. Audubon IBAs include both public and private lands and lack formal protections. IBAs are identified through a rigorous process by bird experts. Each IBA represents a place that supports species of conservation concern (e.g., threatened and endangered species), range-restricted species (e.g., those species limited spatially), species that occur in only one habitat type or biome, or species or groups of species (e.g., waterfowl or shorebirds) that are vulnerable because they congregate in large numbers. While all IBAs are recognized for their importance to birds, some are of greater significance than others. IBAs are prioritized hierarchically, from greatest to least significant, as global, continental, or state.

In addition to these wildlife areas, general vegetation land cover types, including large blocks (greater than 100 acres) of forested and wetland habitats, provides important information about available habitats and the wildlife that likely use them. Further details for each of these land classification systems are provided in the discussion of existing conditions section.

<u>Data Sources and Potential Impact Areas</u>

Specific geospatial data sources evaluated for impacts on wildlife and wildlife habitats included:

- NLCD (Homer et al. 2015) for land cover information, including aquatic and terrestrial (vegetation) habitats;
- Federal, state, and local wildlife conservation areas and easements (USGS-GAP 2016);
- Minnesota wildlife refuge inventory (Minnesota DNR 2016g);

- Audubon IBAs (Audubon 2016);
- Minnesota NHIS colonial waterbird nesting aggregations (Minnesota DNR 2016e); and
- Raptor nest surveys for the Applicant's preferred route (Merjent 2015a, 2015b).

No single one of the datasets listed above provides a complete indication of all relevant impacts to wildlife and wildlife habitat, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, while NLCD data in the ROI can aid the reader in generally understanding the potential for impacting different wildlife habitat tyypes, information that the IBA dataset provides is necessary for a specific understanding of potential impacts to high quality bird habitats.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide acreage estimates, for example, of general vegetative cover types crossed and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to wildlife and wildlife habitat is contained in the text of this section.

Areas of potential impacts on wildlife and wildlife habitat from construction of the Applicant's preferred route were evaluated within the Project footprints provided by the Applicant for the construction work area, ATWS, access roads, pipe yards, permanent right-of-way, MLVs and driveways, and pump stations. Using GIS, these footprints were overlain on the resource maps to identify the resources potentially affected. The potentially affected areas during operation of the Applicant's preferred route were identified in a similar manner, using a 50-foot-wide permanent right-of-way.

The resources potentially affected by route alternatives RA-03AM, RA-06, and RA-08 were similarly estimated using a 120-foot-wide construction work area centered on the route alternative. For alternative RA-07, a 205-foot-wide construction work area was used, with 10 feet on the north side of the existing Line 3 pipeline permanent right-of-way and 195 feet on the south side of the existing Line 3 pipeline permanent right-of-way. Operations comparisons used a 50-foot-wide permanent right-of-way overlain on the wildlife distribution and wildlife habitat resource maps.

The ROI for the wildlife and wildlife habitat evaluation encompasses the area that could be directly or indirectly affected by pipeline construction within 0.5 mile of the route centerlines because some construction activities and indirect effects may occur in areas beyond the construction work areas.

Typical impacts on terrestrial wildlife habitat from pipeline construction and operational maintenance were qualitatively evaluated, including the alteration of vegetation cover. Permanent loss of wildlife habitat was quantified as the area required for maintenance of permanent facilities. Temporary loss and permanent alteration of wildlife habitats were quantified as the size and quality of the area disturbed by the construction work areas and permanent right-of-way by providing the total acres disturbed within wildlife conservation areas and by vegetation cover class. Habitats susceptible to fragmentation were identified by locating large blocks (greater than 100 acres) (Homer et al. 2015) of continuous upland forest and woody wetland cover that would be crossed by the alternative routes where those routes would not be co-located with other linear infrastructure. Particular attention was given to large, mature core or interior forested areas that serve as habitat for protected migratory birds and other wildlife.

The potential for wildlife mortality impacts were qualitatively evaluated based on occurrence, the animal's ability to move away from construction activities, and the animal's susceptibility to being run over or hit by equipment or crew vehicles. The potential for wildlife disturbance, displacement, or blockage of movements also were qualitatively evaluated based on occurrence, locations of migration corridors, locations of sensitive breeding or migration staging areas, and differential sensitivity to human activities.

6.3.4.2 Existing Conditions

The following summary provides information on existing conditions specific to Minnesota. See Section 5.2.4.2 for additional detail on aquatic environments and their relationship to fisheries and aquatic species.

6.3.4.2.1 Fisheries and Aquatic Habitat

The Applicant's preferred route and all route alternatives would cross surface waters, including large rivers; perennial (permanent) streams, intermittent (wet during part of the year) streams, and ephemeral (wet only after precipitation) streams; and large lakes, shallow lakes, and wetlands. See Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 for a discussion of potential impacts on ground water, surface water, and wetland resources, respectively.

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9 mile length (see Section 6.7). Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the fisheries and aquatic habitat ROI for these route alternatives reflect the current state of resources in the environment. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Aquatic Habitat in the Project Area

Waterbodies of all sizes provide habitat for fish and other wildlife. Typically, large rivers are quite wide; flow more slowly than smaller rivers; and have numerous meanders and oxbows, islands, and backwaters. The backwater areas of these rivers are biologically productive and provide important spawning areas for several species of fish, as well as refuge habitat for many other animal species. Connectivity of these rivers is an important feature and influences the distribution of fish populations and other species. Smaller rivers, streams, and wetlands provide foraging areas, nesting areas, and refuge for myriad species of fish and wildlife, including SGCN birds such as yellow rails (*Coturnicops noveboracensis*) and sedge wrens (*Cistothorus platensis*) (see Section 6.3.5 for more information about SGCN). The Mississippi River, which would be crossed by the Applicant's preferred route and all route alternatives (except for RA-06), has a naturally reproducing population of muskellunge that since 2006 also has been stocked with fingerlings or adults.

Lakes are important to Minnesota's environment and economy (e.g., hunting and fishing, many forms of lake recreation, and the tourism industry). Good-quality lake habitat is largely the result of healthy, intact watersheds and shorelines. Watersheds influence water quality, where more intact watersheds tend to result in lakes with better water quality. Shoreline habitat provides bottom substrates, structure, and vegetation that fish and other aquatic animals need for foraging, spawning substrate, and cover from predation.

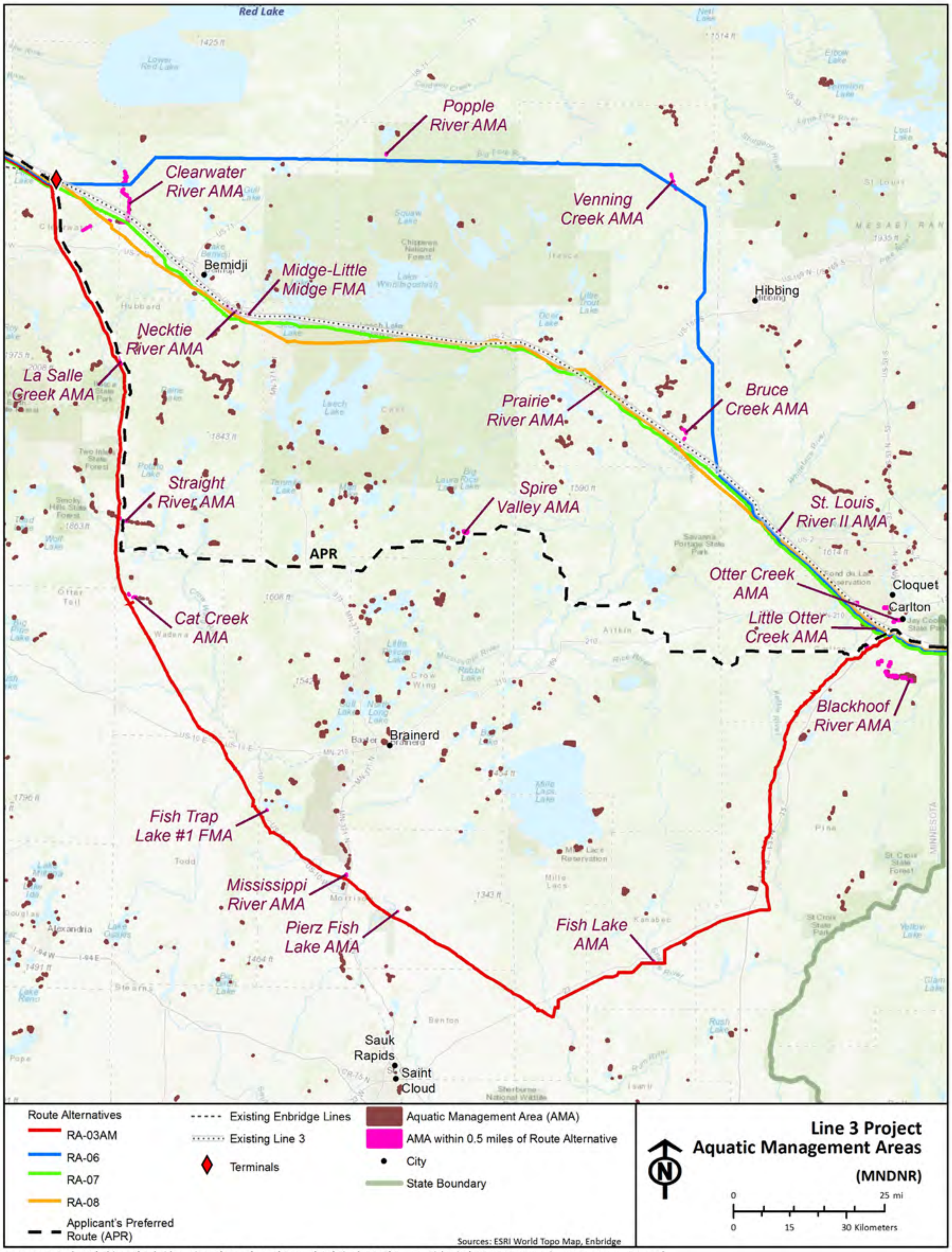
Shallow lakes provide habitat for many species. They are permanent or semi-permanent waterbodies that are less than 15 feet deep and typified by abundant aquatic plant growth that results from generally high levels of nutrients (e.g., phosphorus, nitrogen, and minerals) and abundant sunlight availability in shallow water. Wetlands and vegetated fringes form along the edges of lakes and include stands of emergent and floating-leaved aquatic plants such as cattails (*Typha* spp.), bulrush (several genera), water lily (*Nymphaea* spp.) and reeds (several genera), as well as submerged plants (e.g., coontail [*Ceratophyllum demersum*]), creating an extended littoral zone. These plants provide excellent food and habitat for zooplankton, insects, fish, waterfowl, and other wildlife. Abundant aquatic vegetation also helps to maintain water clarity by anchoring sediments. Shallow lakes are important breeding, nesting, and foraging areas for waterfowl and waterbirds such as ducks, geese, herons, rails, and many more (Minnesota DNR 2016h).

<u>Aquatic Management Areas</u>

All of the route options would traverse areas with abundant freshwater lakes that provide habitat for many species. There are 19 AMAs within 0.5 mile of the Applicant's preferred route and route alternatives (Figure 6.3.4-1).

<u>Other Management Units</u>

Minnesota has identified a number of lakes and streams as having excellent quality or high biological significance. These datasets include Fish IBI lakes, Lakes of Biological Significance, Sentinel Lakes, and designated wildlife lakes. A total of 35 Lakes of Biological Significance, including 25 lakes rated outstanding, 4 lakes rated high, and 6 lakes rated moderate, occur within 0.5 mile of the Applicant's preferred route and route alternatives (Appendix L, Table L-2). Six of these lakes would be crossed by the Applicant's preferred route and route alternatives (Table 6.3.4-1), including Portage Lake, which is a Sentinel Lake.



Source: Minnesota DNR 2016h.

Figure 6.3.4-1. Aquatic Management Areas near the Applicant's Preferred Route and Route Alternatives

Table 6.3.4-1. Lakes of Biological Significance Crossed by the Applicant's Preferred Route and Route Alternatives

Route	Watershed	Area (acres)	Shoreline (miles)	LBS Class[a]	Ranking Category[b]		
					Plant Rank	Fish Rank	Bird Rank
Applicant's preferred route	Unnamed (Wetland)	209	7.3	Moderate	--	--	3
Route alternative RA-06	Long	132	4.1	High	--	2	--
Route alternative RA-07	West Four-Legged	432	8.0	Outstanding	1	--	--
Route alternative RA-07	East Four-Legged	357	6.4	Outstanding	1	--	--
Route alternative RA-07	Pike Bay	4,751	10.7	Outstanding	--	1	--
Route alternative RA-08	Shallow	539	5.1	Outstanding	--	1	--

Sources: Minnesota DNR 2015b, 2016b.

[a] Lake of Biological Significance (LBS) class definitions:

<u>Outstanding</u> – *Plants*: high aquatic plant richness, high floristic quality, and a population of an endangered or threatened plant; important wild rice lakes. *Fish*: exceptional fishery for selected game fish or an outstanding nongame fish community. *Birds*: endangered or threatened colonial waterbird nesting area; presence of several endangered, threatened, or special concern lake bird species; or six or more lake bird Species of Greatest Conservation Need (SGCN).

<u>High</u> – *Plants*: high aquatic plant richness, high floristic quality, or a population of an endangered or threatened plant. *Fish*: populations of more than one fish of special concern and/or SGCN. *Birds*: colonial waterbird nesting area; history of endangered or threatened colonial waterbird nesting; presence of endangered, threatened, or special concern lake bird species; or five lake bird SGCN.

<u>Moderate</u> – *Plants*: high aquatic plant richness, high floristic quality, or a population of an endangered or threatened plant. *Fish*: populations of one fish species of special concern and/or fish SGCN. *Birds*: history of colonial waterbird nesting; presence of an endangered, threatened, or special concern lake bird species; or several lake bird SGCN.

[b] Number of lakes with ranks crossed

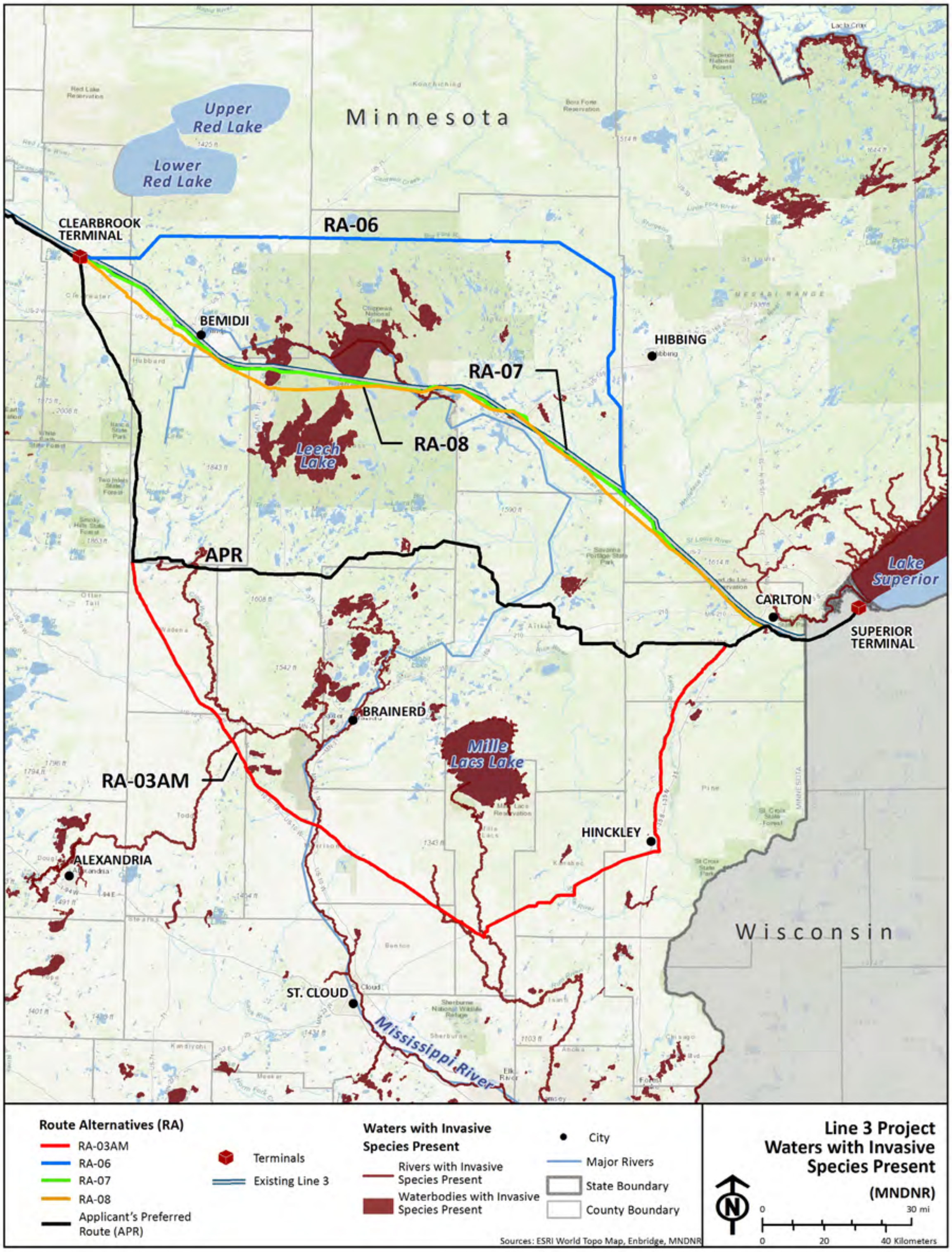
"--" = no crossing

Minnesota DNR-designated trout streams occur primarily in southeastern Minnesota and along the north shore of Lake Superior, although trout streams occur throughout the state.

Based on strong public interest in large muskellunge angling, Minnesota DNR maintains a set of specific management goals and strategies to maintain trophy muskellunge populations (including tiger muskellunge) in select waterbodies. Muskellunge waters must meet one of three criteria: (1) they are stocked; (2) a viable population exists; or (3) they represent an important component of the lake's fishery (either biologically or in terms of angler experience). Muskellunge are actively managed in 99 waters covering a total of 480,153 surface acres, including 8 rivers (Minnesota DNR 2016i).

<u>Aquatic Invasive Species and Infested Waters</u>

Minnesota DNR maintains an Infested Waters List of waters containing high-priority aquatic invasive species. A lake, river, pond, or wetland is included in the infested waters list if it contains an aquatic invasive species that could spread to other waters (Minnesota DNR 2017a). The Applicant's preferred route segment from Clearbrook to Carlton and all route alternatives except for RA-06 would cross or pass near rivers and lakes containing aquatic invasive species (Figure 6.3.4-2) (Table 6.3.4-2). A permit to appropriate, divert, or transport infested waters may be required from Minnesota DNR if a selected alternative would cross an infested waterway.



Source: Minnesota DNR 2016d.

Figure 6.3.4-2. Documented Aquatic Invasive Species Occurrences in Relation to the Applicant's Preferred Route and Route Alternatives

Table 6.3.4-2. Aquatic Invasive Species Infestations within 1 Mile of the Applicant's Preferred Route and Route Alternatives in Minnesota

Drainage (HUC-8) Location	Common Name	Scientific Name	Status	Applicant's Preferred Route		Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
				Minnesota Total	Clearbrook to Carlton				
Clearwater									
Clearwater County	Narrow-leaved cattail	*Typha angustifolia*	Collected	1	1	1	--	--	--
	Northern bur-reed	*Sparganium glomeratum*	Collected	1	1	1	--	--	--
Crow Wing									
Crow Wing River (south-central part of county)	Rusty crayfish	*Orconectes rusticus*	Collected	1	1	--	--	--	--
Upper Twin Lake	Mud bithynia, faucet snail	*Bithynia tentaculata*	Established	1	1	--	--	--	--
Kettle									
Moose Horn River, County Road 46 bridge	Chinese mysterysnail	*Cipangopaludina chinensis*	Established	--	--	1	--	--	--
Pine									
Margaret Lake west of Crooked Lake Township	Curly-leaf pondweed	*Potamogeton crispus*	Established	1	1	--	--	--	--
Platte-Spunk									
[No locality description provided by MARIS]	Common carp	*Cyprinus carpio*	Established	--	--	8	--	--	--
Prairie-Willow									
Ice (Crystal) Lake	Eurasian watermilfoil	*Myriophyllum spicatum*	Established	--	--	--	--	2	2
McKinney Lake	Eurasian watermilfoil	*Myriophyllum spicatum*	Established	--	--	--	--	2	2

Table 6.3.4-2. Aquatic Invasive Species Infestations within 1 Mile of the Applicant's Preferred Route and Route Alternatives in Minnesota

Drainage (HUC-8) Location	Common Name	Scientific Name	Status	Applicant's Preferred Route		Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
				Minnesota Total	Clearbrook to Carlton				
Snake									
Middle River	Common carp	*Cyprinus carpio*	Established	1	--	--	--	--	--
St. Louis									
Beauty Lake (~10 miles northeast of Warba, MN)	Rusty crayfish	*Orconectes rusticus*	Collected	--	--	--	1	--	--
Chub Lake	Eurasian watermilfoil	*Myriophyllum spicatum*	Established	1	--	--	--	--	--
TOTAL				**7**	**5**	**11**	**1**	**4**	**4**

Source: USGS NAS 2016.

Notes:

Numbers represent number of reported occurrences (infestations) within 1 mile of route centerlines as recorded in the USGS Aquatic Invasive Species database.

"--"= no occurrence

HUC-8 = 8-digit hydrologic unit code that delineates watershed boundaries, defined by USGS NHD 2016

Fisheries in the Project Area

Fish species present are similar along the Applicant's preferred route and the route alternatives. Federal, state, and tribal agencies have identified substantial fisheries with recreational or commercial value that occur in waterbodies (e.g., streams, rivers, lakes, and ponds) at or immediately downstream of proposed pipeline crossings. Maintaining abundant populations of fish requires high-quality aquatic habitat and healthy ecosystems. Minnesota DNR has 28 fisheries managers who work with local fishing clubs, lake associations, individuals, and conservation groups to manage the state's lakes and streams. Fisheries management includes protecting and restoring habitats and water quality, regulating the harvest, stocking, and public education.

Minnesota DNR has many fish hatcheries to meet stocking and other needs (Figure 6.3.4-3). Some hatcheries raise trout or northern pike and muskellunge, and white suckers may be raised as food for pike and muskellunge. Minnesota's coolwater hatcheries produce from 2 to 5 million walleye fingerlings and millions of fry each year. Minnesota has more walleye, walleye lakes, and walleye anglers than any other state; and most hatcheries are dedicated to producing walleye. While substantial numbers of walleye are produced at state hatcheries, the majority of walleye result from natural reproduction that occurs in the state, including within the areas crossed by the Applicant's preferred route and route alternatives. Stocking can provide walleye fishing in lakes that lack successful or consistent reproduction but can otherwise support walleye. Stocking also is effective for lakes that have been "rehabilitated" or those that occasionally winterkill. Because many hatcheries use natural water sources as part of their operation, the analysis of potential impacts identified hatcheries downstream of the route options; however, there are no hatcheries within 1 mile of the surface water crossings of the Applicant's preferred route or the route alternatives.

The Applicant's preferred route and route alternatives would cross surface waters with fisheries in the Red River, Rainy River, Upper Mississippi River, Lake Superior, and St. Croix River drainages (Table 6.3.4-3). Common Minnesota game fish and their habitats and distributions in those drainages are listed in Table 6.3.4-4.

Fisheries can be defined as coldwater, coolwater, or warmwater; they are associated with particular fish assemblages. These fisheries can include both game and nongame species. All three types are present in the region. Protected and rare species are discussed in Section 6.3.5, including species designated by Minnesota DNR or USFWS as threatened and endangered.

Coldwater Fisheries

Coldwater fisheries support trout and salmon (Salmonidae), which are important commercial and sport fishes that require cold, clean water for survival and reproduction. Three species of Pacific salmon have been introduced to Lake Superior and now spawn in its tributaries (Minnesota DNR 2016i). Lake trout (*Salvelinus namaycush*) are naturally reproducing in cold lakes throughout the region. The native brook trout (*Salvelinus fontinalis*) and the introduced brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) also are present in rivers and streams in the region.

Source: Minnesota DNR 2016m

Figure 6.3.4-3. Minnesota Fisheries Management Districts and Hatcheries near the Applicant's Preferred Route and Route Alternatives

Table 6.3.4-3. River Drainages Crossed by the Applicant's Preferred Route and Route Alternatives

Route	River Drainage				
	Red River	Rainy River	Upper Mississippi River	Lake Superior	St. Croix River
Applicant's preferred route	X	--	X	X	X
Route alternative RA-03AM	X	--	X	X	X
Route alternative RA-06	X	X	X	X	--
Route alternative RA-07	X	--	X	X	--
Route alternative RA-08	X	--	X	X	--

[a] See Table 6.3.4-4 for common Minnesota game fish in these drainages.

Notes:

Drainages with an "X" indicate drainages crossed.

"--" = no crossing

Table 6.3.4-4. Common Minnesota Game Fish in Major River Drainages Crossed by the Applicant's Preferred Route and Route Alternatives

Common Name	Scientific Name	Habitat	River Drainage[a]				
			Red River	Rainy River	Upper Mississippi River	Lake Superior	St. Croix River
Coldwater – Salmon and Trout							
Brook trout	*Salvelinus fontinalis*	Cool and clear water with sandy and gravelly bottoms and moderate vegetation	i	i	i	x	x
Brown trout	*Salmo trutta*	Coolwater lakes and streams; Lake Superior	i	i	i	i	i
Atlantic salmon	*Salmo salar*	Lake Superior and tributaries	--	--	--	i	--
Chinook salmon	*Oncorhynchus tshawytscha*	Lake Superior and tributaries	--	--	--	i	--
Coho salmon	*Oncorhynchus kisutch*	Lake Superior and tributaries	--	--	--	i	--
Pink salmon	*Oncorhynchus gorbuscha*	Lake Superior and tributaries	--	--	--	i	--
Cisco (tullibee or lake herring)	*Coregonus artedi*	Lakes, large rivers	x	x	x	x	u

Table 6.3.4-4. Common Minnesota Game Fish in Major River Drainages Crossed by the Applicant's Preferred Route and Route Alternatives

Common Name	Scientific Name	Habitat	River Drainage[a]				
			Red River	Rainy River	Upper Mississippi River	Lake Superior	St. Croix River
Lake whitefish	*Coregonus clupeaformis*	Lake Superior and deep, coolwater lakes in northern Minnesota	x	x	x	x	L#
Lake trout	*Salvelinus namaycush*	Coldwater lakes	--	x	i	x	i
Rainbow trout	*Oncorhynchus mykiss*	Cold streams and lakes	i	i	i	i	i
Coolwater – Pike and Perch							
Muskellunge (muskie)	*Esox masquinongy*	Clear, clean lakes	i	x	x	x	i
Northern pike	*Esox lucius*	Vegetated areas of quiet, slow-moving waters in lakes, ponds, and rivers	x	x	x	x	x
Sauger	*Sander canadense*	Large rivers with deep pools	--	x	--	--	L
Walleye	*Sander vitreus*	Large, shallow lakes with gravel shoals	x	x	x	x	x
Yellow perch	*Perca flavescens*	Lakes and backwaters of large rivers; pools and runs of small streams	x	x	x	x	x
Warmwater – Bass, Sunfish, and Catfish							
Largemouth bass	*Micropterus salmoides*	Shallow, fertile, lakes and river backwaters with ample aquatic vegetation as well as vegetated bays of larger lakes	x	x	x	x	x
Smallmouth bass	*Micropterus dolomieu*	Streams, rivers with clear water	i	i	x	x	x
White bass	*Morone chrysops*	Shallow rivers, creeks, and streams	i	--	--	--	L
Yellow bass	*Morone mississippiensis*	Slow-moving rivers, lakes, and ponds	--	--	--	--	--
Black crappie	*Pomoxis nigromaculatus*	Deep, cool, clear lakes	x	x	x	x	x
White crappie	*Pomoxis annularis*	Deep, cool, clear lakes	i	--	--	--	x
Bluegill	*Lepomis macrochirus*	Ponds, lakes, and slow-moving rivers	x	x	x	x	x

Table 6.3.4-4. Common Minnesota Game Fish in Major River Drainages Crossed by the Applicant's Preferred Route and Route Alternatives

Common Name	Scientific Name	Habitat	River Drainage[a]				
			Red River	Rainy River	Upper Mississippi River	Lake Superior	St. Croix River
Pumpkinseed	*Lepomis gibbosus*	Ponds, lakes, and slow-moving rivers	x	x	x	x	x
Green sunfish	*Lepomis cyanellus*	Ponds, lakes, and slow-moving rivers	x	x	x	x	x
Orangespotted sunfish	*Lepomis humilis*	Ponds, lakes, and slow-moving rivers	x	--	x	--	--
Longear sunfish	*Lepomis megalotis*	Shallow ponds, lakes, and slow-moving rivers	--	x	x	--	U W I IA
Warmouth	*Lepomis gulosus*	Shallow ponds, lakes, and slow-moving rivers	--	i	--	--	L W I IA
Rock bass	*Ambloplites rupestris*	Well-oxygenated lakes and streams with boulder and sand bottoms	x	x	x	x	x
Channel catfish	*Ictalurus punctatus*	Large and small rivers, lakes, and ponds	x	--	i	x	x
Flathead catfish	*Pylodictis olivaris*	Turbid, slow-moving streams	--	--	i	--	x
Black bullhead	Ameiurus melas	Slow-moving, quiet waters with soft bottoms made up of mud, sand, and gravel	x	x	x	x	x
Brown bullhead	Ameiurus nebulosus	Slow-moving, quiet waters with soft bottoms made up of mud, sand, and gravel	x	x	x	x	x
Yellow bullhead	Ameiurus natalis	Slow-moving, quiet waters with soft bottoms made up of mud, sand, and gravel	x	--	x	x	x
Miscellaneous							
Rainbow smelt	*Osmerus mordax*	Rivers, coastal areas, and ponds	--	i	i	i	i
Lake sturgeon	*Acipenser fulvescens*	Lakes and rivers with sandy, gravelly, and muddy bottoms	R	x	--	x	x
Shovelnose sturgeon	*Scaphirhynchus platorynchus*	Large rivers	--	--	--	--	L

Table 6.3.4-4. Common Minnesota Game Fish in Major River Drainages Crossed by the Applicant's Preferred Route and Route Alternatives

Common Name	Scientific Name	Habitat	River Drainage[a]				
			Red River	Rainy River	Upper Mississippi River	Lake Superior	St. Croix River
Paddlefish	*Polyodon spathula*	Large rivers and river lakes (e.g., Lake Pepin), oxbow lakes, and backwaters	--	--	--	--	L
Bowfin	*Amia calva*	Clear lakes and slow streams	x	--	x	--	x
Burbot	*Lota*	Cool waters of northern lakes and rivers; Lake Superior	x	x	x	x	x

Sources: Minnesota DNR 2016k; Hatch and Schmidt 2004.

[a] River drainage explanations:
"--" = not listed as present in the drainage
i = introduced to the drainage,
IA = Iowa portion of drainage,
L = below Taylor's Falls
U = above Taylor's Falls
R = native and reintroduced
x = native to and present today in drainage
WI = Wisconsin portion of drainage
# = present prior to 1975

Coolwater Fisheries

Coolwater fisheries support gamefish such as northern pike (*Esox lucius*) and muskellunge or muskie, walleye (*Sander vitreus*), and yellow perch (*Perca flavescens*). Northern pike generally inhabit clear, shallow, warm waters near shore but move to deeper water midsummer using coolwater areas (Michigan DNR 2016a). Muskellunge survive in a wide range of temperatures and prefer clear water (ADW 2016). They move from shallow, weedy water to deeper water as they grow larger (ADW 2016). Walleye are found in submerged bars and rocky areas of shallow bay lake waters in spring and fall but also move to cooler, deeper water (i.e., less than 50 feet) in summer (Michigan DNR 2016b). Yellow perch generally prefer relatively shallow water (i.e., less than 30 feet deep) near shore (Michigan DNR 2016c).

Warmwater Fisheries

Warmwater fisheries support catfish and bullheads (Ictaluridae), sunfish and bass (Centrarchidae), carp and minnows (Cyprinidae), and temperate bass (Moronidae). Catfish and bullheads are found throughout the region, but are most common in warm, fertile rivers and lakes (Minnesota DNR 2016j). Sunfish, including the bluegill (*Lepomis macrochirus*)—which is the most popular sunfish—prefer lakes and slow streams (Minnesota DNR 2016k). Bass, both largemouth (*Micropterus salmoides*) and smallmouth (*Micropterus dolomieu*), are becoming increasingly popular with anglers. Largemouth bass tend to favor clear lakes with abundant aquatic vegetation, and they can tolerate quite warm water temperatures. Smallmouth bass often are found in rivers with suitable gravel or rubble for spawning that are warmer than those that support trout (Minnesota DNR 2016l). Carp and minnows occupy a variety of habitats, including coldwater and warmwater environments (Cornell 2016), and several are listed as SGCN. The common carp (*Cyprinus carpio*) and a number of Asian carp species are invasive fish. The white bass (*Morone chrysops*), important for sport fishing due to its size and abundance, occurs in rivers, tributaries, and reservoirs, as well as in several lakes (Minnesota DNR 2016m). The yellow bass (*Morone mississippiensis*) is found in the Mississippi River backwaters below Lake Pepin (Minnesota DNR 2016m).

6.3.4.2.2 Wildlife and Wildlife Habitat

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the wildlife and wildlife habitat ROI for these route alternatives reflect the current state of resources in the environment. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Wildlife Habitat in the Project Area

Northern Minnesota is relatively undeveloped, with large expanses of protected lands that are home to many species of wildlife. The Applicant's preferred route and route alternatives would cross 10 broad-scale vegetation cover classes: evergreen forest, deciduous forest, mixed forest, scrub/shrub, grassland/herbaceous, hay/pasture, cultivated crops, woody wetlands, emergent herbaceous wetlands, and barren land (Homer et al. 2015). Each of these cover classes is defined in Table 6.3.3-1. In general, the Applicant's preferred route and the route alternatives occur within ecoregions with forested uplands, forested wetlands, non-forested wetlands, prairie/grasslands, and agricultural areas.

Forested uplands, including evergreen, deciduous, or mixed forests, typically exhibit closed canopies, dense understories, large trees, and downed trees. These areas are important habitat components for a variety of birds, salamanders, white-tailed deer (*Odocoileus virginianus*), and large carnivores such as gray wolves (*Canis lupus*) and black bears (*Ursus americanus*).

The scrub/shrub cover class includes shrub and young trees less than 5 meters tall, and includes vegetated areas in an early successional stage or trees stunted from environmental conditions (Homer et al. 2015). These habitats support white-tailed deer, small mammals, reptiles, and several bird species (e.g., ruffed grouse [*Bonasa umbellus*], American woodcock [*Scolopax minor*])

Grasslands and prairies are typified by large open areas with grasses and flowering plants dominating, which provide habitat for many species of pollinators, songbirds, small mammals, snakes, deer, coyotes (*Canis latrans*), and red fox (*Vulpes vulpes*).

Agricultural lands, including hay/pasture and cultivated crops, attract white-tailed deer, sandhill cranes (*Grus canadensis*), trumpeter swans (*Cygnus buccinator*), and wild turkeys that come to feed on crops.

Emergent herbaceous wetlands, such as marshes, and woody wetlands are permanently or periodically inundated with water and provide habitat for amphibians and reptiles, aquatic insects, aquatic mammals such as muskrats (*Ondatra zibethicus*), and many species of birds. Calcareous fens are a type of wetland that support unique plant and animal species (see Section 6.3.1.3).

Barren land includes areas where vegetation accounts for less than 15 percent of the total cover. It may include areas of exposed bedrock, rock slides, glacial debris, strip mines, gravel pits, and other accumulations of earthen material (Homer et al. 2015). These areas provide minimal habitat for wildlife. However, reptiles (e.g., snakes) and small mammals may find shelter in between rocks.

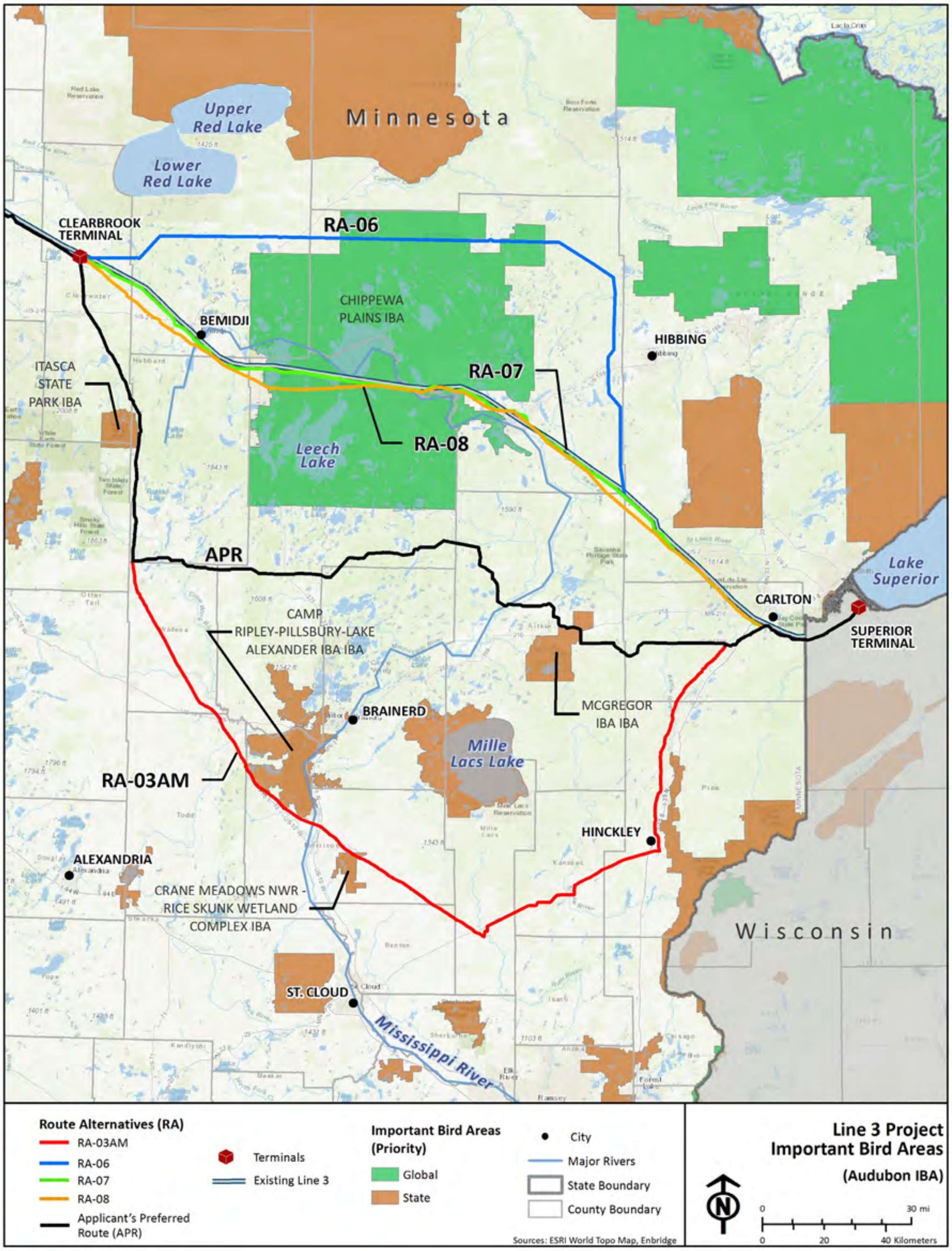
<u>Management Units</u>

Wildlife conservation lands (described in Section 6.3.4.1.2) that occur along or near the Applicant's preferred route are listed in Table 5.2.4-3. The Applicant's preferred route and route alternatives cross a variety of Minnesota DNR wildlife management and conservation areas, including WMAs, wildlife refuges, state forests, and recreation areas. Minnesota's WMAs are established to protect lands and waters that have productive habitat for fish and wildlife, as well as fish- and wildlife-oriented recreation (e.g., hunting, fishing, and bird watching). WMA managers actively plant food plots, restore native plants and wetlands, conduct prescribed burns, and manipulate water levels to provide habitat for game species such as deer, bear, small game, forest upland birds, and waterfowl.

<u>Audubon Important Bird Areas</u>

IBAs in the vicinity of the Applicant's preferred route and route alternatives are shown in Figure 6.3.4-4 and include the following:

- Itasca State Park IBA – This state priority IBA supports 222 species of birds. Itasca's extensive stands of boreal forests with mixed hardwoods provide excellent habitat for many northern birds such as crossbills (*Loxia* spp.), gray jays (*Perisoreus canadensis)*, finches (*Fringillidae*), thrushes (*Turdidae*), black-backed woodpeckers (*Picoides arcticus*), and warblers (*Parulidae*). Over 20 species of nesting warblers and multiple breeding pairs of bald eagles are supported by the park.
- McGregor IBA – This state priority IBA contains various habitats to support many bird species including wetlands, lowland forests, upland deciduous forests, open brushlands, and open grasslands. Species that use the IBA for nesting include, but are not limited to, the American bittern (*Botaurus lentiginosus*), yellow rail (*Coturnicops noveboracensis*), sora (*Porzana carolina*), black tern (*Chlidonias niger*), sandhill crane; 12 species of warblers; the trumpeter swan; bald eagle; American woodcock (*Scolopax minor*); wood thrush (*Hylocichla mustelina*); black-billed cuckoo (*Coccyzus erythropthalmus*); LeConte's sparrow (*Ammodramus leconteii*); and bobolink (*Dolichonyx oryzivorus*). The site is also known for the large number of ring-necked ducks (*Aythya collaris*) it supports during migration.



Source: Audubon 2016.

Figure 6.3.4-4. Audubon Important Bird Areas near the Applicant's Preferred Route and Route Alternatives

- Camp Ripley-Pillsbury-Lake Alexander IBA – This state priority IBA supports the greatest known concentration of nesting red-shouldered hawks (*Buteo lineatus*, a state listed Special Concern Species) in the state. Habitat consists of relatively large blocks of upland deciduous and riparian forests. In addition, 228 species of birds have been documented here since monitoring started in 1991, including 28 species of warblers (and one of the most northerly reports of the hooded warbler [*Setophaga citrina*]). Other listed species that occur in this IBA include the bald eagle, trumpeter swan, yellow rail, and Louisiana waterthrush (*Parkesia motacilla*). Other important features within this IBA are the 21 miles of the Mississippi River and 27 miles of major tributaries (Crow Wing and Gull Rivers), that provide important riparian corridors and migration pathways.
- Chippewa Plains IBA – This global priority IBA is a vast area of large lakes (Winnibigoshish, Leech, Cass, and Pokegama), rivers, and streams, as well as large tracts of upland and lowland forests. The Mississippi River, which flows through the IBA, provides a large river ecosystem complemented by smaller river systems throughout the IBA. Chippewa Plains is important for migrating waterfowl, with 160,000 ring-necked ducks and 30,000 lesser scaup (*Aythya affinis*) recorded in 2011. Nesting waterbirds include the ring-billed gul (*Larus delawarensis*), herring gull (*Larus argentatus*), American white pelican (*Pelecanus erythrorhynchos*), common tern (*Sterna hirundo*), and Caspian tern (*Hydroprogne caspia*).
- Crane Meadows National Wildlife Refuge (NWR)-Rice Skunk Wetland Complex IBA – This state priority IBA consists mostly of lowland grass and brush, with limited upland wooded areas of aspen and oak. Rice-Skunk WMA is characterized by oak woods, lowland aspen, and brush emergent wetlands, and lowland grasses. This IBA is important for migrating waterfowl, nesting waterbirds (great blue herons [*Ardea herodias*], American bitterns, and least bitterns [*Ixobrychus exilis*]), and both breeding and migrating populations of sandhill cranes.

Wildlife in the Project Area

Wildlife species present would be similar along both the Applicant's preferred route and the route alternatives. The species that could be present are described below. The Project region supports a diversity of wildlife, including mammals, birds, amphibians, reptiles, and invertebrates. Mammals include both game species (species that are hunted or trapped such as big and small game animals and fur-bearing animals) and nongame species (small mammals and non-hunted species). Birds present are both resident and migratory, and include game species (waterfowl and upland birds) and nongame species (see Table 5.2.4-5). Amphibians and reptiles include frogs, toads, salamanders, snakes, lizards, and turtles. Invertebrates include a wide variety of insects as well as mollusks.

<u>Mammals</u>

Large Mammals and Big Game

The white-tailed deer is the most common big game animal occurring along the pipeline routes. Deer occur throughout the Project region and are an ecologically, socially, and economically important species. White-tailed deer inhabit a wide variety of habitats and are highly adaptable. Croplands, grasslands, shrublands, orchards, woodlands, and residential areas provide foraging and resting areas for deer. White-tailed deer eat a varied diet that may include acorns, corn, soybeans, mushrooms, grasses, tree leaves, buds, twigs and bark, wild grapes, apples, and assorted shrubs. During winter, deer often aggregate or "yard" in forested stream bottoms and other areas protected from heavy snows. Wolves, coyotes), bears, and bobcats (*Lynx rufus*) are natural predators of deer. White-tailed deer are hunted for sport and meat, and permits are available for hunting using firearms (e.g., shotgun, rifle), muzzleloaders, or archery (e.g., bow and arrow).

Black bears are another big game mammal that occur in the Project region. Black bears occur mainly in the northern third of Minnesota but range as far south as the interface between the forested and agricultural areas (Minnesota DNR 2016i). There are roughly 20,000 black bears in Minnesota (Minnesota DNR 2016n). Black bears are generally found in forests, swamps, and other areas with dense cover, but they also venture into clearings to feed. Black bears feed primarily on new plant growth in spring, switching to ants and ant pupae and a variety of berries in summer, and nuts (acorns and hazelnuts) in autumn. Black bears supplement their diets with corn and other crops, bird eggs, honey, and deer fawns opportunistically. Black bears are hunted for their meat and fur, and most bears are harvested in coniferous areas of northeast Minnesota. Sport hunting is their main source of mortality. Minnesota hunters harvest an average of about 3,000 black bears annually (Minnesota DNR 2016n).

While elk are managed as a game species in many states; only two small remnant populations are present in Minnesota, and elk are listed as a Species of Concern in the state. Elk once were distributed throughout Minnesota, but the native woodland (*Cervus elaphus anadensis*) and prairie (*C. e. manitobensis*) subspecies were nearly extirpated from the state by the early 1900s because of excessive hunting during the 1800s. In the early 1930s, captive-bred elk were used to reestablish a population in northwest Beltrami County. Since then, a second elk herd has become established in Kittson and Roseau counties near the border with Manitoba, Canada. This northern herd is believed to include individuals that have naturally emigrated from Canada, North Dakota, and the original Beltrami County reintroduced herd (Minnesota DNR 2016o). Elk prefer a diet of grasses and forbs, but their diet varies by season. Elk will browse on willow (*Salix* spp.), aspen (*Populus* spp.), and other woody vegetation, and will consume many agricultural crops. Wolves, coyotes, black bears, and cougars (*Puma concolor*) are natural predators of elk. Elk hunting is conservatively managed in Minnesota. Each year, a limited number of licenses are offered to Minnesota residents to hunt elk. Hunters are selected using a lottery system. In 2014, 1,167 hunters applied for a license, but only nine permits were issued and six elk ultimately were harvested (Minnesota DNR 2014b).

Moose (*Alces alces*) occur in the Project region in the northwestern and northeastern portions of Minnesota. Moose hunting was permitted in Minnesota in both of these regions until 1997 when it was prohibited in the northwest corner. Hunting continued in the northeast portion of the state until a 2013 aerial survey revealed that the moose population had declined in this area by 52 percent since 2010, after which Minnesota DNR suspended moose hunting indefinitely (Minnesota DNR 2013, 2016p). Moose eat aspen, maple (*Acer* spp.), and cherry (*Prunus* spp.) trees and many kinds of water plants (Minnesota DNR 2016q). Wolves and bears are natural predators of moose.

Cougars, also known as mountain lions or pumas, are rare but could occur within the region. Cougars occurred throughout most of Minnesota prior to European settlement (Minnesota DNR 2016i). Today, they are occasionally observed in Minnesota. Because there is no evidence of a viable breeding population in Minnesota, cougars are not currently tracked in the Minnesota DNR's Rare Features Database. Cougars are not considered a game animal in Minnesota.

Mid-Sized Mammals, Small Game, and Furbearers

The Project region is home to a number of mid-sized mammals, many of which are classified as "small game" in hunting regulations or as furbearers in trapping regulations. Common small game and furbearers that are hunted or trapped in the Project area include the badger (*Taxidea taxus*), beaver

(*Castor canadensis*), bobcat, coyote, fisher (*Martes pennant*), pine marten (*Martes martes*), red fox, gray fox (*Vulpes* and *Urocyon cinereoargenteus*), mink (*Neovison vison*), muskrat, Virginia opossum (*Didelphis virginiana*), river otter (*Lontra canadensis*), rabbits and hares (*Leporidae*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), squirrels (*Sciuridae*), and weasels (*Mustelidae*). Many furbearers are associated with water and wetlands (e.g., muskrats, mink, otters, and beavers). Rabbits, raccoons, opossums, and coyotes are present in a wide variety of habitats, including croplands, residential areas, hedgerows, and forests. Squirrels require forested habitats with abundant acorn or hickory trees. Mid-sized mammals not traditionally hunted or trapped include the porcupine (*Erethizon dorsatum*) and groundhog or woodchuck (*Marmota monax*).

Small Mammals

Small mammals, including mice, moles, voles, and shrews, are important members of ecosystems. Herbivorous small mammals shape vegetative communities by spreading seeds and grazing. Their burrowing activities and the addition of feces and urine to the soil influence soil chemistry through changes in nutrient and mineral cycling rates and pathways (Hull Sieg 1987). Small mammals such as shrews and bats also function as secondary consumers by preying on invertebrates and other mammals. Small mammals serve as food supply for a large number of predators and can influence predator population cycles. Predators such as foxes and barred owls (*Strix varia*) rely heavily on rodents and other small mammals for food.

Species of small mammals that are likely to occur in the Project area include, but are not limited to, the southern bog lemming (*Synaptomys cooperi*), meadow vole (*Microtus pennsylvanicus*), red-backed vole (*Myodes gapperi*), meadow jumping mouse (*Zapus hudsonius*), woodland jumping mouse (*Napaeozapus insignis*), western harvest mouse (*Reithrodontomys megalotis*), white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), house mouse (*Mus musculus*), star-nosed mole (*Condylura cristata*), and Norway rat (*Rattus norvegicus*) (Minnesota DNR 2016r). Shrews are the smallest mammals in the Project area. Shrews that could occur in the Project region include the pygmy shrew (*Sorex minutus*), short-tail shrew (*Blarina brevicauda*), and masked shrew (*Sorex cinereus*), northern water shrew (*Sorex palustris*), and arctic shrew (*Sorex arcticus*) (Minnesota DNR 2016s).

Bats are important to ecosystems in part because they consume vast numbers of insects, including agricultural pests. Bats occurring in the Project region are primarily forest dwelling or associated with riparian areas and are insectivorous. In summer, the bats roost in trees or in buildings; and in fall migrate to caves to hibernate through the winter. They return to their summer roosting locations in spring. The little brown bat (*Myotis lucifugus*) and big brown bat (*Eptesicus fuscus*) are the most common species in Minnesota. Other species that occur in the Project region include the northern long-eared bat (*Myotis septentrionalis*), hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), and silver-haired bat (*Lasionycteris noctivagans*), and tri-colored bat (*Perimyotis subflavus*). The northern long-eared bat was recently listed as threatened by USFWS (see Section 5.2.5).

Birds

Waterfowl and Gamebirds

All waterfowl and some gamebirds occurring in the Project region are considered migratory birds and are protected under the MBTA (which prohibits the take of any migratory birds without authorization from USFWS). Hunting regulations are developed and authorized by USFWS and state game and fish departments. Waterfowl are harvested primarily in autumn, with some goose seasons occurring in spring. Many waterfowl species breed in or migrate through areas that would be crossed by the

Applicant's preferred route and route alternatives. Important recreational waterfowl include the Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), blue-winged teal (*Anas discors*), and ring-necked duck. Waterfowl habitats include wooded river bottoms, flooded forests, lakes (particularly those with wild rice), rivers, marshes, and flooded grain fields.

Other gamebird species include the American woodcock (*Scolopax minor*), Wilson's snipe (*Gallinago delicate*), mourning dove (*Zenaida macroura*), wild turkey, sandhill crane, greater prairie chicken (*Tympanuchus cupido*), sharp-tailed grouse, and introduced gamebirds such as the ring-necked pheasant (*Phasianus colchicus*) and gray (Hungarian) partridge (*Perdix perdix*).These species occur in areas crossed by the Applicant's preferred route and route alternatives. Refer to Table 5.2.4-4 for a more complete list of gamebird species likely to occur in the vicinity of the Project.

Nongame Birds

The upper Midwest is home to many nongame bird species. Birds are an important part of healthy functioning ecosystems, including forests and prairies, and developed areas such as agricultural, urban, and suburban areas. While a number of bird species are resident or migrate only short distances, many species perform long annual migrations in spring and fall. Minnesota and adjacent states are on the Mississippi Flyway, a key migration flyway for millions of birds and hundreds of species that roughly follows the Mississippi River. Nongame birds occur in all habitat types in the ROI, including coniferous, deciduous, and mixed forests; riparian areas and forested and non-forested wetlands; lakes, rivers, and streams; grasslands, prairies, and pastures; and shelterbelts and agricultural lands. Refer to Table 5.2.4-4 for a more complete list of nongame bird species likely to occur in the vicinity of the Project.

Bald eagles (*Haliaeetus leucocephalus*) once were protected by the ESA. Through the federal government's banning of Dichlorodiphenyltrichloroethane (DDT) and various conservation actions taken across the United States, populations recovered sufficiently, and bald eagles were removed from the endangered species list (delisted) in 2007. However, bald eagles are still protected under the MBTA and the BGEPA. This legislation also protects their nesting structures, which tend to be used for a number of years. Bald eagles nest near lakes and rivers in forested areas where tall, large-diameter trees are available for nesting. Due to a growing population, more eagles have been found nesting in non-typical locations, such as tree lines in agricultural landscapes.

Osprey also were affected by DDT and suffered population declines in the 1960 and 1970s. Their populations have since recovered, and they occur throughout much of the upper Midwest. While osprey used to rely entirely on dead trees for nests, they now also use man-made structures such as powerline poles and communication towers for nesting. Raptor stick nest surveys were conducted within 0.5 mile along the Applicant's preferred route to locate and identify bald eagle and osprey nests between 2014 and 2016. Six active bald eagle nests and one active osprey nest were observed during the most recent survey in 2016 (see Table 5.2.4-5). An additional stick nest was documented in Carlton County, Minnesota; however, the status of the nest and the species using the nest, if any, is not currently known.

<u>Reptiles and Amphibians</u>

Amphibians are four-legged, cold-blooded (meaning they get their warmth from the environment) animals that typically start out as larvae living in water (e.g., tadpoles). The young generally undergo metamorphosis from larva with gills to an adult air-breathing form with lungs. Amphibians use their skin as a secondary respiratory surface; some small terrestrial salamanders and frogs lack lungs and rely entirely on their skin for respiration. Reptiles are cold-blooded animals that can be four-legged, like turtles and lizards, or may have descended from four-legged ancestors, like snakes. Unlike amphibians, reptiles do not have an aquatic larval stage. Many amphibians and reptiles move between aquatic and terrestrial habitats; consequently, they are major links in the flow of energy between these habitats.

Amphibians and reptiles commonly occurring in and around wetlands, lakes, ponds, and rivers in the project region include turtles such as the snapping turtle (*Chelydra serpentine*), painted turtle (*Chrysemys picta*), map turtles (*Graptemys* spp.), and the spiny softshell turtle (*Apalone spinifer*a); frogs that are highly aquatic as adults such as the green frog (*Lithobates clamitans*) and mink frog (*Lithobates septentrionalis*); aquatic salamander species such as the eastern newt (*Notophthalmus viridescens*) and common mudpuppy (*Necturus maculosus*); and snakes, including the brown snake (*Storeria dekayi*) and northern watersnake (*Nerodia sipedon*). Amphibians and reptiles that are more likely to be associated with grasslands, prairies, and agricultural areas in the Project region include hognose snakes (*Heterodon* spp.), garter snakes (*Thamnophis* spp.), and the smooth green snake (*Opheodrys vernalis*), prairie skink (*Plestiodon septentrionalis*), and Great Plains toad (*Anaxyrus cognatus*). Amphibians and reptiles associated with forested habitats in the Project region include treefrogs (*Hyla* spp.), the spring peeper (*Pseudacris crucifer*), American toad (*Anaxyrus americanus*), and salamanders (*Ambystoma* spp.).

Invertebrates

Invertebrates are an essential component of the food chain in many ecosystems. Many hundreds of species of invertebrates occur within the aquatic, wetland, and upland areas that would be crossed by the Applicant's preferred route and route alternatives. Notable groups of aquatic insects include mayflies (Ephemeroptera), caddisflies (Trichoptera), dragonflies and damselflies (Odonata), and midges and mosquitoes (Diptera). Other aquatic invertebrates include mollusks such as native mussels (Palaeoheterodonta), snails (Gastropoda), and crayfish (Astacidea). Commonly seen upland invertebrates include bees, ants, and wasps (Hymenoptera); ladybugs and other beetles (Coleoptera); butterflies and moths (Lepidoptera); grasshoppers, katydids, and crickets (Orthoptera); cicadas, leafhoppers and other true bugs (Hemiptera); and ticks, spiders, and mites (Arachnida).

6.3.4.3 Impact Assessment

6.3.4.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the fish and wildlife ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Clearing and grading would be required for construction of the pipeline, MLVs, new and expanded pump stations, and cathodic protection sites—as well as for access roads and ATWS, including six pipe yards in Minnesota. Construction activities that may affect fish, wildlife, and their habitats could include clearing, grading, dewatering, trenching, blasting, access road construction, waterbody crossings, surface water withdrawals and discharges (e.g., for hydrostatic testing), fueling and use of hazardous materials, facilities construction, and restoration or reclamation of construction areas.

Fisheries and Aquatic Habitat

Construction of the Applicant's preferred route in Minnesota would require 192 stream crossings, with 111 of those crossings occurring between Clearbrook and Carlton (see Table 6.3.1.2-2). The Applicant's preferred route also crosses streams in North Dakota and Wisconsin; streams outside of Minnesota are discussed in Section 5.2.4. The surface waters crossed support warmwater, coolwater, and coldwater trout fisheries.

Surface Water Crossing Methods and Measures Proposed as Part of the Project

Surface water crossings would be designed as close to perpendicular to the axis of the stream channel as engineering and routing constraints allow to create the shortest possible crossing length. The Applicant would determine and obtain approval for specific crossing methods based on factors such as waterbody size, sensitivity, water levels, soil/sediment stability installation, and anticipated season of installation (Appendix E). The Applicant would cross waterbodies using the most environmentally appropriate and feasible method based on consultation among the Applicant, appropriate regulatory agencies and engineering personnel. Methods that may be used include the wet open-cut method, dry open-cut methods (dam-and-pump and flume), guided bore method, or HDD method. These methods are summarized below:

- The wet open-cut method involves trenching through the waterbody while the water continues to flow through the construction work area. The wet trench method has the greatest potential for impacts on fisheries and aquatic habitat.
- The dam-and-pump method is used to cross sensitive waterbodies with low gradients and low flow or meandering channels. It involves installing temporary dams across the waterbody both upstream and downstream of the crossing location, with pumps and piping used to carry stream flow around the construction area. This method results in less sedimentation and turbidity than the wet open-cut method.
- The flume method can be used on relatively shallow and narrow waterbodies that do not have large rocks or bedrock at the trench line and have a relatively straight channel. Similar to the dam-and-pump method, two dams are used to dry the work area. One or more pipes (flumes) extend the course of the waterbody through both dams, carrying stream flow through the construction area. This method results in less sedimentation and turbidity than the wet open-cut method.
- A guided bore could be used to cross ditches adjacent to roads or railroads. The guided bore method involves digging a pit on each side of the waterbody, boring a tunnel from one pit to the other, and installing the pipe in the tunnel. Dewatering and sheet-piling are needed to maintain the integrity of the excavated pits. This method typically results in no sediment release to surface water.
- HDD involves drilling under the surface water and installing the pipeline without physical disturbance of the surface water. HDD crossings are advantageous because they do not disturb streambeds or streambanks and they maintain stream flow and fish passage. However, they require ATWS on both sides of the crossing, which involves vegetative clearing, soil disturbance, and subsequent restoration activities. This method would be used to cross the most environmentally sensitive areas such as sensitive fishery resources and impaired waters. Unless a release of drilling fluid occurs (see Section 6.3.1.2.3), use of this crossing method would not alter or remove aquatic habitat and would not affect fisheries.

As currently planned, the methods used to cross surface waters for the Applicant's preferred route are listed in Table 6.3.4-5.

Table 6.3.4-5. Number of Stream Crossings by Crossing Type for the Applicant's Preferred Route in Minnesota

Water Type	HDD	Guided Bore	Dry Open Cut	Wet Open Cut	Undetermined	Total
Stream/river – perennial	6	--	23	1	4	34
Stream/river – intermittent	--	1	34	7	30	72
Artificial path	11	--	2	--	2	15
Connector	--	--	1	--	3	4
Canal ditch	2	7	24	8	8	49
Lake/pond – perennial	--	--	--	--	18	18
TOTAL CROSSINGS	**19**	**8**	**84**	**16**	**65**	**192**

Source: Water types from USGS NHD 2016. Also see maps in Appendix A.

Notes:

Stream/river, artificial path, and connector types are the crossing types that are most likely to provide fish habitat.

"--" = no crossing

HDD = horizontal directional drill

To avoid or reduce impacts on fisheries and aquatic habitat during construction, the Applicant would implement the measures described in the Environmental Protection Plan (Appendix E), including the following:

- Prepare a list of waterbodies to be crossed and the type of crossing method to be used for each crossing, as a part of obtaining Section 401/404 permits from USACE for all surface water crossings.
- Comply with the seasonal restrictions and other requirements in the Section 401/404 permits to limit impacts on aquatic resources.
- Complete the crossings as quickly as possible to allow suspended sediment levels to return to preconstruction levels after instream work is completed.
- Cross waterbodies using the most environmentally appropriate and feasible method based on consultation among the Applicant, appropriate regulatory agencies, and engineering personnel. Methods that may be used include the wet open-cut method, dry open-cut methods (dam-and-pump and flume), guided bore method, or HDD method.
- Develop and implement BMPs in collaboration with state and federal agencies to avoid and minimize potential impacts associated with water crossing methods (e.g., use of silt or straw as sediment runoff barriers and use of construction mats to minimize ground pressure and soil compaction).
- Implement erosion and sediment control measures and limit the duration of construction in waterbodies, including the measures listed in Section 1.9 of the Applicant's Environmental

Protection Plan (Appendix E) (e.g., temporary stabilization, erosion control blankets, mulch, cat tracking, and temporary slope breakers).

- Comply with Minnesota DNR guidance on water crossing by avoiding in-water work during the exclusion periods: from September 1 through April 15 or September 15 through April 30 for coldwater fisheries (trout) stream crossings, and from March 15 to June 15 or April 1 to June 30 for coolwater and warmwater fisheries stream crossings, depending on the Minnesota DNR region in which the work occurs.
- Suspend temporary water intake hoses or structures above the stream or lake bottom and equip the intakes with screens or equivalent devices to prevent fish uptake.
- Install trench breakers at all waterbody crossings, as appropriate, to prevent diversion of water into upland portions of the pipeline trench and to keep accumulated trench water out of the waterbody.
- Wash and dry equipment designated for use within waterbodies prior to use; purge and clean all pumps before proceeding from one crossing location to the next if designated noxious weeds or invasive aquatic species (e.g., zebra mussels and Eurasian milfoil) are known to be present in the area. Follow all permit requirements to prevent the spread of invasive species.
- Maintain a 20-foot-wide buffer of undisturbed herbaceous vegetation at all streambanks during the initial clearing and complete any instream trenching within 24 hours of initiation at minor waterbodies and within 48 hours at intermediate or major waterbodies (not including HDD crossings).
- Comply with the measures in the Environmental Protection Plan (Appendix E) to avoid or minimize impacts due to the unanticipated release of drilling fluids used in HDD crossings. These measures include (1) planned response actions if releases of drilling mud were to occur in waterbodies or upland areas; (2) containment, clean-up, and notification procedures; and (3) steps to be taken to restore affected areas.
- Discharge hydrostatic waters in a manner that avoids discharge into surface waters with commercially or recreationally important species, and in compliance with the stipulations of permits required for both intake and discharge. This would include seasonal restrictions and limitations associated with infested waters.

General Potential Impacts on Fisheries and Aquatic Habitat due to Surface Water Crossings

Increased Sedimentation. Construction of the Applicant’s preferred route would require clearing of vegetation from the construction work area (more information below about impacts of structure removal). Removal of large trees and other woody vegetation near waterbodies would result in loss of shading, nutrients, and habitat features for fish at waterbody crossings. In addition, this change in streambank features would alter aquatic habitats used by fish for cover, spawning, and foraging. Loss of riparian cover can result in increased water temperatures, which can be detrimental to coldwater species such as trout or salmon. The amount of vegetation that would be permanently removed adjacent to surface waters would be restricted to the permanent right-of-way at waterbody crossings, and streambanks would be restored with vegetation. Revegetation would take longer for forested areas in the construction work areas adjacent to the permanent right-of-way as compared to prairie or agricultural areas. Therefore, vegetation clearing for construction of the Applicant’s preferred route in grassy or agricultural streambank areas would result in indirect, short-term, negligible to minor impacts on fisheries and aquatic habitats; impacts in forested or other woody streambank areas would be long term and minor to major, depending on existing surface water conditions. Removal of vegetation along waterbodies also can create conditions for bank destabilization and further erosion, which would result in direct temporary to short-term minor impacts on species residing in the immediate vicinity while the Applicant undertakes measures to stabilize the banks. For example, erosion can suffocate eggs and other aquatic species.

As a part of the crossing construction process, river beds and streambeds would be restored to preconstruction condition, with no impediments to water flow anticipated, and streambanks would be restored to preconstruction grades when practicable. If the slope of the bank is determined to be unstable, it would be reshaped to prevent slumping. The use of open-cut crossings during pipeline construction would result in short- to long-term minor impacts on channel morphology and stability (see Section 6.3.1.2), which in turn would result in short-to long-term minor impacts on fisheries and aquatic habitats.

The wet open-cut crossing method would result in greater amounts of sedimentation than the other methods. As currently planned, only 16 of the surface water crossings would be accomplished using the wet open-cut method. Crossings using the dam-and-pump and flume methods would increase sedimentation, but less than if using the wet open-cut method. The guided bore and HDD methods would not result in increased sedimentation if conducted successfully. However, if a frac-out were to occur, the consequences can be major because of the release of materials into already sensitive or impaired waters (more information about frac-outs below).

Increased sedimentation and turbidity can degrade aquatic habitat by filling in inter-gravel spaces and pool habitats, which reduces spawning habitat, rearing habitat, and benthic invertebrate production. Reduced productivity of aquatic invertebrates can result in reduced food available for insectivorous fish. Mussels are particularly vulnerable to suffocation from instream construction activities. Fine sediments introduced by these processes can suffocate fish eggs and newly hatched larvae living in gravel, resulting in reduced survival. In addition, sediments can abrade the sensitive gill membranes of young and adult fish, resulting in injury or death; and can reduce the ability of fish to locate prey or escape predation, leading to increased energy expenditure for foraging and increased mortality. Large concentrated sediment plumes can cause sediment accumulation within the gills of young and adult fish, which can lead to suffocation and increased mortality of fish that are not able to move away from sediment plumes fast enough to find refuge.

Disturbed areas at crossings would be restored and stabilized as soon as practical after pipeline installation. (Section 6.3.1.2.3 identifies erosion and sedimentation control measures that would be implemented during and after open-cut crossings and describes the potential impacts on surface water quality and sedimentation that could result from each crossing method.) The increase in sedimentation is expected to be minor, and the impact on fisheries and aquatic habitat from increases in sedimentation associated with surface water crossings would be temporary to short term and minor. With successful use of the guided bore or HDD crossing methods, sedimentation would not increase and fisheries and aquatic habitats would not be affected. If a frac-out were to occur, the impacts would be short term to long term and major.

Removal of Large Instream Structures. At some surface water crossings, large in-water structures (e.g., large woody debris and boulders) may need to be removed during construction of the crossing. These structures would be replaced after completion of the crossing, and stream hydrodynamics would transport sediments from upstream to the disturbed area until equilibrium is reestablished. This construction activity would result in a temporary to short-term, negligible to minor impact on aquatic habitat.

Direct Impacts on Fisheries. Trenching and backfilling, damming, and other instream construction activities could result in direct or indirect injury or mortality of fish. Mussels are particularly vulnerable to crushing from instream construction activities. However, fish likely would respond to the increased instream activities by leaving the construction area and avoiding direct impacts. Small fish species and juvenile individuals of larger fish species may be injured or killed by entrainment, which results when a fish gets trapped within hoses or pipes being used to dewater construction areas or divert surface waters around construction areas. Fish entrainment can be reduced by screening the ends of pipes and pump hoses, smaller fish may still be injured or killed by being impinged, trapped against, the screening due to suction and water pressure. The potential direct impacts of instream construction on aquatic species would be temporary and minor.

Leaks or Small Spills. Spills and leaks of fuel or other hazardous liquids could occur during vehicle and equipment operation, during refueling and lubricating of construction equipment, and from leaks from storage containers or equipment working in or near streams. To protect surface water resources, NPDES permits would require secondary containment of hazardous materials, prohibition of engine degreasing at work sites, containment and collection of liquid and solid wastes, and a spill prevention and response plan for fueling and maintenance of vehicles. The Applicant would store petroleum products, hazardous chemicals, and lubricating oils; conduct refueling, maintenance, and lubricating operations; and perform concrete coating activities in upland areas more than 100 feet from surface waters (Appendix E). Although these and other similar measures would be implemented (see Section 6.3.1.2 for additional details), small leaks or spills could reach surface waters and would alter water quality in the area of the release and for short distances downstream. Because such releases would likely be small and rapidly dispersed, the impacts on fisheries and aquatic habitats are expected to be temporary to short term and minor.

Potential impacts on fisheries and aquatic habitats from an unanticipated release of crude oil are discussed in Chapter 10.

Unanticipated Release of Drilling Fluids. For HDD crossings, there is a risk of escape of drilling fluids (frac-out) into rivers at crossings. During drilling, fluid (water, bentonite clay, and possible additives) is circulated through the drilling pipe to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. The potential exists for an inadvertent release or “frac-out” of this drilling fluid to occur when pressurization of the drill hole is beyond the containment capability of the overburden soil material, which would allow the drilling fluid to flow to the ground or river bed surface. Although bentonite clay is non-toxic, drilling mud can smother aquatic wildlife and increase turbidity in affected surface waters. The consequences of a frac-out are amplified in waters where this technique is used, because these waters are already identified as sensitive or impaired. Additives may be mixed with the drilling fluids/mud for viscosity or lubricating reasons. Only non-hazardous additives approved by Minnesota PCA under permit conditions would be used, and a Material Safety Data Sheet for the drilling fluid would be maintained onsite. If a frac-out occurred near the streambank, bank stability may be compromised. Construction personnel would monitor the crossing to detect releases of drilling mud.

The HDD operator would constantly monitor drilling fluid pressures during pilot hole operations and, if a loss in fluid pressure or circulation was identified, the operator would notify onsite construction observers who would visually monitor the portion of the drill path where the drill tool is located to determine whether a drilling mud release occurred. If a release occurred, the Applicant would implement containment, response, and clean-up procedures as outlined in the Environmental Protection Plan (Appendix E) to limit the potential for drilling mud to reach surface water. These procedures include containment using straw bales, sandbags, pumps, and hoses, vacuum trucks; response activities, including adjusting drill rates and pump volumes or stopping drilling, removal of mud with pumps and appropriate storage away from the waterbody prior to disposal; and coordination with appropriate agencies to discuss additional containment or clean-up requirements. If a frac-out occurred and went undetected or was not quickly contained, impacts on surface water quality as well as on fisheries and aquatic habitat could be long term and major. However, with implementation of the Applicant-proposed measures to respond to a drilling mud release during HDD construction, the impact of a release could be short term to long term and major, depending on the nature of the release and resources near the location of the crossing.

Hydrostatic Test Water Withdrawal and Discharge. The Applicant would withdraw water for hydrostatic testing, dust control, trench dewatering, and HDD installation. Hydrostatic testing would require approximately 11 to 17 million gallons of water for each construction spread that would be obtained from lakes, streams, or groundwater wells. The Applicant is currently evaluating transferring water from one test section to another in order to minimize the total quantity of water needed to complete the hydrostatic test. The volume of water appropriation needed for dust control, trench dewatering, and HDD installation has not been determined. Prior to construction, the Applicant would obtain a water appropriation permit from Minnesota DNR.

Withdrawals from surface waters for construction could result in entrainment of small fish, eggs, and macroinvertebrates during extraction; however, intakes would be equipped with a screen or equivalent device to prevent uptake of aquatic species. Smaller fish and invertebrates may still be injured or killed by being impinged, trapped against, the screening due to suction and water pressure. Spawning fish could be displaced through decreased water levels, fish eggs could desiccate if water levels drop too low, or eggs may experience delayed development due to impaired water quality. Larval and juvenile fish could be affected through entrainment during water withdrawal, decreased survival under conditions of poor water quality, and reduced prey availability.

As stipulated in permit requirements, the Applicant would select appropriation sites that would meet Minnesota DNR’s criteria of “doing no harm,” and all appropriation sites would be reviewed by Minnesota DNR prior to issuance of a water appropriation permit. The permit requires that water withdrawals have a minimal potential for impacts on groundwater resources and must not adversely affect trout streams, calcareous fens, or other significant environmental resources. If water is withdrawn from surface water, hose intakes would be equipped with screens to prevent entrainment of aquatic species, and adequate waterbody flow rates and volumes would be maintained to protect aquatic life and allow for downstream uses as required by the water use permit (Appendix E).

Hydrostatic test water would be discharged from a test section in one of two ways: (1) into well-vegetated upland areas using controlled-flow velocity with a dewatering structure such as a silt fence and straw bales or into geotextile filter bags that are used to avoid soil erosion, sediment transport, and bottom scouring; or (2) into the waterbody from which it was withdrawn to prevent the spread of invasive species or degradation in water quality; the discharge rate would not exceed the permitted applicable discharge rate (Appendix E). Water would be treated as specified in the NPDES permit prior to discharge; and the Applicant would monitor pH, dissolved oxygen levels, and any other parameters required by the permit, as described in Appendix D of the Environmental Protection Plan (Appendix E). Discharges would adhere to all conditions set forth in NPDES and water appropriation permits, including discharge over approved energy dissipation measures (e.g., sand bags, plastic sheeting, or natural rock riprap) and the sedimentation control measures as described above. If inter-basin transfers of water occur, there is also the potential to introduce and spread aquatic nuisance species; however, hydrostatic waters would be discharged through a filtering device to the source waterbody and following all requirements of acquired permits. With adherence to water appropriation and NPDES permit conditions, and implementation of the Applicant-proposed measure described above, impacts on fisheries and aquatic habitats from water appropriation and discharge during construction would be temporary and minor

Impacts on Management Units and Managed Species

Aquatic Management Areas. LaSalle Creek would be crossed using the HDD method; this would affect 0.4 acre of the LaSalle Creek AMA. The LaSalle Creek AMA is 28 acres and provides angling opportunities (as described below, LaSalle Creek also is a designated trout stream). This would be the second pipeline to cross this AMA; an existing pipeline crossing is at the southern extent of the AMA. Woody vegetation would be removed from the construction work area during construction and, depending on the crossing method used, the habitat quality of LaSalle Creek adjacent to the crossing location may be reduced. The crossing of LaSalle Creek has the potential to introduce invasive species and result in the loss of habitat and reduction of habitat quality. These impacts are expected to be short term, and negligible to minor as little habitat would be lost in the construction work area and BMPs would be in place to prevent the spread of invasive species.

The Applicant's preferred route would come within 0.5 mile of three other AMAs (Figure 6.3.4-1) but would not directly disturb these areas (Table 6.3.4-6). AMAs represent good-quality aquatic habitats with functional adjacent uplands.

Table 6.3.4-6. Aquatic Management Areas Crossed by or near the Applicant's Preferred Route in Minnesota (acres)

Aquatic Management Area	Construction Work Area[a]	Permanent Right-of-Way[b]	Within 0.5 Mile of Centerline[c]
Blackhoof River AMA	<0.1	<0.1	44.4
LaSalle Creek AMA	0.4	0.2	27.4
Spire Valley AMA	<0.1	<0.1	56.2
Straight River AMA	<0.1	<0.1	16.6
TOTAL	**0.4**	**0.2**	**144.6**

Source: Minnesota DNR 2016h.

[a] Enbridge-provided footprint for construction work area, including additional temporary workspaces and access roads.

[b] Enbridge-provided footprint for permanent right-of-way, including primary access roads, pump stations, and mainline valves.

[c] Acres of Aquatic Management Area (AMA) within 0.5 mile of the centerline of the Applicant's preferred route.

Other Management Units. Thirty-nine sensitive aquatic resources are present within 0.5 mile of the Applicant's preferred route, including 5 lakes rated for Fish IBI, 10 Lakes of Biological Significance, 1 Sentinel Lake, 21 trout streams, 1 trout lake, and 1 lake managed for muskellunge.

The Applicant's preferred route would not cross any of the five lakes rated for Fish IBI that occur within 0.5 mile (Table 6.3.4-7); therefore, no impacts are anticipated. One of the lakes, Portage Lake, also is a designated Sentinel Lake; the construction work area for the Applicant's preferred route would be on the edge of the basin of Portage Lake. BMPs would be in place to prevent erosion or other impacts on this lake during construction. The disturbance area would be restored to preconstruction conditions once the crossing is complete (see Section 6.3.1.2). Little habitat would be lost due to construction, and BMPs would be in place to reduce impacts on aquatic habitats, as described above so the resultant impact is expected to be short term and negligible to minor.

Table 6.3.4-7. Lakes with Fish Index of Biotic Integrity Ranking within 0.5 Mile of the Applicant's Preferred Route in Minnesota

Watershed	DNR Identifier No.	Fish Index of Biological integrity Status
Roosevelt	14175	Exceptional
Island	14798	Exceptional
Waukenabo	13413	Below impairment threshold
Big LaSalle	14298	Exceptional
Portage	15124	Exceptional

Source: Minnesota DNR 2014a.

Note:

Occurrences are within 0.5 mile centered on the Applicant's preferred route (none would be crossed by the route).

Of the 10 Lakes of Biological Significance within 0.5 mile of the Applicant's preferred route (Appendix L, Table L-2), 8 are classified as outstanding. Construction of the Applicant's preferred route could result in the introduction of invasive species, loss of high-quality habitat, and reduction of habitat suitability for special-status species. However, the impacts would be indirect and short term and negligible to minor, because little habitat would be removed and BMPs would be in place to prevent the spread of invasive species.

No hatcheries are within 0.5 mile of the Applicant's preferred route, and none are immediately downstream of a water crossing for the Applicant's preferred route. The nearest hatchery is the Spire Valley trout hatchery which is located about 0.65 mile upstream of a crossing; the hatchery's water supply is dependent on artesian groundwater quantity and quality. Consequently, construction of the Applicant's preferred route would not affect the hatchery. A discussion of crossings where artesian conditions exist and associated BMPs is provided in Section 6.3.1.1.

Twenty-one trout streams are within 0.5 mile of the Applicant's preferred route; the Applicant's preferred route crosses six of those trout streams (Table 6.3.4-8). One trout lake (Marion Lake in Cass County) is within 0.5 mile of the Applicant's preferred route but is not within the construction work area.

Trout streams are sensitive to erosion, sedimentation, and changes to riparian vegetation in areas adjacent to the streams because those habitats provide shade and cooling. Pipeline construction could alter groundwater connectivity or flow, resulting in warming of the stream and reduced habitat suitability for trout and their invertebrate prey. Trout streams may have groundwater discharge zones or wetland seepage areas on hillsides or slopes with deep organic soils that could be disrupted during construction. Destabilization of these soils could result in long-term increases to nutrients and sediments in the streams. Removal of vegetation along small trout streams could result in less large woody vegetation in the stream. However, riparian vegetation would be removed only from the construction work area adjacent to the trout stream and only if either wet or dry open-cut crossing methods are used. If HDD methods are used for crossing clearing of vegetation could be limited to the 50-foot permanent right-of-way. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way, which could lead to permanent major thermal effects on trout streams. If tributaries to trout streams are crossed, some downstream impacts from sedimentation could occur, depending on the distance to the trout stream. The Applicant's preferred route would cross the Moose Horn River downstream of a protected trout stream and upstream of a tributary (King Creek) to a protected trout stream. As noted in Section 6.3.1.1, the impacts of sedimentation on surface water crossings and the impact of pipeline crossings on water quality along the Applicant's preferred route would be temporary to short term and minor. As a result of these considerations, and with selection of the most appropriate crossing method and implementation of appropriate BMPs, the impacts on trout streams from construction of the Applicant's preferred route would be permanent to short term and minor to major, depending on the crossing.

Table 6.3.4-8. Number of Trout Streams Crossed by or near the Applicant's Preferred Route in Minnesota

Trout Streams – Kittle Name (Kittle Number)	Milepost	Construction Work Area[a]	Permanent Right-of-Way[b]	Within 0.5 Mile of Centerline[c]
Blackhoof River (S-001-003)	MN 408.1	1	1	1
King Creek (M-050-046-029-023)	MN 344.2	1	1	1
LaSalle Creek (M-163)	MN 171.4	--	--	1
LaSalle Creek (M-163)	MN 171.7	1	1	1
Pine River, South Fork (M-106-013)	MN 232.7	--	--	1
Spring Brook (M-106-004-002-001)	MN 265.3	1	1	2
Straight River (M-096-035-002-002)	MN 198.3	1	1	1
Unnamed stream (M-050-046-029-023-002)	MN 344.8	--	--	1
Unnamed stream (M-050-046-029-029)	MN 406.3	--	--	1
Unnamed stream (M-106-013-008)	MN 232.4	--	--	1
Unnamed stream (S-001.9-009)	MN 313.4	--	--	1
Unnamed stream (S-001.9-011)	MN 364.2	--	--	1
Unnamed stream (S-001-003-027.8)	MN 408.1	--	--	1
Unnamed stream (S-001-003-028)	MN 352.1	--	--	1
Unnamed stream (S-001-003-029)	MN 352.3	1	1	1
Unnamed stream (S-001-003-030)	MN 352.7	--	--	1
Unnamed stream (S-001-003-030-001)	MN 408.7	--	--	1
Unnamed stream (S-001-003-030-001-B001)	MN 408.8	--	--	1
Unnamed stream (S-002-008-001)	MN 339.9	--	--	1
Unnamed stream (S-002-008-001-005)	MN 361.8	--	--	1
TOTAL		**6**	**6**	**21**

Table 6.3.4-8. Number of Trout Streams Crossed by or near the Applicant's Preferred Route in Minnesota

Trout Streams – Kittle Name (Kittle Number)	Milepost	Construction Work Area[a]	Permanent Right-of-Way[b]	Within 0.5 Mile of Centerline[c]

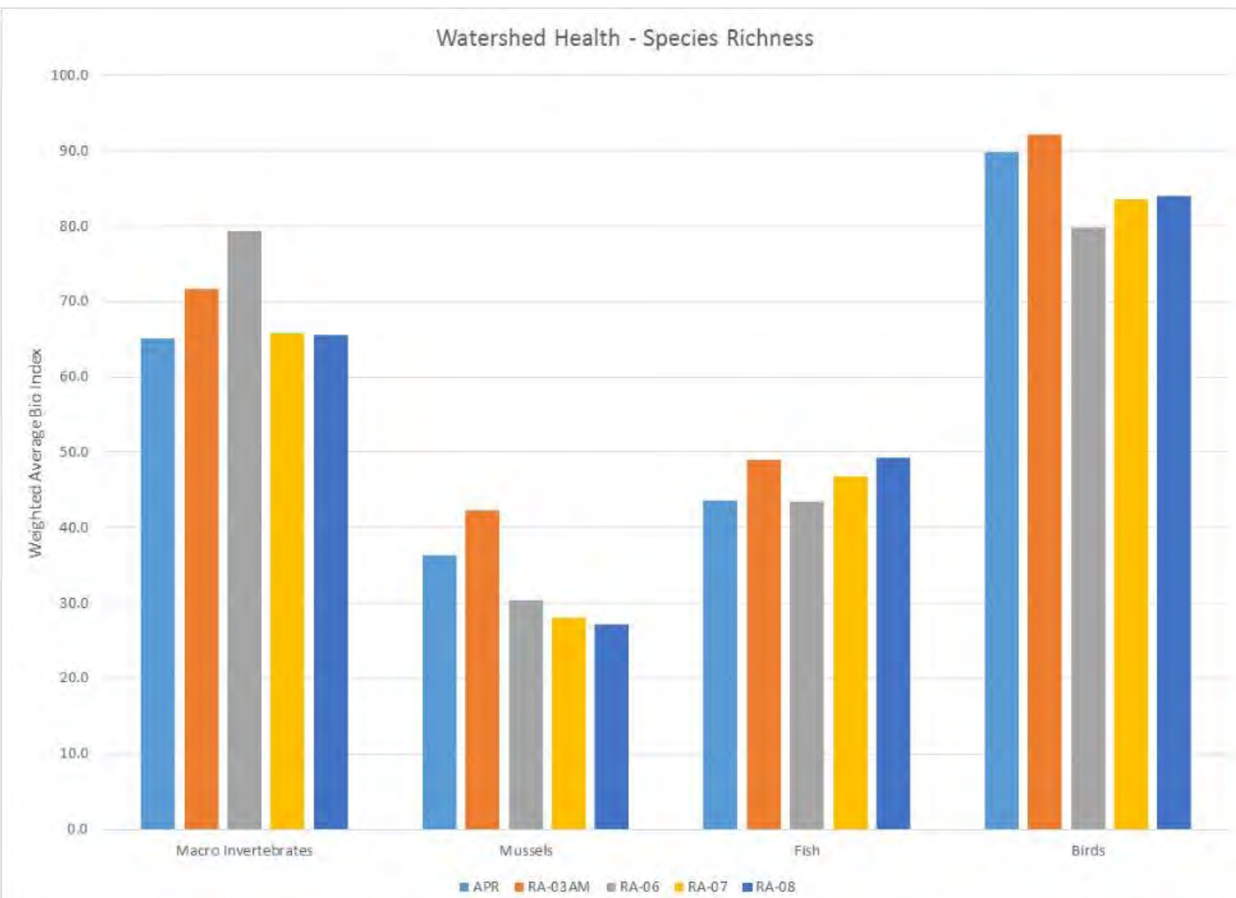
Source: Minnesota DNR 2015a.

[a] Enbridge-provided footprint for construction work area.

[b] Enbridge-provided footprint for permanent right-of-way.

[c] Number of trout streams within 0.5 mile of the centerline of the Applicant's preferred route.

Minnesota PCA's Watershed Health Assessment parameters for species richness, stream species quality, and habitat quality and connectivity were compared for the Applicant's preferred route and RA-03AM, RA-06, RA-07, and RA-08 between Clearbrook and Carlton using the data in Figures 6.3.4-5, 6.3.4-6, and 6.3.4-7. No clear consistent trends distinguished among the potential routes, although in some instances, one alternative scored higher than the others for some individual indices.



Source: Minnesota DNR 2016f.

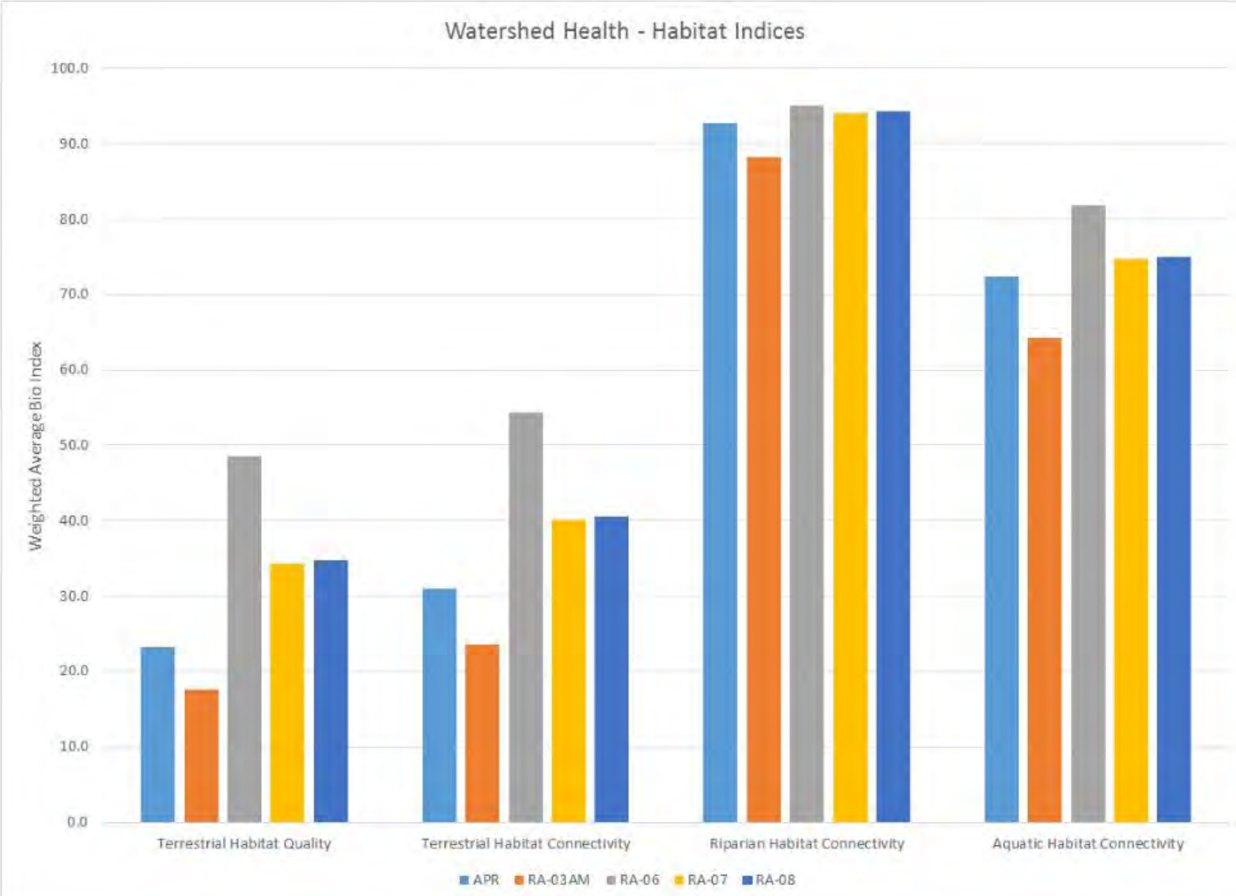
APR = Applicant's preferred route, RA = route alternative

Figure 6.3.4-5. Weighted Average Species Richness Indices for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Source: Minnesota DNR 2016f.

APR = Applicant's preferred route, RA = route alternative

Figure 6.3.4-6. Weighted Average Stream Species Quality Indices for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton



Source: Minnesota DNR 2016f.

APR = Applicant's preferred route, RA = route alternative

Figure 6.3.4-7. Weighted Average Habitat Quality and Connectivity Indices for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Wildlife and Wildlife Habitat

General Potential Impacts

Construction would include clearing and grading of the construction work area, ATWS, temporary and permanent access roads, and the sites of MLVs, new and expanded pump stations, and cathodic protection sites. Other construction activities that could affect wildlife and wildlife habitats include trenching, dewatering, blasting, waterbody crossings, surface water withdrawals and discharges (e.g., for hydrostatic testing), fueling and use of hazardous materials, facility construction, and restoration or reclamation of temporary construction areas. Wildlife may be affected directly by construction activities or indirectly from disturbances caused by human activity and noise associated with construction activities. Although only a narrow band of habitat would be directly altered by construction, indirect effects would occur over a wider area

As noted above, the Applicant would incorporate measures into the Project to avoid or minimize construction impacts on fisheries and fisheries habitat, and many of those measures would help to avoid or minimize impacts on wildlife and wildlife habitats. In addition to the fishery-related measures, the Applicant would implement the following measures to avoid or reduce impacts on wildlife and wildlife habitats:

- Confine clearing activities to the approved construction work areas and adhere to erosion control specifications to minimize impacts on vegetation, aquatic resources and wildlife.
- Fell trees toward previously cleared construction areas to prevent damage to adjacent trees.
- Upon completion of pipeline installation and backfilling and construction of facilities, revegetate disturbed areas in accordance with the Environmental Protection Plan (Appendix E) unless otherwise directed by landowners or land management agencies.
- Restore cleared areas and reseed with an appropriate seed mix (e.g., Minnesota BWSR-approved mixes) to minimize the duration of vegetative disturbance. Where appropriate, this seed mix could be used to provide a food source for wildlife.
- Slope the ends of open trenches to provide ramps for wildlife that fall into the trench (e.g., small animals such as rodents, amphibians, and snakes) to be able to escape.
- Handle, store, and dispose of food and general waste generated during construction to reduce attraction for opportunistic scavengers such as raccoons, crows, and gulls that could prey on other wildlife in the area.
- Handle, store, and dispose of all solid waste and hazardous materials in accordance with stipulations of permits and as presented in the Environmental Protection Plan.

Construction of the Applicant's preferred route would result in clearing of 1,696 acres of evergreen, deciduous and mixed forested habitats as well as 1,665 acres of cultivated crops (Table 6.3.4-9). Forest and cultivated crops represent approximately 66 percent of the total vegetation affected by construction of the Applicant's preferred route. Additionally, 604 acres of woody and emergent herbaceous wetlands would be disturbed by construction.

Table 6.3.4-9. Vegetation Cover Removed for the Applicant's Preferred Route in Minnesota (acres)

Vegetation Cover Class	Con[a]	Op[b]	ATWS[c]	Access Roads	Pump Stations	MLVs[d]	Total[e]	
							Con	Op
Evergreen forest	175.8	70.7	18.2	18.6	0.5	0.5	198	86
Deciduous forest	1,349.2	594.0	96.8	102.6	2.4	2.1	1,477	670
Mixed forest	18.2	7.8	1.4	2.3	--	--	20	10
Scrub/shrub	225.8	111.5	15.2	13.1	2.1	--	243	125
Grassland/herbaceous	129.8	62.1	32.4	8.7	3.5	0.2	164	73
Hay/pasture	577.2	258.7	120.7	45.4	15.7	1.2	699	320
Cultivated crops	1,335.5	574.6	326.9	22.3	20.1	1.8	1,665	617
Woody wetlands	336.0	169.6	17.7	13.0	3.0	0.5	355	185
Emergent herbaceous wetlands	229.2	122.4	18.9	7.1	3.0	0.1	249	132
Barren land	3.6	1.7	8.1	0.6	--	--	12	2
TOTAL	**4,380.3**	**1,973.2**	**656.2**	**233.8**	**50.2**	**6.6**	**5,082**	**2,220**

Source: Homer et al. 2015.

[a] Con = Enbridge-provided footprint for construction work area.

[b] Op = Enbridge-provided footprint for permanent right-of-way.

[c] ATWS = additional temporary workspaces (also pipe yards).

[d] MLVs = mainline valves, including valve pad and driveways.

[e] Con = Sum of Enbridge-provided construction work area, ATWS including pipe yards, and temporary access roads; Op = Sum of Enbridge-provided pipeline permanent right-of-way, primary access roads, pump stations, and MLVs (including valve pads and driveways).

Notes:

Values in table may not sum to subtotals and totals due to rounding.

"--" = no occurrence

The areas cleared would remain clear of brush, trees, and vegetation until restoration is completed. This would result in the loss of habitat for some species, including those species that use tree and shrub habitats for cover, forage, and nesting. The effects on wildlife habitat generally would be short term and minor, except in areas where woody vegetation is removed or wetlands affected. In those areas, the impact would be long term to permanent and minor to major, because of the long recovery period for forested areas and the sensitivity of wetlands to disturbance. Woody vegetation would be permanently excluded from the permanent right-of-way of the pipeline but would be allowed to recover in the construction work area outside of the permanent right-of-way. This loss of habitat would affect small mammals, amphibians, reptiles, and other small animals to a greater extent than large animals (e.g., deer and large birds), which have larger territories and can avoid the active construction areas. Therefore, the impact on wildlife from the loss of habitat would range from temporary to permanent and minor to major for small wildlife species, and short term and minor for larger species.

Clearing, grading, trenching, and the use of construction vehicles and equipment would result in direct impacts on some animals, particularly small and mid-sized mammals, reptiles, amphibians, and invertebrates. Members of these species would be affected more than large wildlife because of their relative lack of mobility compared to that of larger animals (e.g., deer and coyotes). Burrows and dens could be destroyed or abandoned during clearing and excavation, resulting in displacement or loss of young, and loss of foraging or cover habitat during rearing seasons. Burrowing animals would be expected to return and recolonize the right-of-way after construction; however, compacted areas, such as temporary work areas, may become less suitable habitat because they would no longer be conducive to burrowing (Lauzon et al. 2002). In addition, nests could be destroyed or abandoned, resulting in loss of eggs and young, and loss of foraging or cover habitat during nesting seasons. Although open trenches would be sloped at the ends, some small animals may become trapped in open trenches and may not survive. As a result of these considerations, it anticipated that the direct impact of these activities on wildlife would be temporary to short term and minor.

Many animals would be temporarily displaced from the active construction areas and adjacent areas because of clearing activities, noise, and human disturbance. Human disturbance could influence wildlife behavior or cause displacement of species that are less tolerant of human intrusion or more sensitive to noise, and intraspecific competition could increase stress among some individuals. Noise disturbance from construction activities also could lead to nest abandonment and subsequent depredation of eggs or young. The indirect effects of construction disturbance may include reduced foraging time and increased alerting behaviors, which could result in increased energy expenditure and potentially lower survival or reproduction. These indirect impacts would be reduced with implementation of the BMPs incorporated into the Project as described above. In addition, nearby habitat could provide cover and suitable escape habitat for many of the common wildlife species that would be displaced, and mobile animals could return to the area after completion of construction and restoration activities, if appropriate habitats are available. Consequently, the impact of these displacements during construction would be temporary to short term and minor.

The Applicant may be required to trap beavers or alter or remove beaver dams to lower water elevations within the construction corridor prior to construction. Because beavers would likely move back to the area once construction is complete (Wisconsin DNR 2005), these activities would result in a temporary to short term and negligible to minor impact on beavers and on the altered waterbodies. Removal of a beaver dam may require a separate Public Waters Work Permit and, depending on the location, may not be permitted where beaver dams maintain control of basin water levels.

Disturbed areas would be susceptible to invasion by noxious and invasive species; if that occurred, the wildlife habitats would be degraded. However, implementation of BMPs to address invasive species would reduce the potential establishment and spread of noxious weeds, resulting in short-term and negligible to minor impacts.

During construction and clearing of the right-of-way, vehicle emission by-products (e.g., polycyclic aromatic hydrocarbons, aldehydes, carbon monoxide, nitrogen oxides, ozone, and sulfur oxides) could contaminate soil and vegetation in the areas immediately adjacent to the construction vehicles and equipment. The construction period at any location would be relatively short-and would occur only during daytime hours—except for HDD crossings of surface waters, which would occur for 24 hours per day, and the level of contamination in vegetation is not expected to be substantial. Although it is possible that species such as pollinators and herbivores that inhabit the areas where vegetation is exposed to these contaminants could be affected, the impact would be short term and negligible.

Impacts on Management Units and Managed Species

Construction of the Applicant's preferred route would result in habitat loss or alteration of 439 acres within WMAs and state forests (Table 6.3.4-10), including approximately 15 acres of the Grayling Marsh WMA and approximately 3 acres of the Lawler WMA. Loss or alteration of habitats could adversely affect both game and nongame wildlife that use these WMAs until vegetation has recovered. The resultant impact on the WMAs would be short term to long term, depending on the existing habitat types, and minor to major, depending on the landscape context of these public areas to the areas around them (see Table 6.3.4-10).

Construction would occur on land within eight state forests (Table 6.3.4-10), resulting in loss and alteration of forest habitat as well as fragmentation of forest. Because the recovery of forested areas in the temporary construction work area (i.e., the disturbed areas outside of the permanent right-of-way) would take decades, the impact would be long term to permanent but minor to major because of the relatively small area affected compared to the amount of nearby forested areas and habitat fragmentation (see Table 6.3.4-10).

The Applicant's preferred route would cross the McGregor IBA, affecting about 48 acres during construction (Table 6.3.4-11). Construction during the nesting season (beginning May 1 for most birds of conservation concern) could result in the loss of bird eggs and young. The Applicant would work with USFWS and Minnesota DNR to develop measures that would avoid and minimize disturbance or destruction of migratory birds. The impact on the IBA and breeding birds within the IBA from removal of vegetation would be short term to long term and minor based on to the relatively small area affected compared to the acreage of the unaffected portion of the IBA (see Table 6.3.4-11).

An access road would cross the Itasca State Park IBA; however, the pipeline corridor would not cross the IBA and would be co-located with an existing pipeline for most of the length near this IBA. As a result, no impacts are expected on this IBA; if noise and disturbance affected some species within the IBA, the impact would be temporary and negligible.

Raptor habitat could be compromised by removal of trees from the construction work area and extra workspaces in adjacent areas. Many of these species require large, unfragmented habitats. In addition, because most raptors reuse nest structures for many years, loss of nest structures would require a pair to find a new nest tree and build a new nest. If suitable new nest trees are not available within established territories, new territories would need to be established. These processes would lead to increased energy demands during nesting and could lead to reduced or lost reproduction in subsequent years. Most migratory birds begin nesting from mid-April through late July; however, bald eagles may nest as early as January (Minnesota DNR 2017b). Construction during the nesting season (beginning May 1 for most birds of conservation concern) could result in loss of bird eggs and young. The Applicant would work with USFWS to develop measures to avoid and minimize destruction of migratory birds. Raptor nests identified during 2014 to 2016 surveys would be avoided when possible. If removal of one of these nests is unavoidable, a permit and consultation with USFWS and Minnesota DNR would be required.

Table 6.3.4-10. Wildlife Conservation Lands Potentially Affected by Construction and Operation of the Applicant's Preferred Route in Minnesota

Designation Type	Con[a] (acres)	Op[b] (acres)	Facilities[c] Con[a] (acres)	Facilities[c] Op[b] (acres)	Total[d] Con (acres)	Total[d] Op (acres)	Within 0.5 Mile of Centerline Acres	Within 0.5 Mile of Centerline No.
Habitat or Species Management Area								
Grayling Marsh Wildlife Management Area	14.1	6.4	0.6	--	14.8	6.4	820.1	1
Lawler Wildlife Management Area	2.9	1.5	--	--	2.9	1.5	197.8	2
Lowe Wildlife Management Area	--	--	--	--	--	--	57.9	1
McGregor Wildlife Management Area	--	--	--	--	--	--	152.1	1
Mud Lake Wildlife Management Area	--	--	--	--	--	--	3.6	1
Salo Marsh Wildlife Management Area	--	--	--	--	--	--	201.6	1
Resource Management Area								
BLM land	--	--	--	--	--	--	60.8	1
State Forest								
Badoura	--	--	--	0.4	--	0.4	--	--
Fond du Lac	--	--	--	--	--	--	987.8	2
Foothills	42.3	18.6	11.8	1.1	54.1	19.7	1,811.4	1
Hill River	102.9	48.3	5.0	6.0	107.9	54.2	5,056.0	1
Huntersville	96.9	42.9	11.9	7.4	108.9	50.3	4,504.0	2
Land O'Lakes	130.2	58.1	25.9	5.2	156.2	63.4	5,913.6	5
Mississippi Headwaters	25.1	10.7	3.8	6.7	28.9	17.4	1,335.2	2
Paul Bunyan	--	--	--	--	--	--	264.9	1
Savanna	8.7	4.6	0.2	0.1	9.0	4.6	579.6	6
Waukenabo	15.8	8.3	0.5	0.7	16.2	8.9	545.5	4
White Earth	--	--	--	1.5	--	1.5	207.6	1
Private Conservation Land								
Marginal cropland – Limited	--	--	--	--	--	--	22.3	4
TOTAL[d]	**439.1**	**199.4**	**59.7**	**29.1**	**498.9**	**228.5**	**22,721.8**	**37**

Source: USGS-GAP 2016

[a] Con = estimated construction work area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Enbridge-provided footprint for permanent right-of-way.

[b] Op = estimated permanent right-of-way in acres based on a 50-foot-wide right-of-way centered on the route; Enbridge-provided footprint for permanent right-of-way in Minnesota.

[c] Facilities for construction include additional temporary workspaces (ATWS), including pipe yards, and temporary access roads; facilities for operation include primary access roads; pump stations; and mainline valves (MLVs), including valve pads and driveways.

[d] Con = sum of pipeline construction work area, ATWS (including pipe yards), and temporary access roads; Op = sum of pipeline permanent right-of-way, primary access roads, pump stations, and MLVs, including valve pads and driveways.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

"--" = no crossing

Table 6.3.4-11. Audubon Important Bird Areas and Colonial Waterbird Nesting Sites Potentially Affected by the Applicant's Preferred Route in Minnesota

Resource	Con[a]	Op[b]	ATWS	Access Roads	Pump Stations and MLVs	Total[c]		Within 0.5 Mile of Centerline
						Con	Op	
Audubon Important Bird Areas (acres)								
McGregor IBA	47.5	24.5	3.1	2.2	0.1	50.6	26.8	3,023.3
Itasca State Park IBA	--	--	--	1.5	--	--	1.5	384.7
TOTAL	**47.5**	**24.5**	**3.1**	**3.7**	**0.1**	**50.6**	**28.3**	**3,408.1**
Colonial Waterbird Nesting Sites (number)								
Mahtowa – great blue heron	--	--	--	--	--	--	--	1
Shell River – great blue heron	--	--	--	--	--	--	--	1
TOTAL	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**

Sources: Audubon 2016; Minnesota DNR 2016e.

[a] Con = estimated construction work area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Enbridge-provided footprint for permanent right-of-way.

[b] Op = estimated permanent right-of-way in acres based on a 50-foot-wide right-of-way centered on the route; Enbridge-provided footprint for permanent right-of-way in Minnesota.

[c] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), including pipe yards, and temporary access roads; Op = sum of pipeline permanent right-of-way, primary access roads, pump stations, and mainline valves (MLVs), including valve pads and driveways

Notes:

Values in table may not sum to subtotals and totals due to rounding.

"--" = no crossing

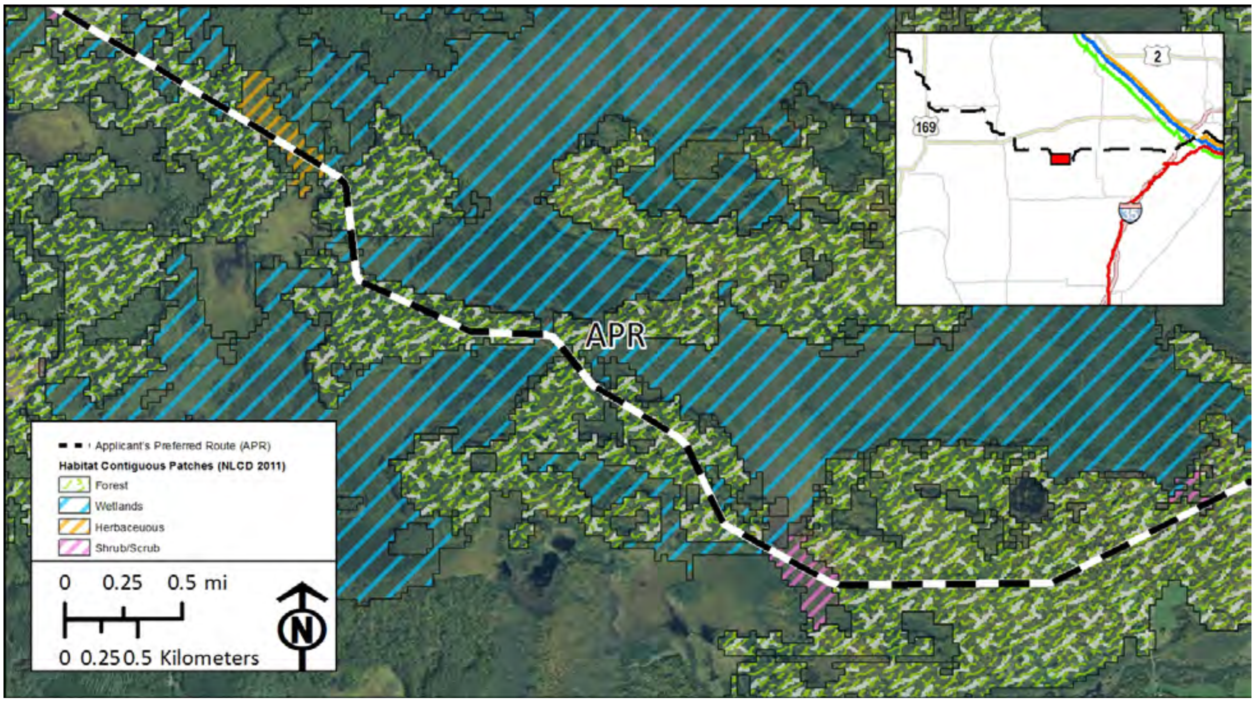
IBA = Important Bird Area

Two colonial waterbird nesting sites (rookeries) occur within 0.5 mile of the Applicant's preferred route (Table 6.3.4-11). Waterbirds can be vulnerable to development, particularly when appropriate replacement habitat is not available and disturbance, even though a number of the species are not rare. Direct impacts may occur from the loss of nesting habitat; indirect impacts could occur from disturbance to adults, nests, young due to construction. Wildlife agencies often recommend a buffer of no impact around the colony and/or season restrictions on construction. The Shell River great blue heron rookery is about 1,220 feet from the closest construction work area; the impact on this rookery is expected to be indirect, temporary, and negligible to minor, depending on the time of year construction takes place. The Mahtowa great blue heron rookery is about 340 feet from the closest construction work area. Because construction activities would occur within a distance that would affect the Mahtowa colony, the Applicant would be required to consult with USFWS and Minnesota DNR, and a permit may be required. The impact of construction within this buffer zone would be temporary to long term and could be minor to major, depending on the construction activities conducted.

Impacts from Habitat Fragmentation

Habitat fragmentation is caused when contiguous habitats are divided into separate fragments. Large-block habitats (habitats larger than 100 acres) are susceptible to impacts from fragmentation—

particularly large, mature-core or interior forested areas that serve as habitat for migratory birds and other wildlife (Figure 6.3.4-8). Construction of linear projects such as pipelines can cause habitat fragmentation as well as changes in vegetation cover. Potential fragmentation effects on wildlife habitat include a decrease in total habitat area, amount of interior habitat, biodiversity (richness), and connectivity. Fragmentation also may cause an increase in amount of edge habitat, increase the risk of invasive species spread, and isolate some habitat types. The reduction in habitat connectivity can disrupt behavior and movement of species, alter population dynamics, reduce the chance of recolonization in extirpated island habitats, and decrease genetic diversity. Forest-nesting birds are particularly vulnerable to habitat fragmentation effects resulting from linear construction projects. Habitat fragmentation leads to increased predation, increased competition by generalist species, and changes in microclimate and vegetation that may result in extirpation and reduced reproductive success for area-sensitive species.



Source: Analysis based on Homer et al. 2015.

Figure 6.3.4-8. Example of Potential Fragmentation of Large-Block Habitats by the Applicant's Preferred Route

The Applicant's preferred route is co-located with other pipelines, utilities, or roads along most of its length. However, between Clearbrook and Carlton, nine segments (between approximately MPs 215.0 and 352.0 [Table 6.3.4-12]) are not co-located with other infrastructure. Within this span, 21 large-block forested and wetland habitats would be crossed and fragmented by construction of the Applicant's preferred route. This would occur along approximately 38 miles of the Applicant's preferred route, or approximately 11 percent of the route in Minnesota and 17 percent of the route between Clearbrook and Carlton. These habitat "patches" that would be crossed include primarily forested and woody wetland habitats. The largest patch crossed is approximately 8,900 acres over 7 miles, and the smallest patch crossed is approximately 130 acres over less than 1 mile (Table 6.3.4-12). Impacts on wildlife from habitat fragmentation would be permanent and major, depending on the habitat type and species present. These impacts would be greatest in the least disturbed areas.

Table 6.3.4-12. Large-Block Habitat Patches Crossed by the Applicant's Preferred Route in Minnesota

Beginning Milepost	Ending Milepost	Crossing Length (miles)	Patch Type	Patch Size (acres)
214.7	221.9	7.2	Forest/wetlands/herbaceous	4,513
223.1	224.3	1.2	Forest	1,208
265.2	266.1	0.9	Forest/scrub/shrub	561
279.8	283.4	3.6	Forest/wetlands	2,558
283.8	284.7	0.9	Wetlands	738
286.8	289.8	3.0	Forest/wetlands	549
291.5	292.9	1.4	Forest/wetlands	587
294.1	296.5	2.4	Wetlands	678
297.3	299.1	1.8	Wetlands	2,629
302.0	302.6	0.6	Forest/wetlands	156
302.9	303.6	0.7	Forest/wetlands	149
307.1	307.8	0.7	Forest/wetlands	133
308.1	308.7	0.6	Forest/wetlands	222
308.9	310.1	1.2	Forest/wetlands	1,200
311.1	312.1	1.0	Forest/wetlands	654
322.1	328.8	6.7	Forest/wetlands	8,951
329.7	330.8	1.1	Forest/wetlands	556
348.0	348.1	0.1	Forest	135
349.3	350.9	1.6	Forest/wetlands	332
351.5	352.0	0.5	Wetlands	408
352.1	352.5	0.4	Forest/wetlands	187
TOTAL		**37.6**		**27,101**

Source: Fragmentation analysis based on Homer et al. 2015.

Operations Impacts

The following sections describe the potential impacts of normal operation of the Applicant's preferred route. Potential impacts from an accidental release of crude oil during operation are addressed in Chapter 10.

<u>Fisheries and Aquatic Habitat</u>

General Potential Impacts

The pipeline right-of-way in upland areas would be maintained in an herbaceous vegetative state during operation to allow access along the right-of-way for inspection, monitoring, and maintenance. Permanent removal of riparian vegetation within the permanent right-of-way in areas adjacent to waterbody crossings would result in localized alterations in habitat, streambank stability loss and erosion, and the potential for increased sedimentation. The Applicant would conduct regular monitoring of the right-of-way and would be able to identify streambank areas where changes may occur to the topography or vegetation. If any such changes are identified, the Applicant would consult Minnesota DNR and Minnesota PCA and make repairs and improvements following recommendations of these agencies. With implementation of these measures, localized changes to topography or vegetation would result in short-term minor impacts in the vicinity of the alteration.

Permanent removal of riparian vegetation in areas adjacent to some waterbody crossings would allow more light to enter the waterbody and could cause long-term to permanent, negligible to minor increases in temperature at these locations. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way. This could lead to permanent thermal effects on trout streams. During normal operation, no other measurable changes to water quality in surface waters would be expected, with no impacts on most fisheries or aquatic habitats.

Minor accidental fuel and lubricant leaks and spills could be released from maintenance and inspection vehicles using the permanent right-of-way and nearby areas. Any refueling, fuel storage, or vehicle maintenance would follow the Applicant-proposed measures set forth in the Environmental Protection Plan (Appendix E). If minor leaks or spills during operations reach surface waters, negligible to minor changes to surface water quality would result, and the subsequent temporary impacts on fisheries and aquatic habitats would be negligible to minor.

Chemical methods (i.e., herbicides) to control invasive vegetation species during operations could be used near waterbodies. The Applicant would implement its noxious weed plans that include methods to prevent and reduce the introduction and spread of noxious weeds and invasive species, and would implement BMPs for herbicide applications. Only herbicides and surfactants labeled for aquatic use would be used within 50 feet of any waterbody (Appendix E). In addition, herbicide use would be based on the invasive species present from monitoring, and the minimum herbicide would be used to treat the species present. These actions would reduce potential impacts on aquatic species from herbicides reaching surface waters with runoff. As a result, the use of herbicides would result in temporary and negligible impacts on fisheries and aquatic habitats.

Impacts from Integrity Management Digs

During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. In upland areas, these integrity digs would result in loss of vegetation in localized areas for relatively short periods of time. The Applicant would implement measures to minimize runoff to surface water during and after these activities, similar to the measures incorporated into the Project during construction. If pipe segments need to be repaired or replaced along surface water crossings, the wet open-cut or dry open-cut method would be used to access the pipe. These methods would be the same as those used for construction of the crossing, as described above. Impacts on fisheries and aquatic habitat would be similar to those experienced during construction; for each integrity dig, the impacts would be short term to long term and minor, depending on the location, habitats affected, and whether repair or replacement are needed. These impacts would occur periodically over the life of the Project.

During repair or replacement of pipe as part of the Integrity Management Program, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. The frequency with which hydrostatic testing would occur, locations of testing, and amount of water needed for testing and dust control are not defined. As described for pipeline construction, the Applicant would be required to obtain water appropriation and NPDES permits for testing procedures, and the volume of water would be substantially less than for construction. With adherence to permits and implementation of BMPs to avoid the intake or entrainment of fish, potential impacts associated with minor alterations in stream flows from water appropriation and discharge for each integrity dig would be temporary and negligible.

Wildlife and Wildlife Habitat

General Potential Impacts

During operation of the pipeline, the permanent right-of-way would be maintained to prevent woody vegetation from re-growing. Losses of tree and shrub habitats used by birds for cover, forage, and nesting would be permanent in the area of the temporary construction work area that is outside of the permanent right-of-way because of the long period of time required for forest habitat to regenerate. Within the permanent right-of-way, the impact of this loss would be permanent and minor to major.

Differences in vegetation cover between the permanent right-of-way and the surrounding landscape can act as a barrier for some species, such as squirrels and small mammals, while acting as a travel corridor for others, such as raccoons and coyotes. Small mammals that do attempt to cross the cleared right-of-way in previously forested areas could be exposed to increased predation by coyotes, foxes, or birds. Trees and shrubs along rivers and creeks provide high-value wildlife habitat. Furbearers such as muskrats, mink, otter, weasels, and beaver use river edge habitats; and permanent removal of trees and large shrubs along the 50-foot-wide permanent right-of-way would create a break in cover that could increase exposure to terrestrial predators like foxes and coyotes, as well as predatory birds. Losses of tree and shrub habitats used by small mammals and birds for cover, forage, and nesting would be a permanent and minor impact because the permanent right-of-way would be maintained free of trees and large shrubs.

Mowing and vegetation removal can result in injury or direct mortality of smaller species such as turtles, small mammals, and bird eggs and young. This recurring impact would be localized to the permanent right-of-way and the areas around aboveground facilities, resulting in short-term minor impacts on common wildlife for each occurrence; but the mowing would be repeated periodically over the life of the Project.

The maintained permanent right-of-way may be used as travel corridors by some big game animals and humans. Increased human use could lead to disturbance and hunting pressure on game animals, resulting in minor permanent effects on wildlife (Hinkle et al. 2002).

The permanent right-of-way may become attractive to some small species as well. For example, during operations, there may be some warming of the soil above the pipeline, which may attract rabbits, badgers, and other burrowing rodents, especially during winter months. Small mammals attracted to the permanent right-of-way could be exposed to increased predation by coyotes, foxes, or birds. The pipeline right-of-way also could attract migratory waterfowl during early spring if it becomes snow free before surrounding habitats. This has been demonstrated during the early spring melt, when early vegetation emergence near roadways and the buried portion of the Trans Alaska Pipeline in Northern Alaska attracts waterfowl, shorebirds, and ptarmigan (Trans Alaska Pipeline System Owners 2001). Migratory birds attracted to the permanent right-of-way could be exposed to increased predation by coyotes, foxes, or other predators. These effects would be permanent but minor.

Habitat in the permanent right-of-way could be degraded if native vegetation is replaced by noxious and invasive species. The use of chemical controls can adversely affect wildlife species, particularly amphibians because of their sensitivity to chemical exposure. However, implementation of BMPs for use of herbicides that include measures such as only using herbicides when necessary and using aquatic formulations within 50 feet of water, and prevention of the spread of noxious species would minimize the potential for impacts; and the impact on wildlife and wildlife habitats is expected to be temporary to short term and minor.

Impacts on Management Units and Managed Species

The Applicant's preferred route would cross the McGregor IBA, permanently affecting about 25 acres. IBAs represent relatively intact areas that are important to birds. Maintenance of the permanent right-of-way could reduce populations of species sensitive to habitat disturbance and could indirectly result in a permanent and minor effect on breeding birds within the McGregor IBA.

Impacts from Habitat Fragmentation

During operation, the habitat fragmentation along the permanent right-of-way would continue, as described for construction impacts, and could reduce populations of some forest interior species (e.g., birds, mammals, and amphibians). Forest-nesting birds are particularly vulnerable to habitat fragmentation effects of linear construction projects. Forest-nesting songbird abundance, diversity, and reproduction rates have been shown to become depressed from the fragmentation associated with linear developments (Jalkotzy et al. 1997). Linear corridors also increase songbird nest predation and parasitism (e.g., by brown-headed cowbirds), by fragmenting forest habitats and increasing access to nests. As a result, habitat fragmentation during operation of the Applicant's preferred route would cause permanent minor to major impacts on wildlife, depending on the location and species.

Impacts from Integrity Management Digs

The integrity management digs described above (see operations impacts for fisheries and aquatic habitat) would result in changes to the permanent right-of-way that would be similar to those during construction.

During operation, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. In upland areas, these integrity digs would result in loss of vegetation in localized areas for relatively short periods of time. The Applicant would restore the affected areas to conditions present prior to initiating the integrity dig. The impacts would be similar to those during construction of the pipeline, but over a substantially smaller area and without impacts on forested areas because the areas affected by integrity digs essentially would be limited to the permanent right-of-way. Consequently, impacts on wildlife and wildlife habitat would be short term and negligible to minor but would occur periodically over the life of the Project.

6.3.4.3.2 Route Alternatives (from Clearbrook to Carlton)

The types of potential impacts on fisheries and aquatic resources and wildlife and wildlife habitat that would result from construction and operation of route alternatives RA-03AM, RA-06, RA-07, and RA-08 would be the same as those described for the Applicant’s preferred route. The species present would be similar for the Applicant’s preferred route and all route alternatives. The duration and magnitude of impacts would be similar among all of the alternatives, with relatively minor differences resulting from different locations and increased or decreased occurrences of the impacts along the routes. As a result, this section refers to the impact analysis presented above for the Applicant’s preferred route for most anticipated impacts.

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the fish and wildlife ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Fisheries and Aquatic Habitat

General Potential Impacts. Construction of RA-03AM would require crossing 167 streams, including 8 trout streams (Tables 6.3.4-13 and 6.4.3-14). These crossings would be constructed using the methods described in Section 6.3.4.3.1 for construction of surface water crossings of the Applicant’s preferred route, including incorporation of the BMPs described in that section. The impacts of surface water crossings for RA-03AM would be the same as those for the Applicant’s preferred route. Most crossing impacts would be temporary to short term and negligible to minor, although the use of wet open-cut crossings could result in a short- to long-term, minor impact at each crossing. Where streambanks are cleared of forested or other woody vegetation, the potential impacts on fisheries and aquatic habitats would be permanent and minor to major, depending on existing surface water conditions. Crossing methods have not been established for RA-03AM.

Table 6.3.4-13. Number of Stream Crossings for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Water Type	Applicant's Preferred Route	Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
Stream/river – perennial	25	41	57	28	31
Stream/river – intermittent	42	62	29	20	27
Artificial path	11	13	18	5	6
Connector	3	6	5	2	4
Canal ditch	15	31	12	19	27
Lake/pond – perennial	15	14	16	6	11
Swamp/marsh – intermittent	--	--	--	1	--
TOTAL CROSSINGS	**111**	**167**	**137**	**81**	**106**

Source: USGS NHD 2016.

Note:

The surface water types most likely to provide fish habitat are stream/river, artificial path, and connector.

Table 6.3.4-14. Number of Sensitive Aquatic Resources Crossed by and near the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Sensitive Aquatic Resource	Applicant's Preferred Route[a]			Route Alternative RA-03AM[b]			Route Alternative RA-06[b]			Route Alternative RA-07[c]			Route Alternative RA-08[b]		
	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]
Fish IBI Lake	--	--	5	--	--	6	--	--	--	--	--	3	--	--	1
Sentinel Lake	--	--	1	--	--	1	--	--	--	--	--	--	--	--	--
Lake of Biological Significance	--	--	10	--	--	6	1	1	4	3	2	16	1	1	16
Trout stream	6	6	17	8	8	19	7	6	28	8	6	7	7	4	18
Trout lake	--	--	1	--	--	--	1	1	--	--	--	--	--	--	--
Muskie lake	--	--	1	--	--	--	--	--	--	--	--	4	--	--	2
TOTAL	**6**	**6**	**35**	**8**	**8**	**32**	**9**	**8**	**32**	**11**	**8**	**30**	**8**	**5**	**37**

Sources: Minnesota DNR 2015b; 2015c; 2016b.

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on route.

[d] 0.5 mile = within 0.5 mile of the centerline of the route.

"—" = no crossing, Fish IBI Lake = Fish Index of Biotic Integrity Lake

Potential Impacts on Management Units and Managed Species. RA-03AM would result in 0.5 acre of disturbance to the LaSalle Creek AMA and would pass within 0.5 mile of seven other AMAs (Table 6.3.4-15). AMAs represent good-quality habitats with functional adjacent upland wildlife habitat areas. Impacts on AMAs from construction would depend on the type of waterbody crossing method used. As for the Applicant's preferred route, the Applicant would incorporate BMPs into construction to avoid or minimize impacts. Consequently; the impacts of construction of RA-03AM related to loss of habitat and reduction of habitat quality would be short term and negligible to minor. RA-03AM also would pass within 0.5 mile of six lakes with Fish IBI ratings (Table 6.3.4-16). The Applicant would implement BMPs to prevent the spread of invasive species, with the resultant impacts expected to be at most short term and negligible to minor. RA-03 would not cross any Lakes of Biological Significance (Table 6.3.4-17) or any waters managed for muskellunge (Table 6.3.4-18).

Table 6.3.4-15. Aquatic Management Areas Crossed by or near the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton (acres)

Aquatic Management Area	Applicant's Preferred Route[a]			Route Alternative RA-03AM[b]			Route Alternative RA-06[b]			Route Alternative RA-07[c]			Route Alternative RA-08[b]		
	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]
Blackhoof River AMA	--	--	44.4	--	--	44.4	--	--	--	--	--	--	--	--	--
Bruce Creek AMA	--	--	--	--	--	--	--	--	--	--	--	0.2	0.3	0.1	3.8
Cat Creek AMA	--	--	--	--	--	14.9	--	--	--	--	--	--	--	--	--
Clearwater River AMA	--	--	--	--	--	--	0.2	0.1	17.3	0.3	0.1	15.4	--	--	4.9
Fish Lake AMA	--	--	--	--	--	0.3	--	--	--	--	--	--	--	--	--
Fish Trap Lake #1 FMA	--	--	--	--	--	0.7	--	--	--	--	--	--	--	--	--
LaSalle Creek AMA	0.4	0.2	27.4	0.5	0.2	27.4	--	--	--	--	--	--	--	--	--
Little Otter Creek AMA	--	--	--	--	--	--	4.6	1.9	92.9	7.8	1.9	92.9	4.4	1.8	82.2
Midge-Little Midge FMA	--	--	--	--	--	--	--	--	--	--	--	0.2	--	--	--
Mississippi River AMA	--	--	--	--	--	12.8	--	--	--	--	--	--	--	--	--
Necktie River AMA	--	--	--	--	--	--	--	--	--	--	--	41.9	--	--	41.9
Otter Creek AMA	--	--	--	--	--	--	--	--	67.2	--	--	67.2	--	--	66.6
Pierz Fish Lake AMA	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--
Popple River AMA	--	--	--	--	--	--	--	--	3.1	--	--	--	--	--	--
Prairie River AMA	--	--	--	--	--	--	--	--	--	--	--	0.4	--	--	--
Spire Valley AMA	--	--	56.2	--	--	--	--	--	--	--	--	--	--	--	--
St. Louis River II AMA	--	--	--	--	--	--	--	--	25.1	--	--	25.1	--	--	--
Straight River AMA	--	--	16.6	--	--	16.6	--	--	--	--	--	--	--	--	--
Venning Creek AMA	--	--	--	--	--	--	0.3	0.1	12.5	--	--	--	--	--	--
TOTAL	**0.4**	**0.2**	**144.6**	**0.5**	**0.2**	**117.2**	**5.0**	**2.1**	**218.2**	**8.2**	**2.0**	**243.2**	**4.7**	**2.0**	**199.5**

Source: Minnesota DNR 2016h.

Table 6.3.4-15. Aquatic Management Areas Crossed by or near the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton (acres)

Aquatic Management Area	Applicant's Preferred Route[a]			Route Alternative RA-03AM[b]			Route Alternative RA-06[b]			Route Alternative RA-07[c]			Route Alternative RA-08[b]		
	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]	Con	Op	0.5 Mile[d]

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide right-of-way centered on the route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the route.

[d] 0.5 mile = within 0.5 mile of the centerline of the route.

Notes:

Values in table may not sum to subtotals and totals due to rounding.

"—" = no crossing

AMA = Aquatic Management Area, FMA = Fisheries Management Area

Table 6.3.4-16. Number of Lakes with Fish IBI Ranking within 0.5 Mile of the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Lake Name	Fish IBI Status	Applicant's Preferred Route	Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
Big LaSalle	Exceptional	1	1	--	--	--
Fish	Meeting standard	--	1	--	--	--
Fish Trap	Exceptional	--	1	--	--	--
Green Prairie Fish	Mixed results – below/meeting	--	1	--	--	--
Irving	Exceptional	--	--	--	1	--
Island	Exceptional	1	1	--	-	--
Little Wolf	Exceptional	--	--	--	1	
Lower Sucker	Meeting standard	--	--	--	--	1
Midge	Meeting standard	--	--	--	1	--
Portage	Exceptional	1	1	--	--	--
Roosevelt	Exceptional	1	--	--	--	--
Waukenabo	Below impairment threshold	1	--	--	--	--
TOTAL		**5**	**6**	**0**	**3**	**1**

Source: Minnesota DNR 2014a.

Notes:

Number of occurrences within 0.5 mile centered on route (none would be crossed by route construction work area).

Fish IBI = Index of Biotic Integrity thresholds were developed to classify lakes based on their fish communities as exceptional, meeting standards, vulnerable to impairment, and impaired; "--" no occurrence

Table 6.3.4-17. Lakes of Biological Significance Crossed by the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton (acres)

Class	Watershed, Minnesota DNR Identifier	Applicant's Preferred Route[a]		Route Alternative RA-03AM[b]		Route Alternative RA-06[b]		Route Alternative RA-07[c]		Route Alternative RA-08[b]	
		Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Outstanding	13543	--	--	--	--	--	--	--	--	6.0	2.5
	Pike Bay, 14487	--	--	--	--	--	--	1.5	--	--	--
	West Four-Legged, 21300	--	--	--	--	--	--	7.0	1.5	--	--
	East Four-Legged, 23949	--	--	--	--	--	--	2.0	0.6	--	--
High	12005	--	--	--	--	3.4	1.4	--	--	--	--
TOTAL		**--**	**--**	**--**	**--**	**3.4**	**1.4**	**10.9**	**2.1**	**6.0**	**2.5**

Source: Minnesota DNR 2016b.

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide right-of-way centered on the route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline.

Notes:

Includes lakes and ponds.

Values in table may not sum to subtotals and totals due to rounding.

"--" no crossing

Table 6.3.4-18. Number of Lakes Managed for Muskellunge Fisheries within 0.5 Mile of the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Watershed	Minnesota DNR Identifier	Muskie Population[a]	Applicant's Preferred Route	Route Alternative RA-03AM	Route Alternative RA-06	Route Alternative RA-07	Route Alternative RA-08
Cass	14870	N	--	--	--	1	--
Leech	21722	N	--	--	--	--	1
Little Wolf	14970	I	--	--	--	1	--
Pike Bay	14487	N	--	--	--	1	1
Roosevelt	14175	I	1	--	--	--	--
Winnibigoshish	12798	N	--	--	--	1	--
TOTAL			**1**	**--**	**--**	**4**	**2**

Source: Minnesota DNR 2008 – Muskellunge Waters.

[a] Muskie (Muskellunge) population: N = native, I = introduced

Notes:

Occurrences within 0.5 mile centered on route (none would be crossed by a construction work area).

"--" = no occurrence

Minnesota PCA's Watershed Health Assessment parameters for species richness, stream species quality, and habitat quality and connectivity were compared for the Applicant's preferred route and RA-03AM, RA-06, RA-07, and RA-08 between Clearbrook and Carlton using the data in Figures 6.3.4-5, 6.3.4-6, and 6.3.4-7. No clear consistent trends distinguished between the potential routes, although in some instances, one alternative scored higher than the others for some individual indices.

Wildlife and Wildlife Habitat

General Potential Impacts. The types of construction-related impacts on wildlife and wildlife habitats for RA-03AM and the measures to be implemented to avoid or reduce impacts associated with pipeline construction would be the same as those described in Section 6.3.4.3.1 for the Applicant's preferred route. Construction of RA-03AM would disturb 3,578 acres of wildlife habitat, primarily consisting of forest, hay, and pasture land (Table 6.3.4-19). Impacts on these areas would be similar to those described above, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Forests provide complex and valuable habitat for many species of wildlife and would require decades to recover to maturity. Compared to the Applicant's preferred route, RA-06, RA-07, and RA-08, construction of RA-03AM would disturb the smallest acreage of wetlands (Table 6.3.4-19). The potential impact on wildlife and wildlife habitat from construction of RA-03AM would be long term to permanent and minor to major.

Table 6.3.4-19. Vegetation Cover Potentially Affected by the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Vegetation Cover Class	Applicant's Preferred Route[a]		Route Alternative RA-03AM[b]		Route Alternative RA-06[b]		Route Alternative RA-07[c]		Route Alternative RA-08[b]	
	Con	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**
Evergreen forest	173.4	69.6	145.4	60.1	102.6	42.6	234.5	37.0	106.4	43.7
Deciduous forest	1,255.5	554.0	975.1	403.1	797.7	332.9	772.6	177.1	591.8	245.5
Mixed forest	17.5	7.4	13.5	5.7	164.2	68.3	139.4	27.9	74.6	30.5
Scrub/shrub	210.6	104.3	190.5	80.2	251.4	104.2	276.9	83.4	123.8	51.8
Grassland/herbaceous	93.5	45.0	142.8	60.6	115.5	49.2	404.8	107.0	81.3	34.5
Hay/pasture	388.1	175.2	1,030.6	432.9	213.2	89.2	325.5	88.4	303.9	128.2
Cultivated crops	173.4	76.4	565.2	237.7	43.0	18.0	76.3	23.1	31.7	13.2
Woody wetlands	316.6	158.8	194.7	78.1	732.2	304.2	1,055.9	236.1	651.1	270.2
Emergent herbaceous wetlands	174.0	95.3	315.1	133.5	223.3	94.0	536.1	154.2	318.6	134.7
Barren land	3.6	1.7	5.1	2.2	30.5	12.8	10.4	3.2	2.8	1.1
TOTAL	**2,806.4**	**1,287.8**	**3,579.0**	**1,494.1**	**2,673.6**	**1,115.4**	**3,832.3**	**937.4**	**2,286.0**	**953.5**

Source: Homer et al. 2015.

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the pipeline route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Note:

Values in table may not sum to subtotals and totals due to rounding.

Potential Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from construction of RA-03AM would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Construction of RA-03AM would have short-term minor impacts on 44.1 acres of wildlife conservation areas, including one waterfowl refuge, one WMA, one state forest and one land classified as "other forest land" (Table 6.3.4-20). RA-03AM also would cross two IBAs, resulting in approximately 70 acres of short-term minor disturbance during construction as this pipeline would be co-located with existing corridors (Table 6.3.4-21). RA-03AM would not pass near any colonial nesting waterbird sites (Table 6.3.4-22).

Table 6.3.4-20. Wildlife Management Areas and Forests Potentially Affected by the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton (acres)

Unit Type and Name	Applicant's Preferred Routea		Route Alternative RA-03AMb		Route Alternative RA-06b		Route Alternative RA-07c		Route Alternative RA-08b	
	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Wildlife Refuge										
Bemidji Game Refuge	--	--	--	--	--	--	142.1	35.1	62.8	26.2
Staples Waterfowl Refuge	--	--	4.9	2.0	--	--	--	--	--	--
Wildlife refuge subtotal	***--***	***--***	***4.9***	***2.0***	***--***	***--***	***142.1***	***35.1***	***62.8***	***26.2***
Wildlife Management Area										
Bemidji Slough Wildlife Management Area	--	--	--	--	--	--	--	--	4.1	1.7
Grayling Marsh Wildlife Management Area	15.5	6.5	--	--	--	--	--	--	--	--
Lawler Wildlife Management Area	4.0	1.5	--	--	--	--	--	--	--	--
Neitermeier Wildlife Management Area	--	--	5.4	2.2	--	--	--	--	--	--
Swan River Deer Yard Wildlife Management Area	--	--	--	--	--	--	--	--	7.4	3.1
Wildlife Management Areas Subtotal	***19.5***	***8.0***	***5.4***	***2.2***	***--***	***--***	***142.1***	***35.1***	***11.6***	***4.8***
State Forest										
Big Fork	--	--	--	--	69.6	29.0	--	--	--	--
Bowstring	--	--	--	--	--	--	217.9	55.4	96.8	40.4
Fond du Lac	--	--	--	--	15.4	6.4	26.2	6.4	15.3	6.4
Foot Hills	30.2	12.6	--	--	--	--	--	--	--	--
George Washington	--	--	--	--	106.5	44.4	--	--	--	--
Hill River	67.5	27.9	--	--	--	--	--	--	--	--
Huntersville	45.5	19.0	--	--	--	--	--	--	--	--
Land O'Lakes	101.0	42.1	--	--	--	--	--	--	--	--
Mississippi Headwaters	8.5	3.5	8.5	3.5	--	--	2.9	0.7	7.7	3.2

Table 6.3.4-20. Wildlife Management Areas and Forests Potentially Affected by the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton (acres)

Unit Type and Name	Applicant's Preferred Routea		Route Alternative RA-03AMb		Route Alternative RA-06b		Route Alternative RA-07c		Route Alternative RA-08b	
	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Savanna	11.0	4.6	--	--	--	--	--	--	38.1	15.9
Waukenabo	19.8	8.3	--	--	--	--	--	--	--	--
State forest subtotal	***283.6***	***118.0***	***8.5***	***3.5***	***191.5***	***79.8***	***247.1***	***62.6***	***158.0***	***65.9***
Other Forest Land										
Miscellaneous	77.6	32.5	30.3	12.8	133.9	55.5	97.1	23.6	67.6	28.2
Other forest land subtotal	***77.6***	***32.5***	***30.3***	***12.8***	***133.9***	***55.5***	***97.1***	***23.6***	***67.6***	***28.2***
TOTAL	**380.7**	**158.5**	**44.1**	**18.5**	**325.3**	**135.2**	**486.3**	**86.1**	**237.1**	**98.9**

Sources: Minnesota DNR 2016n, Minnesota DNR 2016g = wildlife refuge inventory.

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the pipeline route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on pipeline route.

Notes:

All impacts on Minnesota Wildlife Management Areas (WMAs) and state forests would occur between Clearbrook and Carlton, Minnesota.

Values in table may not sum to subtotals and totals due to rounding.

"--" = no occurrence

Table 6.3.4-21. Estimated Impacts on Important Bird Areas for the Applicant's Preferred Route and Route Alternatives Between Clearbrook and Carlton (acres)

Audubon Important Bird Area	Applicant's Preferred Route[a]			Route Alternative RA-03AM[b]			Route Alternative RA-06[b]			Route Alternative RA-07[c]			Route Alternative RA-08[b]		
	Con	Op	0.5 Mile	Con	Op	0.5 Mile	Con	Op	0.5 Mile	Con	Op	0.5 Mile	Con	Op	0.5 Mile
Camp Ripley-Pillsbury-Lake Alexander IBA	--	--	--	42.3	17.2	2,758.2	--	--	--	--	--	--	--	--	--
Chippewa Plains IBA	--	--	--	--	--	--	512.1	213.3	22,651.0	1,016.1	247.8	26,492.8	594.2	247.6	26,137.6
Crane Meadows NWR – Rice Skunk Wetland Complex IBA	--	--	--	27.6	11.5	1,233.9	--	--	--	--	--	--	--	--	--
Itasca State Park IBA	--	--	384.7	--	--	384.9	--	--	--	--	--	--	--	--	--
McGregor IBA	47.5	24.5	3,023.4	--	--		--	--	--	--	--	--	--	--	--
TOTAL	**47.5**	**24.5**	**3,408.1**	**69.8**	**28.7**	**4,377.1**	**512.1**	**213.3**	**22,651.0**	**1,016.1**	**247.8**	**26,492.8**	**594.2**	**247.6**	**26,137.6**

Source: Audubon 2016.

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide right-of-way centered on the pipeline route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Note:

Values in table may not sum to subtotals and totals due to rounding.

"--" = no occurrence

IBA = Important Bird Area, NWR = National Wildlife Refuge

Table 6.3.4-22. Number of Colonial Waterbird Nesting Sites Potentially Affected by the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Description	Applicant's Preferred Route[a]			Route Alternative RA-06[b]			Route Alternative RA-07[c]			Route Alternative RA-08[b]		
	Con	Op	0.5 Mile	Con	Op	0.5 Mile	Con	Op	0.5 Mile	Con	Op	0.5 Mile
Big Fork River – great blue heron	--	--	--	--	--	1	--	--	--	--	--	--
Boulder Hill – great blue heron	--	--	--	--	--	--	--	--	1	--	--	1
Grass Lake – red-necked grebe	--	--	--	--	--	--	--	--	1	--	--	--
Larson Lake – great blue heron	--	--	--	1	1	1	--	--	--	--	--	--
Mahtowa – great blue heron	--	--	1	--	--	--	--	--	--	--	--	--
Portage Creek – great blue heron	--	--	--	--	--	--	--	--	--	1	1	1
Red Lake Trail – great blue heron	--	--	--	--	--	1	--	--	--	--	--	--
Sherry Lake – great blue heron	--	--	-	1	1	1	--	--	--	--	--	--
Wagner Creek #2 – great blue heron	--	--	--	--	--	1	--	--	--	--	--	--
Shell River – great blue heron	--	--	1	--	--	--	--	--	--	--	--	--
TOTAL	**--**	**--**	**2**	**2**	**2**	**5**	**--**	**--**	**2**	**1**	**1**	**3**

Source: Minnesota DNR 2016e.

[a] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[b] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the pipeline route.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3); Op = estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on the pipeline route.

Notes:

No colonial waterbird nests occur within 0.5 mile of RA-03AM.

0.5 mile = 0.5 mile from centerline of pipeline route

"--" = no occurrence

Impacts from Habitat Fragmentation. RA-03AM is co-located with existing pipelines, transmission lines, and roads across all of its length. No large-block habitats would be fragmented by RA-03AM; however, widening corridors in this area could contribute to habitat loss and conversion, decreased habitat quality, and increased risk of the introduction of invasive species. Impacts on wildlife habitat and wildlife from fragmentation are expected to be temporary to short term and negligible.

<u>Operations Impacts</u>

Fisheries and Aquatic Habitat

General Potential Impacts. General impacts from operation of a pipeline along the RA-03AM route would be similar to those described for the Applicant's preferred route above. Operation of RA-03AM would affect 167 stream crossings, including 9 trout streams within the permanent right-of-way. Impacts could result from maintenance activities, including vegetation management at stream edges that would occur for the life of the Project. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way, which could lead to permanent major thermal effects on trout streams. Additional impacts could occur from the use of herbicides and accidental fuel and lubricant leaks and spills from maintenance and inspection vehicles. With implementation of the proposed BMPs, these impacts would be short- to long-term and minor to major, depending on the nature of the vegetation permanently removed. RA-03AM would result in 0.2 acre of disturbance to the LaSalle Creek AMA.

Impacts from Integrity Management Digs. Impacts from integrity management digs for RA-03AM would be similar to those described for the Applicant's preferred route. During operation, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. The Applicant would implement measures to minimize runoff to surface water during and after these activities, similar to the measures incorporated into the Project during construction. If pipe segments need to be repaired or replaced along surface water crossings, the wet open-cut or dry open-cut method would be used to access the pipe. These methods would be the same as those used for construction of the crossing, as described above. The impacts on fisheries and aquatic habitat would be similar to those experienced during construction; for each integrity dig, the impacts would be short term to long term and minor, depending on the location, habitats affected, and whether repair or replacement are needed. These impacts would occur periodically over the life of the Project.

During repair or replacement of pipe as part of the Applicant's Integrity Management Program, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. With adherence to permits and implementation of BMPs to avoid the intake or entrainment of fish, the impacts associated with minor alterations in stream flows from water appropriation and discharge for each integrity dig would be temporary and negligible.

Wildlife and Wildlife Habitat

General Potential Impacts. General impacts from operation of a pipeline along the RA-03AM route would be similar to those described for the Applicant's preferred route. Operation of RA-03AM would affect 1,495 acres of wildlife habitat, primarily consisting of deciduous forest, hay, and pasture land. During operation of the pipeline, the permanent right-of-way would be maintained to prevent woody vegetation from re-growing. Losses of tree and shrub habitats used by birds for cover, forage, and nesting would be long term to permanent in the area of the construction work area that is outside of the permanent right-of-way because of the long period of time that forest requires to regenerate. Within the permanent right-of-way, the impact would be permanent and minor to major.

Mowing and vegetation removal can result in injury or direct mortality of smaller species such as turtles, small mammals, and bird eggs and young. This recurring impact would be localized to the permanent right-of-way and the areas around aboveground facilities, resulting in short-term minor impacts on common wildlife for each occurrence; but the mowing would be repeated periodically over the life of the Project. The permanent right-of-way also could create a travel corridor for some species. Habitat in the permanent right-of-way could be degraded if native vegetation is replaced by noxious and invasive species. The use of chemical controls can adversely affect wildlife species, particularly amphibians because of their sensitivity to chemical exposure. However, implementation of BMPs for use of herbicides that include measures such as only using herbicides when necessary and using aquatic formulations within 50 feet of water, and prevention of the spread of noxious species would minimize the potential for impacts; and the impact on wildlife and wildlife habitats is expected to be temporary to short term and minor.

Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from operation of RA-03AM would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Construction of RA-03AM would permanently disturb 19 acres of wildlife conservation areas, including one waterfowl refuge, one WMA, one state forest, and one land classified as "other forest land" (Table 6.3.4-20). RA-03AM also would cross two IBAs, resulting in approximately 29 acres of permanent minor to major disturbance during operation (Table 6.3.4-21).

Impacts from Habitat Fragmentation. RA-03AM is co-located with existing pipelines, transmission lines, and roads across all of its length. No large-block habitats would be fragmented by RA-03AM; however, widening corridors in this area could contribute to permanent habitat loss and conversion, decreased habitat quality, and increased risk of invasive species introduction. The impacts on wildlife habitat and wildlife from fragmentation are expected to be temporary to short term and negligible.

Impacts from Integrity Management Digs. Integrity management digs would result in disturbance to wildlife and wildlife habitat as described above for construction impacts; however, the area affected would be substantially smaller and would occur entirely within the established right-of-way. As a result, impacts on wildlife and wildlife habitat from integrity digs would be short term and negligible to minor but would occur periodically over the life of the Project.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the fish and wildlife ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Construction Impacts

Fisheries and Aquatic Habitat

General Potential Impacts. Construction of RA-06 would require crossing 137 streams, including seven trout streams and one trout lake (Tables 6.3.4-13 and 6.4.3-15). These crossings would be constructed using the methods described in Section 6.3.4.3.1 for construction of surface water crossings for the Applicant's preferred route, including incorporation of the BMPs described in that section. The impacts of surface water crossings for RA-06 would be the same as those for the Applicant's preferred route. Most crossing impacts would be temporary to short term and negligible to minor; although the use of wet open-cut crossings could result in a short- to long-term, minor impact at each crossing. Where streambanks are cleared of forested or other woody vegetation, the potential impacts on fisheries and aquatic habitats would be permanent and minor to major, depending on existing surface water conditions. Crossing methods have not been established for RA-06.

Potential Impacts on Management Units and Managed Species. RA-06 would cumulatively result in 5 acres of disturbance to three AMAs (Clearwater, Little Otter Creek, and Venning Creek) and would pass within 0.5 mile of three other AMAs (Table 6.3.4-14). AMAs represent good-quality habitats with functional adjacent upland wildlife habitat areas. Impacts on AMAs from construction would depend on the type of waterbody crossing method used. Construction of RA-06 would disturb 3.4 acres of one Minnesota Lake of Biological Significance with a rating of high (Table 6.3.4-18).

As for the Applicant's preferred route, the Applicant would incorporate BMPs into construction to avoid or minimize impacts; consequently, impacts from loss of habitat and reduction of habitat quality would be short term and negligible to minor. The Applicant would implement BMPs to prevent the spread of invasive species, with the resultant impact expected to be at most short term and negligible to minor.

Minnesota PCA's Watershed Health Assessment parameters for species richness, stream species quality, and habitat quality and connectivity were compared for the Applicant's preferred route and RA-03AM, RA-06, RA-07, and RA-08 between Clearbrook and Carlton using the data in Figures 6.3.4-5, 6.3.4-6, and 6.3.4-7. No clear consistent trends distinguished between the potential routes, although in some instances, one alternative scored higher than the others for some individual indices (e.g., RA-06 scored highest for macroinvertebrate species richness, terrestrial habitat quality, terrestrial habitat connectivity, and aquatic habitat connectivity).

Wildlife and Wildlife Habitat

General Potential Impacts. The types of impacts on wildlife and wildlife habitats from construction of RA-06 and the measures to be implemented to avoid or reduce construction-related impacts would be the same as those described in Section 6.3.4.3.1 for the Applicant's preferred route. Construction of RA-06 would disturb 2,674 acres of wildlife habitat, primarily consisting of forest and woody wetlands (Table 6.3.4-19). Impacts on these areas would be similar to those described above, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Forests provide complex and valuable habitat for many species of wildlife and would take decades to recover to maturity. The potential impact on wildlife and wildlife habitat from construction of RA-06 would be long term to permanent and minor to major.

Potential Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from construction of RA-06 would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Construction of RA-06 would have short- to long-term minor impacts on 325 acres of wildlife conservation areas, including three state forests (Table 6.3.4-20). RA-06 also would cross the Chippewa Plains IBA, resulting in approximately 512 acres of permanent minor disturbance during construction from clearing of the right-of-way (Table 6.3.4-21). RA-06 would also disturb the Larson Lake and Sherry Lake great blue heron rookeries (Table 6.3.4-22). Research has shown that construction activities within 300 meters (984 feet) of nesting great blue herons can cause nest abandonment and reproductive failure (VFWD 2002; MNFI 2016). RA-06 could result in removal of great blue heron rookery trees within construction work areas, which would result in permanent major impacts on heron nesting habitat and short-term and minor impacts on individual birds as they would be forced to find new nest sites. Permits would be needed from USFWS and Minnesota DNR if tree removal would occur during the nesting season.

Impacts from Habitat Fragmentation. RA-06 is not co-located with other pipelines, utilities, or roads across much of its length and would affect a greater number of large-block habitats than any other potential route. Sixty large-block habitats (more than 100 acres) would be crossed and fragmented by construction of RA-06 between approximately MP 140.0 and 295.0 (Table 6.3.4-23). The large-block habitats that would be crossed by RA-06 primarily include forested and woody wetland habitats, with the largest patch size (about 9,100 acres) crossed by approximately 7 miles of pipeline and the smallest patch size (about 110 acres) crossed by approximately 0.4 mile of pipeline (Table 6.3.4-23). Habitats along RA-06 would be fragmented across a total of approximately 114 miles (about 58 percent of the route) between Clearbrook and Carlton. The construction of RA-06 would result in a total of 83,996 acres fragmented. Habitat fragmentation resulting from construction of RA-06 would create more edge habitats, may result in decreased populations of forest interior species, and could facilitate spread of invasive species. Impacts from habitat fragmentation by construction of RA-06 would be long term and major.

Table 6.3.4-23. Large-Block Habitat Patches Crossed by Route Alternative RA-06 in Minnesota

Beginning Milepost	Ending Milepost	Crossing Length (miles)	Patch Type	Patch Size (acres)
140.1	140.8	0.7	Forest	349
142.7	143.8	1.1	Forest, wetlands	1,729
144.0	144.4	0.4	Forest, wetlands	109
146.4	151.5	5.1	Forest, wetlands, scrub/shrub	6,589
151.6	153.3	1.7	Forest	1,233
153.4	153.7	0.3	Forest, wetlands, scrub/shrub	533
155.2	155.5	0.3	Forest	1,960
155.5	155.5	0.0	Wetlands	465
155.5	157.8	2.3	Forest, wetlands	1,867
158.0	159.0	1.0	Forest, wetlands	466
160.3	160.9	0.6	Forest, wetlands	395
161.4	162.7	1.3	Forest, wetlands	333
163.5	165.0	1.5	Forest, scrub/shrub	689
166.6	167.6	1.0	Forest, wetlands	413
168.1	169.0	0.9	Forest, wetlands	166
170.7	171.0	0.3	Forest	173
180.7	182.3	1.6	Forest, wetlands	784
182.4	183.6	1.2	Forest, wetlands	315
183.8	193.3	9.5	Forest, wetlands, scrub/shrub	8,539
193.4	196.7	3.3	Forest, wetlands	2,607
196.8	202.1	5.3	Forest, wetlands	467
204.4	205.4	1.0	Forest, wetlands	324
205.5	207.0	1.5	Forest, wetlands	2,882
207.3	208.3	1.0	Forest, wetlands, scrub/shrub	121
208.4	210.0	1.6	Forest, wetlands, scrub/shrub, herbaceous	968
210.2	212.1	1.9	Forest, wetlands	508
214.4	215.2	0.8	Forest, wetlands	1,870

Table 6.3.4-23. Large-Block Habitat Patches Crossed by Route Alternative RA-06 in Minnesota

Beginning Milepost	Ending Milepost	Crossing Length (miles)	Patch Type	Patch Size (acres)
215.3	215.9	0.6	Forest, wetlands	235
215.6	216.2	0.6	Forest	237
218.5	221.1	2.6	Forest, wetlands, scrub/shrub, herbaceous	3,260
222.6	223.4	0.8	Forest	138
223.7	230.3	6.6	Forest, scrub/shrub	9,135
230.4	233.1	2.7	Forest, scrub/shrub	909
234.4	236.2	1.8	Forest, scrub/shrub, herbaceous	945
236.3	237.1	0.8	Scrub/shrub	1,266
237.3	239.5	2.2	Scrub/shrub	1,128
239.5	242.4	2.9	Forest, wetlands, scrub/shrub, herbaceous	1,280
242.5	243.6	1.1	Forest, wetlands, scrub/shrub, herbaceous	248
244.2	244.7	0.5	Forest	116
244.8	246.5	1.7	Forest, wetlands, scrub/shrub	706
246.6	249.3	2.7	Forest, wetlands, scrub/shrub, herbaceous	586
249.6	252.7	3.1	Wetlands	3,251
252.8	254.5	1.7	Forest, wetlands	367
254.9	255.8	0.9	Forest, wetlands, scrub/shrub	524
255.9	257.3	1.4	Forest, wetlands	295
257.4	257.9	0.5	Forest	133
257.9	261.4	3.5	Forest, wetlands	783
261.5	262.3	0.8	Forest	143
262.4	264.0	1.6	Scrub/shrub, wetlands	723
264.1	265.3	1.2	Forest	274
265.4	266.7	1.3	Forest, wetlands, scrub/shrub	184
266.9	268.3	1.4	Forest	790
269.3	272.2	2.9	Forest	886
272.8	273.5	0.7	Forest	145

Table 6.3.4-23. Large-Block Habitat Patches Crossed by Route Alternative RA-06 in Minnesota

Beginning Milepost	Ending Milepost	Crossing Length (miles)	Patch Type	Patch Size (acres)
274.2	276.4	2.2	Forest, wetlands	821
276.5	277.8	1.3	Forest, wetlands, scrub/shrub	1,570
279.2	280.3	1.1	Forest, wetlands	467
281.1	284.1	3.0	Forest	3,339
284.4	290.8	6.4	Forest, wetlands	5,451
290.7	295.2	4.5	Wetlands	6,804
TOTAL		**114.3**		**83,996**

Source: Fragmentation analysis based on Homer et al. 2015 – NLCD 2011.

Operations Impacts

Fisheries and Aquatic Habitat

General Potential Impacts. General impacts from operation of a pipeline along system RA-06 would be similar to those described for the Applicant's preferred route above. Operation of RA-06 would affect 137 stream crossings (Table 6.3.4-13), including seven trout streams and one trout lake within the permanent right-of-way (Table 6.3.4-15). Operations of RA-06 would impact 2.1 acres of AMA and 1.4 acres of Lakes of Biological Significance (Table 6.3.4-15). Impacts could result from maintenance activities, including vegetation management at stream edges that would occur for the life of the Project. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way, which could lead to permanent major thermal effects on trout streams and permanent minor changes at other waterbody crossings. Additional impacts could occur from the use of herbicides and accidental fuel and lubricant leaks and spills from maintenance and inspection vehicles. With implementation of the proposed BMPs, these impacts would be short term and negligible to minor.

Impacts due to Integrity Management Digs. Impacts from integrity management digs of a pipeline along system alternative RA-06 would be similar to those described for the Applicant's preferred route above. During operation, the Applicant would implement its Integrity Management Program, which has the potential to require excavation and repair or replacement of sections of the pipeline. The Applicant would implement measures to minimize runoff to surface water during and after these activities, similar to the measures incorporated into the Project during construction. If pipe segments need to be repaired or replaced along surface water crossings, either the wet open-cut or dry open-cut method would be used to access the pipe. These methods would be the same as those used for construction of the crossing as described above. The impacts on fisheries and aquatic habitat would be similar to those experienced during construction; for each integrity dig, the impacts would be short term to long term and minor, depending on the location, habitats affected, and whether repair or replacement are needed. These impacts would occur periodically over the life of the Project.

During the repair or replacement of pipe as part of the Applicant's Integrity Management Program described above, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. With adherence to permits and implementation of BMPs to avoid the intake or entrainment of fish, the impacts associated with minor alterations in stream flows from water appropriation and discharge for each integrity dig would be temporary and negligible.

Wildlife and Wildlife Habitat

General Potential Impacts. General impacts from operation of a pipeline along system RA-06 would be similar to those described for the Applicant's preferred route above. Operation of RA-06 would affect 1,115 acres of wildlife habitat, primarily consisting of deciduous forest and woody wetlands. During operation of the pipeline, the permanent right-of-way would be maintained to prevent woody vegetation from regrowing. Losses of tree and shrub habitats used by birds for cover, forage, and nesting would be long term to permanent in the area of the construction work area that is outside of the permanent right-of-way due to the long period of time for forest to regenerate. Within the permanent right-of-way, this impact would be permanent and minor to major.

Mowing and vegetation removal can result in injury or direct mortality of smaller species such as turtles, small mammals, and bird eggs and young. This recurring impact would be localized to the permanent right-of-way and the areas around aboveground facilities, resulting in short-term minor impacts on common wildlife for each occurrence, but the mowing would be repeated periodically over the life of the Project. The permanent right-of-way also could create a travel corridor for some species. Habitat in the permanent right-of-way could be degraded if native vegetation is replaced by noxious and invasive species. Use of chemical weed controls can adversely affect wildlife species, particularly amphibians because of their sensitivity to chemical exposure. However, implementation of BMPs for use of herbicides that include measures such as only using herbicides when necessary and using aquatic formulations within 50 feet of water, and prevention of the spread of noxious species would minimize the potential for impacts; and the impact on wildlife and wildlife habitats is expected to be temporary to short term and minor.

Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from operation of RA-06 would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Construction of RA-06 would permanently disturb 135 acres of wildlife conservation areas, including three state forests (Table 6.3.4-20). RA-06 also would cross the Chippewa Plains IBA, resulting in approximately 213 acres of permanent disturbance during operation (Table 6.3.4-21).

Impacts from Habitat Fragmentation. RA-06 is not co-located with other pipelines, utilities, or roads across much of its length and would affect a greater number of large-block habitats than any other potential route. Sixty large-block habitats (more than 100 acres) would be crossed and fragmented by construction of RA-06 between approximately MP 140.0 and 295.0 (Table 6.3.4-23). The large-block habitats that would be crossed by RA-06 primarily include forested and woody wetland habitats. The largest patch size (about 9,100 acres) would be crossed by approximately 7 miles of pipeline, and the smallest patch size (about 110 acres) would be crossed by approximately 0.4 mile of pipeline (Table 6.3.4-23). Habitats along RA-06 would be fragmented across a total of approximately 114 miles (about 58 percent of the route) between Clearbrook and Carlton. Habitat fragmentation resulting from construction of RA-06 would create more edge habitats, may result in decreased populations of forest interior species, and could facilitate the spread of invasive species. Impacts from habitat fragmentation by operations of RA-06 would be permanent and major.

Impacts from Integrity Management Digs. Integrity management digs would disturb wildlife and wildlife habitat as described above for construction impacts; however, the area affected would be substantially smaller and would occur entirely within the established right-of-way. Consequently, impacts on wildlife and wildlife habitat would be short term and negligible to minor but would occur periodically over the life of the Project.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the fish and wildlife ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Fisheries and Aquatic Habitat

General Potential Impacts. Construction of RA-07 would require crossing 81 streams, including 6 trout streams (Tables 6.3.4-13 and 6.4.3-15). These crossings would be constructed using the methods described in Section 6.3.4.3.1 for construction of surface water crossings of the Applicant's preferred route, including incorporation of the BMPs described in that section. The impacts of surface water crossings for RA-07 would be the same as those for the Applicant's preferred route. Most crossing impacts would be temporary to short term and negligible to minor; although the use of wet open-cut crossings could result in a short- to long-term, minor impact at each crossing. Where streambanks are cleared of forested or other woody vegetation, the potential impacts on fisheries and aquatic habitats would be permanent and minor to major, depending on existing surface water conditions. Crossing methods have not been established for RA-07.

Potential Impacts on Management Units and Managed Species. RA-07 would cumulatively result in 8.2 acres of disturbance to two AMAs (Clearwater and Little Otter Creek) and would pass within 0.5 mile of six other AMAs (Table 6.3.4-14). AMAs represent good-quality habitats with functional adjacent upland wildlife habitat areas. Impacts on AMAs from construction would depend on the type of waterbody crossing method used. RA-07 also would pass within 0.5 mile of three lakes with Fish IBI ratings (Table 6.3.4-16). Construction of RA-07 would disturb 10.9 acres within three Minnesota Lakes of Biological Significance rated as outstanding (Table 6.3.4-17) as well as pass within 0.5 mile of four lakes managed for muskellunge (Table 6.3.4-18).The Applicant would incorporate BMPs into construction to avoid or minimize impacts; as a result, construction-related impacts from loss of habitat and reduction of habitat quality would be short term and negligible to minor. The Applicant also would implement BMPs to prevent the spread of invasive species, with the resultant impact expected to be at most short term and negligible to minor. Minnesota PCA's Watershed Health Assessment parameters for species richness, stream species quality, and habitat quality and connectivity were compared for the Applicant's preferred route and RA-03AM, RA-06, RA-07, and RA-08 between Clearbrook and Carlton using the data in Figures 6.3.4-5, 6.3.4-6, and 6.3.4-7. No clear consistent trends distinguished between the route options.

Wildlife and Wildlife Habitat

General Potential Impacts. The types of impacts on wildlife and wildlife habitats from construction of RA-07 and the measures to be implemented to avoid or reduce construction-related impacts would be the same as those described in Section 6.3.4.3.1 for the Applicant's preferred route. Construction of RA-07 would disturb 3,833 acres of wildlife habitat primarily consisting of forest and wetlands (Table 6.3.4-19). Impacts on these areas would be similar to those described above including the potential of introduction of invasive species, loss of habitat, and reduction of habitat quality. Forests provide complex and valuable habitat for many species of wildlife and would take decades to recover to maturity. The potential impact on wildlife and wildlife habitat from construction of RA-07 would be long term to permanent and minor to major.

Potential Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from construction of RA-07 would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Construction of RA-07 would have short-term minor impacts on 486 acres of wildlife conservation areas, including one wildlife refuge and three state forests (Table 6.3.4-20). RA-07 also would cross the Chippewa Plains IBA, resulting in approximately 1,016 acres of disturbance during construction (Table 6.3.4-21); however, RA-07 is within or adjacent to existing pipelines and corridors with high levels of disturbance and therefore its impact on IBAs would be less than routes traversing undisturbed areas. These impacts would be short term and minor.

Red-necked grebes occupy the Grass Lake rookery, which is nearly 2,000 feet from the proposed route of RA-07. At this distance, construction activities would not be expected to disturb nesting red-necked grebes and any impacts would be temporary and negligible, regardless of the construction season.

Impacts from Habitat Fragmentation. RA-07 is co-located with existing pipelines, transmission lines, and roads across all of its length. No large-block habitats would be fragmented by RA-07; however, widening corridors in this area could contribute to habitat loss and conversion, decreased habitat quality, and increased risk of the introduction of invasive species. Potential impacts on wildlife habitat and wildlife from fragmentation are expected to be temporary to short term and negligible.

<u>Operations Impacts</u>

Fisheries and Aquatic Habitat

General Potential Impacts. General impacts from operation of a pipeline along the RA-07 route would be similar to those described for the Applicant's preferred route. Operation of RA-07 would affect 81 stream crossings, including 6 trout streams within the permanent right-of-way. Impacts could result from maintenance activities, including vegetation management at stream edges that would occur for the life of the Project. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way, which could lead to permanent major thermal effects on trout streams and permanent minor effects at other water crossings. Additional impacts could occur from the use of herbicides and accidental fuel and lubricant leaks and spills from maintenance and inspection vehicles. With implementation of the proposed BMPs, these impacts would be temporary and negligible to minor. RA-07 would disturb 2 acres within AMAs. Operation of RA-07 also would disturb 2.1 acres of Minnesota Lakes of Biological Significance. Permanent and minor impacts would be expected for these resources.

Impacts from Integrity Management Digs. Impacts from integrity management digs along the RA-07 route would be similar to those described for the Applicant's preferred route. During operation, the

Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. The Applicant would implement measures to minimize runoff to surface water during and after these activities, similar to the measures incorporated into the Project during construction. If pipe segments need to be repaired or replaced along surface water crossings, the wet open-cut or dry open-cut method would be used to access the pipe. These methods would be the same as those used for construction of the crossing, as described above. Potential impacts on fisheries and aquatic habitat would be similar to those experienced during construction; for each integrity dig, the impacts would be short term to long term and minor, depending on the location, habitats affected, and whether repair or replacement are needed. These impacts would occur periodically over the life of the Project.

During repair or replacement of pipe as part of the Integrity Management Program, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. With adherence to permits and implementation of BMPs to avoid the intake or entrainment of fish, impacts associated with minor alterations in stream flows from water appropriation and discharge for each integrity dig would be temporary and negligible.

Wildlife and Wildlife Habitat

General Potential Impacts. General impacts from operation of a pipeline along the RA-07 route would be similar to those described for the Applicant's preferred route. Operation of RA-07 would affect 936 acres of wildlife habitat, primarily consisting of deciduous forest and woody wetlands. During operation of the pipeline, the permanent right-of-way would be maintained to prevent woody vegetation from re-growing. Losses of tree and shrub habitats used by birds for cover, forage, and nesting would be long term to permanent in the area of the construction work area that is outside of the permanent right-of-way because of the long period of time required for forest to regenerate. Within the permanent right-of-way, the impact would be permanent and minor to major.

Mowing and vegetation removal can result in injury or direct mortality of smaller species such as turtles, small mammals, and bird eggs and young. This recurring impact would be localized to the permanent right-of-way and the areas around aboveground facilities, resulting in short-term minor impacts on common wildlife for each occurrence; but the mowing would be repeated periodically over the life of the Project. The permanent right-of-way also could create a travel corridor for some species. Habitat in the permanent right-of-way could be degraded if native vegetation is replaced by noxious and invasive species. The use of chemical controls can adversely affect wildlife species, particularly amphibians because of their sensitivity to chemical exposure. However, implementation of BMPs for use of herbicides that include measures such as only using herbicides when necessary and using aquatic formulations within 50 feet of water, and prevention of the spread of noxious species would minimize the potential for impacts; and the impact on wildlife and wildlife habitats is expected to be short term and minor.

Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from operation of RA-07 would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Operation of RA-07 would permanently disturb 86 acres of wildlife conservation areas (Table 6.3.4-20). RA-07 also would cross the Chippewa Plains IBA, resulting in approximately 248 acres of permanent disturbance during operation (Table 6.3.4-21). Impacts on these resources would be long term to permanent and minor.

Impacts from Habitat Fragmentation. RA-07 is co-located with existing pipelines, transmission lines, and roads across all of its length. No large-block habitats would be fragmented by RA-07; however, widening corridors in this area could contribute to habitat loss and conversion, decreased habitat quality, and increased risk of the introduction of invasive species. Impacts on wildlife habitat and wildlife from fragmentation are expected to be temporary to short term and negligible.

Impacts from Integrity Management Digs. Integrity management digs would disturb wildlife and wildlife habitat as described above for construction impacts; however, the area affected would be substantially smaller and would occur entirely within the established right-of-way. Consequently, impacts on wildlife and wildlife habitat from integrity digs would be short term and negligible to minor but would occur periodically over the life of the Project.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the fish and wildlife ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Construction Impacts

Fisheries and Aquatic Habitat

General Potential Impacts. Construction of RA-08 would require crossing 106 streams, including 7 trout streams (Tables 6.3.4-13 and 6.4.3-15). These crossings would be constructed using the methods described in Section 6.3.4.3.1 for construction of surface water crossings of the Applicant's preferred route, including incorporation of the BMPs described in that section. The impacts of surface water crossings for RA-08 would be the same as those described for the Applicant's preferred route. Most crossing impacts would be temporary to short term and negligible to minor; although the use of wet open-cut crossings could result in a short- to long-term, minor impact at each crossing. Where streambanks are cleared of forested or other woody vegetation, the potential impacts on fisheries and aquatic habitats would be permanent and minor to major, depending on existing surface water conditions. Crossing methods have not been established for RA-08.

Potential Impacts on Management Units and Managed Species. RA-08 would cumulatively result in 4.7 acres of disturbance to two AMAs (Bruce Creek and Little Otter Creek) and would pass within 0.5 mile of three other AMAs (Table 6.3.4-14). AMAs represent good-quality habitats with functional adjacent upland wildlife habitat areas. Impacts on AMAs from construction would depend on the type of waterbody crossing method used. RA-08 also would pass within 0.5 mile of one lake with a Fish IBI rating (Table 6.3.4-16). Construction of RA-08 would disturb 6 acres of one Minnesota Lake of Biological Significance with a rating of outstanding (Table 6.3.4-17) as well as pass within 0.5 mile of two lakes managed for muskellunge (Table 6.3.4-18). As for the Applicant's preferred route, the Applicant would incorporate BMPs into construction to avoid or minimize impacts; as a result, the impacts of construction of RA-08 from loss of habitat and reduction of habitat quality would be short term and negligible to minor. The Applicant would implement BMPs to prevent the spread of invasive species, with the resultant impact expected to be at most short term and negligible to minor. Minnesota PCA's Watershed Health Assessment parameters for species richness, stream species quality, and habitat quality and connectivity were compared for the Applicant's preferred route and RA-03AM, RA-06, RA-07, and RA-08 between

Clearbrook and Carlton using the data in Figures 6.3.4-5, 6.3.4-6, and 6.3.4-7. No clear consistent trends distinguished between the potential routes.

Wildlife and Wildlife Habitat

General Potential Impacts. The types of impacts on wildlife and wildlife habitats that would occur for construction of RA-08 and the measures to be implemented to avoid or reduce impacts associated with pipeline construction would be the same as those described in Section 6.3.4.3.1 for the Applicant's preferred route. Construction of RA-08 would disturb 2,287 acres of wildlife habitat, primarily consisting of forest and wetlands (Table 6.3.4-19). Impacts on these areas would be similar to those described above, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Forests provide complex and valuable habitat for many species of wildlife and would require decades to recover to maturity. Potential impacts on wildlife and wildlife habitat from construction of RA-08 would be long term to permanent and minor to major.

Potential Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from construction of RA-08 would be similar to those described for the Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Construction of RA-08 would have short-term minor impacts on 237 acres of wildlife conservation areas, including one wildlife refuge, two WMAs, and four state forests (Table 6.3.4-20). RA-08 also would cross the Chippewa Plains IBA, resulting in approximately 594 acres of long-term to permanent and minor to major disturbance during construction (Table 6.3.4-21). Because RA-08 is within or adjacent to existing pipelines and corridors with high levels of disturbance, impacts on IBAs would be somewhat less than for routes traversing undisturbed areas.

A great blue heron colony falls within the construction and operation area of RA-08. Construction of RA-08 would result in disturbance to the Portage Creek great blue heron rookery (Table 6.3.4-22). Research has shown that construction activities within 300 meters (984 feet) of nesting great blue herons can cause nest abandonment and reproductive failure (VFWD 2002; MNFI 2016). RA-08 could result in removal of great blue heron rookery trees within construction work areas, which would cause permanent major impacts on Portage Creek heron nesting habitat and short-term and minor impacts on individual birds, as they would be forced to find new nest sites. Permits would be needed from USFWS and Minnesota DNR if tree removal would occur during the nesting season.

Impacts from Habitat Fragmentation. RA-08 is co-located with existing pipelines, transmission lines, and roads across all of its length. No large-block habitats would be fragmented by RA-08; however, widening corridors in this area could contribute to habitat loss and conversion, decreased habitat quality, and increased risk of invasive species introduction. Potential impacts on wildlife habitat and wildlife from fragmentation are expected to be temporary to short term and negligible.

Operations Impacts

Fisheries and Aquatic Habitat

General Potential Impacts. General impacts from operation of a pipeline along the RA-08 route would be similar to those described for the Applicant's preferred route above. Operation of RA-08 would affect 106 stream crossings, including 4 trout streams within the permanent right-of-way. Operation of RA-08 would disturb 2 acres of AMAs and 2.5 acres of Minnesota Lakes of Biological Significance. Impacts could result from maintenance activities, including vegetation management at stream edges that would occur for the life of the Project. Trees and shrubs would not be allowed to reestablish within the permanent right-of-way, which could lead to permanent major thermal effects on trout streams and permanent but minor impacts at other water crossings. Additional impacts could occur from the use of herbicides and accidental fuel and lubricant leaks and spills from maintenance and inspection vehicles. With implementation of the proposed BMPs, these impacts would be short term and negligible to minor.

Impacts from Integrity Management Digs. Impacts from integrity management digs along the RA-08 route would be similar to those described for the Applicant's preferred route above. During operation, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline. The Applicant would implement measures to minimize runoff to surface water during and after these activities, similar to the measures incorporated into the Project during construction. If pipe segments need to be repaired or replaced along surface water crossings, the wet open-cut or dry open-cut method would be used to access the pipe. These methods would be the same as those used for construction of the crossing, as described above. Potential impacts on fisheries and aquatic habitat would be similar to those experienced during construction; for each integrity dig, the impacts would be short term to long term and minor, depending on the location, habitats affected, and whether repair or replacement are needed. These impacts would occur periodically over the life of the Project.

During repair or replacement of pipe as part of the Integrity Management Program, it may be necessary to withdraw and discharge water to hydrostatically test sections of pipe and for dust control during the integrity digs and backfilling activities. With adherence to permits and implementation of BMPs to avoid the intake or entrainment of fish, the impacts associated with minor alterations in stream flows from water appropriation and discharge for each integrity dig would be temporary and negligible.

Wildlife and Wildlife Habitat

General Potential Impacts. The types of impacts on wildlife and wildlife habitats from construction of RA-08 and the measures to be implemented to avoid or reduce construction-related impacts would be the same as those described in Section 6.3.4.3.1 for the Applicant's preferred route. Operation of RA-08 would affect 955 acres of wildlife habitat, primarily consisting of deciduous forest and wetlands. During operation of the pipeline, the permanent right-of-way would be maintained to prevent woody vegetation from re-growing. Losses of tree and shrub habitats used by birds for cover, forage, and nesting would be long term to permanent in the area of the construction work area that is outside of the permanent right-of-way because of the long period of time required for forest to regenerate. Within the permanent right-of-way, the impact would be permanent and minor to major.

Mowing and vegetation removal can result in injury or direct mortality of smaller species such as turtles, small mammals, and bird eggs and young. This recurring impact would be localized to the permanent right-of-way and the areas around aboveground facilities, resulting in short-term minor impacts on common wildlife for each occurrence; but the mowing would be repeated periodically over the life of the Project. The permanent right-of-way also could create a travel corridor for some species. Habitat in the permanent right-of-way could be degraded if native vegetation is replaced by noxious and invasive species. The use of chemical controls can adversely affect wildlife species, particularly birds, from accidental ingestion. However, implementation of BMPs for use of herbicides and prevention of the spread of noxious species would minimize the potential for impacts. Therefore, the potential impact on wildlife and wildlife habitats is expected to be short term and minor.

Impacts on Management Units and Managed Species. Potential impacts on WMAs, state forests, and other conservation lands from operation of RA-08 would be similar to those described for the

Applicant's preferred route, including the potential for introduction of invasive species, loss of habitat, and reduction of habitat quality. Operation of RA-08 would permanently disturb 237 acres of wildlife conservation areas (Table 6.3.4-20). RA-08 also would cross the Chippewa Plains IBA, resulting in approximately 248 acres of permanent disturbance during operation (Table 6.3.4-21). Operation of RA-08 would result in permanent removal of the Portage Creek great blue heron rookery (Table 6.3.4-22) resulting in permanent major impacts on the colony but short-term and minor impacts on the individuals.

Impacts from Habitat Fragmentation. RA-08 is co-located with existing pipelines, transmission lines, and roads across all of its length. No large-block habitats would be fragmented by RA-08; however, widening corridors in this area could contribute to habitat loss and conversion, decreased habitat quality, and increased risk of the introduction of invasive species. The impacts on wildlife habitat and wildlife due to fragmentation are expected to be temporary to short term and negligible.

Impacts from Integrity Management Digs. Integrity management digs would disturb wildlife and wildlife habitat as described above for construction impacts; however, the area affected would be substantially smaller and would occur entirely within the established right-of-way. As a result, impacts on wildlife and wildlife habitat would be short term and negligible to minor but would occur periodically over the life of the Project.

6.3.4.4 Summary and Mitigation

6.3.4.4.1 Summary

Construction and operation of the Applicant's preferred route or any of route alternatives could result in impacts on aquatic habitat, fish, wildlife habitat, and wildlife, ranging from no impact to permanent major impacts. Impacts would likely occur in forested areas and wetlands where habitat fragmentation would be most noticeable as well as in areas where large trees are permanently removed along streambanks. Impacts would also occur where colonial waterbird nesting trees are removed. Table 6.3.4-24 presents a summary of construction- and operations-related impacts on aquatic habitat, fish, wildlife habitat, and wildlife for the Applicant's preferred route and route alternatives.

Avoidance and impact minimization measures that would influence the duration and magnitude of impacts include Applicant-proposed measures, measures proposed by Minnesota DNR, and measures that would be included in state and federal permits. All stream crossings and measureable disturbance to wildlife (e.g., beaver dams, colonial nesting waterbirds, raptor nests) or aquatic species (e.g., fish, mussels) would be reviewed and approved by the authorizing agency prior to construction and may include requirements for further surveys or additional mitigation. The avoidance and mitigation measures and the standard BMPs described for the Applicant's preferred route would be applicable to the route alternatives.

Fisheries and Aquatic Habitat

<u>Construction Impacts</u>

The largest potential impacts on aquatic habitat due to construction would result from clearing vegetation along streambanks, in-water disturbance from construction of the Applicant's preferred route or route alternative pipelines across surface water where the wet or dry open-cut crossing methods are used, and if a frac-out occurred during the HDD method in sensitive or impaired waters.

The Applicant's preferred route would cross 192 surface waters along its total length and 111 waterbodies between Clearbrook and Carlton. For two route alternatives, the number of surface water crossings between Clearbrook and Carlton is greater (167 crossings for RA-03AM and 137 crossings for RA-06); and for two route alternatives, the number is less (81 crossings for RA-07 and 106 crossings for RA-08). All of the potential routes would cross AMAs and sensitive aquatic resources within the ROIs of the pipeline routes between Clearbrook and Carlton, including Fish IBI Lakes, Lakes of Biological Significance (including many ranked as outstanding), one Sentinel Lake (along RA-03M), seven trout streams, one trout lake, and lakes managed for muskellunge. No hatcheries are within the ROIs of the potential routes. Although there are hatcheries farther downstream, construction is not expected to affect those hatcheries.

The Applicant's preferred route and the route alternatives pass through forested areas and would involve the removal of woody vegetation that provides shade and stability along some streams. This could result in long-term major impacts on trout streams due to the potential for thermal changes. However, impacts on aquatic habitat, including trout streams and other sensitive aquatic resources, could be temporary to long-term and minor if the crossing method with least disturbance is used and BMPs are in place to reduce impacts. Proper restoration of streambanks after construction of stream crossings would prevent additional sedimentation as well as changes to the width, depth, and temperature of all streams, including trout streams.

The waters within the ROIs of the Applicant's preferred route and route alternatives provide habitat for similar species of fish, including important managed recreational species such as muskellunge and trout. Fish in the vicinity of surface water crossings along all routes likely would respond to the increased instream activities by leaving the construction area and avoiding direct impacts; however, injuries or mortality could occur resulting in temporary and minor impacts for common species in the area. Aquatic habitat connectivity and species richness of macroinvertebrates, mussels, and fish do not differ among pipeline routes.

With adherence to water appropriation and NPDES permit conditions and implementation of Applicant-proposed measures, impacts on fisheries and aquatic habitats from water appropriation and discharge during pipeline construction would be temporary and minor for the Applicant's preferred route and route alternatives.

Operations Impacts

Vegetation maintenance during operations would require the removal of riparian vegetation from the permanent right-of-way of each of the pipeline alternatives, including areas adjacent to waterbody crossings. The resultant impacts on aquatic habitat would be similar for the Applicant's preferred route and route alternatives with RA-03AM and RA-06 requiring the greatest number of stream crossings. The impacts for the new pipeline would be long term and minor to major at heavily wooded crossing locations, and short term to long term and minor to major at crossings within grasslands or croplands. That Applicant's preferred route and all route alternatives would cross trout streams where the impact during operation would be permanent and major due to possible increases in temperature.

If minor leaks or spills occurred during normal operations for the Applicant's preferred route and route alternatives there would be negligible to minor changes to surface water quality and the resultant impacts on fisheries and aquatic habitats would be temporary and negligible to minor.

For all alternatives, the Applicant would implement its noxious weed plans that include methods to prevent and reduce the introduction and spread of noxious weeds and invasive species, and would implement BMPs for herbicide applications to minimize impacts on aquatic and terrestrial resources. As a result, the use of herbicides would result in temporary negligible impacts on fisheries and aquatic habitats.

During operation of the pipeline route options, the Applicant would implement its Integrity Management Program, which could require excavation and repair or replacement of sections of the pipeline at surface water crossings using the wet or dry open-cut method to access the pipe. For each integrity dig, impacts would be short term and minor, and would occur periodically over the life of the Project. Impacts from integrity digs would be similar for all routes.

Wildlife and Wildlife Habitat

<u>Construction Impacts</u>

Impacts on wildlife habitat would vary slightly among the Applicant's preferred route and route alternatives. The acreage of wildlife habitat affected by construction of the pipeline route options ranges from 2,286 acres (RA-08) to 3,578 acres (RA-03AM). All of the routes would cross WMAs. The Applicant's preferred route, RA-06 and RA-07 would permanently convert the greatest number of acres to maintained pipeline right-of-way. Audubon IBAs would be crossed by all routes. Route alternatives RA-06, RA-07, and RA-08 would result in greater permanent habitat removal than RA-03AM or the Applicant's preferred route.

Overall, wildlife habitat quality is similar for all routes based on vegetation cover class. Some routes would have greater impacts on high-value habitat such as wetlands (i.e., RA-07) or deciduous forest (i.e., Applicant's preferred route) than others. RA-03AM would mostly affect hay and pasture land. RA-07 and RA-08 would be co-located with existing pipelines for their entire lengths; RA-03AM would be co-located with existing pipelines, electrical transmission lines, and roads (Section 6.7). RA-06 would not be co-located with other pipelines, utilities, or roads across much of its length. Alternatives co-located would occupy areas that are already somewhat degraded, resulting in less impact on wildlife and habitat than routes or portions of routes that are not within or adjacent to utility corridors. Habitat fragmentation would be greatest for the Applicant's preferred route (36.7 miles and 27,101 acres) and RA-06 (114.3 miles 83,996 acres). Route alternatives RA-03AM, RA-07, and RA-08 would be co-located with existing pipelines, transmission lines, and roads across most of their lengths such that these route alternatives would not contribute to wildlife habitat fragmentation.

For the Applicant's preferred route and all route alternatives, clearing, grading, trenching, and the use of construction vehicles and equipment would result in direct impacts on some animals, particularly small and mid-sized mammals, reptiles, amphibians and invertebrates. Members of these species would be affected more than large wildlife because of their relative lack of mobility compared to that of larger animals (e.g., deer and coyotes). The impact of these activities on wildlife would be temporary to short term and minor for all route options. Both RA-06 and RA-08 could result in permanent removal of heron nesting trees.

Many animals would be temporarily displaced from the active construction areas and adjacent areas. Nearby habitat could provide cover and suitable escape habitat for many of the displaced species, and the more mobile animals could return to the area after completion of construction and restoration activities, if appropriate habitats are available. As a result, the impact of these displacements during construction would be temporary to short term and minor.

Operations Impacts

The types of impacts associated with operations would be similar for the Applicant's preferred route and the route alternatives and would occur for the life of the Project. The general impacts of right-of-way maintenance would be temporary to short term and minor for each occurrence for all potential pipeline routes. Impacts of right-of-way maintenance within general wildlife habitat, conservation lands, and IBAs would be short term to permanent and minor to major, depending on the type of habitat present. Maintenance activities could reduce populations of species sensitive to habitat disturbance and could result in permanent minor effects on breeding birds. Maintenance of the right-of-way would also include mowing of vegetation, which could disturb wildlife or result in mortality of common small species. These impacts would be short term and minor.

The maintained permanent rights-of-way may be used as travel corridors by some big game animals and humans and may become attractive to some small species. This could result in permanent and minor effects on common wildlife. Implementation of BMPs to prevent the spread of noxious species would minimize impacts from herbicide applications and from colonization of the rights-of-way with invasive plants.

During operation, the Applicant's Integrity Management Program would periodically require excavation and repair or replacement of sections of the pipeline. The impacts would be similar to those occurring during construction of the pipeline; but they would occur over a substantially smaller area. For all routes, these impacts would be short term and negligible to minor for each occurrence but would occur periodically over the life of the Project.

6.3.4.4.2 Mitigation

In addition to the measures the Applicant would incorporate into the Project to avoid or minimize impacts, including stipulations in the permits required for the Project, Minnesota DNR has identified the following measures to reduce impacts on fisheries and wildlife:

- Use the HDD crossing method at all crossings of tributaries that are upstream of trout streams.
- Cover open-vent pipe ends with screens at cathodic protection systems to prevent birds and small mammals from becoming trapped in the pipe.
- During maintenance mowing of the permanent right-of-way, set the mower blade height at 6 to 8 inches above the ground to reduce injury and mortality impacts on small animals, and to prevent erosion.
- If construction activities occur within the recommended buffer distance of 984 feet from the Mahtowa or other heron rookeries during the nesting season (from April through August), the Applicant must consult with USFWS and Minnesota DNR and obtain any permits that may be required.
- Use wider vegetated buffers during construction near trout streams (100 feet vs the standard 50 feet).
- Reduce the construction work area width.

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Construction Impacts					
Aquatic habitat loss or reduction of aquatic habitat quality from construction activities, including hydrostatic testing	Generally temporary to long-term/negligible to minor impacts Long-term to permanent/minor to major impacts *(where streambanks are cleared of forested or woody vegetation)* • 111 stream crossings	Generally temporary to long-term/negligible to minor impacts Long-term to permanent /minor to major impacts *(where streambanks are cleared of forested or woody vegetation)* • 167 stream crossings	Generally temporary to long-term/negligible to minor impacts Long-term to permanent /minor to major impacts *(where streambanks are cleared of forested or woody vegetation)* • 137 stream crossings	Generally temporary to long-term/negligible to minor impacts Long-term to permanent /minor to major impacts *(where streambanks are cleared of forested or woody vegetation)* • 81 stream crossings	Generally temporary to long-term/negligible to minor impacts Long-term to permanent /minor to major impacts *(where streambanks are cleared of forested or woody vegetation)* • 106 stream crossings
Trout stream habitat loss or reduction of aquatic habitat quality from surface water crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 6 trout stream crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 8 trout stream crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 7 trout stream and 1 trout lake crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 8 trout stream crossings	Short-term/minor impacts Permanent/major potential thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 7 trout stream crossings
Loss of habitat and reduction of habitat quality in Aquatic Management Areas (AMAs)	Short-term/negligible to minor impacts • 0.4 acre of AMA disturbance	Short-term/negligible to minor impacts • 0.5 acre of AMA disturbance	Short-term/negligible to minor impacts • 5.0 acres of AMA disturbance	Short-term/negligible to minor impacts • 8.2 acres of AMA disturbance	Short-term/negligible to minor impacts • 4.7 acres of AMA disturbance

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Loss of habitat and reduction of habitat quality in Minnesota Lakes of Biological Significance (LBS) and other sensitive aquatic resources such as fish IBI Lakes, mussel beds, and muskie lakes	No impact on LBS, but 1 sentinel lake may have short-tern/negligible to minor impacts	No impact	Short-term/negligible to minor impacts • 3.4 acres of LBS disturbance	Short-term/negligible to minor impacts • 10.9 acres of LBS disturbance	Short-term/negligible to minor impacts • 6 acres of LBS disturbance
Potential for injury, mortality, or disturbance of aquatic species affecting fisheries	Temporary/minor to major impacts	Temporary/minor to major impacts	Temporary/minor to major impacts	Temporary/minor to major impacts	Temporary/minor to major impacts
Loss of habitat or reduction of wildlife habitat quality from construction activities and vegetation clearing[k]	Temporary to permanent/minor to major impacts from clearing of the right-of-way; pipeline would be co-located with existing corridors • 2,806 acres of habitat, primarily deciduous forest and crop land	Temporary to permanent/minor impacts; pipeline would be co-located with existing corridors the entire length • 3,579 acres of habitat, primarily deciduous forest, hay, and pasture land	Long-term to permanent/minor to major impacts from clearing of the right-of-way • 2,674 acres of habitat, primarily forest and woody wetlands	Long-term/minor to major impacts; pipeline would be co-located with existing corridors the entire length • 3,832 acres of habitat, primarily wetlands and forest	Long-term to permanent to /minor to major impacts; pipeline would be co-located with existing corridors the entire length • 2,287 acres of habitat, primarily wetlands and forest
Loss of habitat or reduction of wildlife habitat quality in wildlife conservation areas from vegetation clearing	Short-term to permanent/minor to major impacts from clearing of the right-of-way • 381 acres of wildlife conservation areas	Short-term/minor impacts; pipeline would be co-located with existing corridors • 44 acres of wildlife conservation areas	Short-term/minor impacts from clearing of the right-of-way • 325 acres of wildlife conservation areas	Short-term/minor impacts; pipeline would be co-located with existing corridors • 486 acres of wildlife conservation areas	Short-term/minor; pipeline would be co-located with existing corridors • 237 acres of wildlife conservation areas

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Loss of habitat or reduction of wildlife habitat quality in Audubon Important Bird Areas (IBAs) from vegetation clearing	Short- to long-term/minor impacts from clearing of the right-of-way • 48 acres of IBAs	Short-term/minor impacts because pipeline would be co-located with existing corridors • 70 acres of IBAs	Permanent/minor to major impacts from clearing of the right-of-way • 512 acres of IBAs	Short-term/minor impacts because pipeline would be co-located with existing corridors • 1,016 acres of IBAs	Short-term/minor impacts because pipeline would be co-located with existing corridors • 594 acres of IBAs
Disturbance or loss of colonial waterbird nesting sites	Temporary/minor to major impacts on the Mahtowa rookery depending on season	No impact	Permanent/major impacts from removal of colonial waterbird nesting tree(s) at the Larson Lake and Sherry Lake great blue heron rookeries	Temporary/negligible impacts on Grass Lake red-necked grebe rookery	Permanent/major impacts from removal of colonial waterbird nesting tree(s) at the Portage Creek great blue heron rookery
Loss of habitat or reduction of wildlife habitat quality from habitat fragmentation	Permanent/minor to major impacts on primarily forested and woody wetlands • 37.6 miles of habitat fragmented • 21 large-block habitats (>100 acres) crossed • 27,101 acres total habitat fragmented	No impact because pipeline would be co-located with existing corridors	Permanent/major impacts on primarily forested and woody wetlands • 114.3 miles of habitat fragmented • 60 large-block habitats (>100 acres) crossed • 83,996 acres total habitat fragmented	No impact because pipeline would be co-located with existing corridors	No impact because pipeline would be co-located with existing corridors
Potential for injury, mortality, or disturbance of wildlife species	Temporary/minor to major impacts	Temporary/minor to major impacts	Temporary/minor to major impacts	Temporary/minor to major impacts	Temporary/minor to major impacts

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Operations Impacts					
Aquatic habitat loss or reduction of aquatic habitat quality from maintenance activities, integrity digs, or small leaks and spills	Short-term to long-term/ minor to major impacts Permanent/major thermal effects (*where streambanks are cleared of forested or woody vegetation*) • 111 stream crossings	Short-term to long-term/ minor to major impacts Permanent/major thermal effects (*where streambanks are cleared of forested or woody vegetation*) • 167 stream crossings	Short-term to long-term/ minor to major impacts Permanent/major thermal effects (*where streambanks are cleared of forested or woody vegetation*) • 137 stream crossings	Short-term to long-term/ minor to major impacts Permanent/major thermal effects (*where streambanks are cleared of forested or woody vegetation*) • 81 stream crossings	Short-term to long-term/ minor to major impacts Permanent/major thermal effects (*where streambanks are cleared of forested or woody vegetation*) • 106 stream crossings
Trout stream habitat loss or reduction of aquatic habitat quality from right-of-way maintenance at surface water crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 6 trout stream crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 8 trout stream crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 6 trout stream and 1 lake crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 6 trout stream crossings	Short-term/minor impacts Permanent/major thermal effects *(where streambanks are cleared of forested or woody vegetation)* • 4 trout stream crossings
Loss of habitat and reduction of habitat quality in Aquatic Management Areas (AMAs)	Short-term/negligible to minor impacts *This would be the second pipeline to cross LaSalle Creek AMA* • 0.2 acre of AMA disturbance	Short-term/negligible to minor impacts *This would be the second pipeline to cross LaSalle Creek AMA* • 0.2 acre of AMA disturbance	Short-term/negligible to minor impacts • 2.1 acres of AMA disturbance	Short-term/negligible to minor impacts • 2 acres of AMA disturbance	Short-term/negligible to minor impacts • 2 acres of AMA disturbance
Loss of habitat and reduction of habitat quality in Minnesota LBS; no other sensitive aquatic resources were affected	No impact	No impact	Short-term/negligible to minor impacts • 1.4 acres of LBS disturbance	Short-term/negligible to minor impacts • 2.1 acres of LBS disturbance	Short-term/negligible to minor impacts • 2.5 acres of LBS disturbance

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Potential for injury, mortality, or disturbance of aquatic species impacting fisheries from leaks, spills, or herbicide applications	Temporary to long-term/ minor impacts	Temporary to long-term/ minor impacts	Temporary to long-term/ minor impacts	Temporary to long-term/ minor impacts	Temporary to long-term/ minor impacts
Loss of habitat or reduction of wildlife habitat quality from maintenance activities and vegetation clearing	Permanent/minor to major impacts from maintenance of the right-of-way • 1,288 acres of habitat, primarily forest	Permanent/minor to major impacts from maintenance of the right-of-way • 1,495 acres of habitat, primarily deciduous forest, hay, and pasture land	Permanent/minor to major impacts from maintenance of the right-of-way • 1,115 acres of habitat, primarily forest and woody wetland	Permanent/minor to major impacts from maintenance of the right-of-way • 937 acres of habitat, primarily wetlands and deciduous forest	Permanent/minor to major impacts from maintenance of the right-of-way • 954 acres of habitat, primarily wetlands and deciduous forest
Loss of habitat or reduction of wildlife habitat quality in wildlife conservation areas from maintenance and vegetation clearing	Permanent/minor to major impacts from maintenance of the right-of-way • 159 acres of wildlife conservation areas	Permanent/minor to major impacts from maintenance of the right-of-way • 19 acres of wildlife conservation areas	Permanent/minor to major impacts from maintenance of the right-of-way • 135 acres of wildlife conservation areas	Permanent/minor to major impacts from maintenance of the right-of-way • 86 acres of wildlife conservation areas	Permanent/minor to major impacts from maintenance of the right-of-way • 99 acres of wildlife conservation areas
Loss of habitat or reduction of wildlife habitat quality in Audubon IBAs from maintenance and vegetation clearing	Permanent/minor to major impacts from maintenance of the right-of-way • 25 acres of IBA	Permanent/minor to major impacts from maintenance of the right-of-way • 29 acres of IBA	Permanent/minor to major impacts from maintenance of the right-of-way • 213 acres of IBA	Permanent/minor to major impacts from maintenance of the right-of-way • 248 acres of IBA	Permanent/minor to major impacts from maintenance of the right-of-way • 248 acres of IBA

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]
Loss of habitat or reduction of wildlife habitat quality from habitat fragmentation	Permanent/major impacts on primarily forested and woody wetlands • 21 large-block habitats (>100 acres) • 27,101 acres total habitat fragmented	Temporary to short-term/negligible impacts from widening existing corridor	Permanent/major impacts on primarily forested and woody wetlands • 60 large-block habitats (>100 acres) crossed • 83,996 acres total habitat fragmented	Temporary to short-term/negligible impacts from widening existing corridor	Temporary to short-term/negligible impacts from widening existing corridor
Potential for injury, mortality, or disturbance of wildlife species	Short-term minor to major impacts from habitat loss or fragmentation and mortality of common species during mowing and other maintenance activities; maintenance may also disturb the Mahtowa heron colony.	Short-term minor to major impacts from habitat loss or fragmentation and mortality of common species during mowing and other maintenance activities	Short-term minor to major impacts from habitat loss or fragmentation and mortality of common species during mowing and other maintenance activities	Short-term minor to major impacts from habitat loss or fragmentation and mortality of common species during mowing and other maintenance activities	Short-term minor to major impacts from habitat loss or fragmentation and mortality of common species during mowing and other maintenance activities

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to fish and wildlife. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, stream crossing counts provide a broad understanding of the types potential for impacts to aquatic habitat. However, information from other datasets, like the Sentinel Lakes and LBS and datasets, helps to define the extent of potential impacts on high quality habitats. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-460 to 6-510. This table, for example provides numbers of streams crossed by the route and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to stream habitats is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-460 to 6-483. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-484 to 6-498. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.3.4-24. Summary of Potential Impacts on Fish and Wildlife for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,j]	Route Alternative RA-08[g,i]

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-498 to 6-504. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[f] **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-504 to 6-507. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-507 to 6-510. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[h] Con = Enbridge-provided footprint for construction work area; Op = Enbridge-provided footprint for permanent right-of-way.

[i] Con = estimated 120-foot-wide construction work area centered on route, Op = estimated 50-foot-wide permanent right-of-way.

[j] Con = estimated 205-foot-wide construction work area (with 10 feet wide on the north side of the existing Line 3 and 95 feet wide on the south side of the existing Line 3); Op = estimated 50-foot-wide permanent right-of-way.

[k] Permanent loss in forested areas that are newly developed. The impacts would be less along co-located lines (e.g., RA-07).

6.3.4.5 References

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6.3.5 Unique Natural Resources

This section describes protected, rare, and sensitive plants and animals (termed "unique natural resources") that could be affected by construction and operation associated with the Minnesota portion of the Applicant's preferred route and route alternatives. The effects could result from loss or disturbance of a resource or from habitat loss and degradation. The analysis of impacts on unique natural resources from construction and operation of the Applicant's preferred route and route alternatives considered the potential for injury, mortality, or disturbance of the following:

- Federally listed endangered and threatened species;
- State-listed threatened, endangered, and special concern species;
- Minnesota SGCN;
- MBS Sites; and
- Minnesota SNAs.

This section first describes the existing conditions for unique natural resources that may be affected by construction and operation of the Applicant's preferred route and the route alternatives. The potential Project-related impacts on these resources from construction and operation of the Applicant's preferred route are then described, along with measures the Applicant would implement to minimize impacts. Next, the potential Project-related impacts on unique natural resources from construction and operation are addressed for each route alternative (RA-03AM, RA-06, RA-07, and RA-08) and compared to each other and to the Applicant's preferred route between Clearbrook and Carlton. The comparison focuses on the area between Clearbrook and Carlton because the Applicant's preferred route and the route alternatives all have identical routes from Neche, North Dakota, to Clearbrook and from Carlton to Superior, Wisconsin. A summary and comparison of the impacts are included at the end of the section, along with potential mitigation measures to be considered. Potential impacts on unique natural resources from an unanticipated crude oil release are addressed in Chapter 10.

6.3.5.1 Regulatory Context and Methodology

6.3.5.1.1 Regulatory Context

The regulatory context for evaluating impacts on unique natural resources is described in Section 5.2.5.1, including the federal ESA and Minnesota's Endangered Species Statute (Minn. R. Ch. 6134) and associated rules. Birds protected under the MBTA and BGEPA are discussed in Section 6.3.4. This section provides information for regulatory agencies to assess potential impacts on unique natural resources. The Applicant would be required to comply with appropriate species-specific conservation measures identified by state and federal natural resource agencies.

6.3.5.1.2 Methodology

The methodology for evaluating impacts on unique natural resources is described in Section 5.2.5.1. For federally listed species, the ROI for this evaluation encompassed the area within a distance of 1 mile from the centerlines of the pipeline routes. For the state-listed species and related concerns, the ROI for the evaluation encompassed the area within a distance of 0.5 mile from the centerlines of the pipeline routes. This is the area that could be directly or indirectly affected by pipeline construction. The area within 0.5 mile of the route centerlines was used as the ROI for state-listed species instead of 1 mile because the available state data have more specific locations associated with known occurrences than federal data. Impacts were evaluated by considering the area directly and indirectly affected by the Applicant's preferred route and the route alternatives between Clearbrook and Carlton, Minnesota.

Direct impacts for the Applicant's preferred route were evaluated based on construction footprints provided by the Applicant. The areas identified consist of the construction work area, ATWS, access roads, pipe yards, pipeline permanent right-of-way, valve pads and driveways, and pump stations within Minnesota. Comparisons of construction impacts for route alternatives were based on the Applicant-provided construction work area for the Applicant's preferred route; a 120-foot-wide construction work area for RA-03AM, RA-06, and RA-08; and a 205-foot-wide construction work area for RA-07. Comparisons of operations impacts were based on the Applicant's footprint for the pipeline permanent right-of-way (a 50-foot-wide area centered on the pipeline route) and a 50-foot-wide permanent pipeline rights-of-way centered on the routes of RA-03AM, RA-06, RA-07, and RA-08. Animals were considered affected when they occurred within 0.5 mile of the route centerlines; plants were considered affected when they occurred within construction work areas and permanent rights-of-way.

The regulatory drivers for unique natural resources and the geospatial data sources evaluated were as follows:

- Federally listed animals and plants were evaluated using the USFWS' Information for Planning and Conservation (IPaC) online system for the area within a 2-mile-wide ROI (i.e., 1 mile from the centerline of each pipeline). While impacts were assessed for this entire area, direct impacts primarily would occur within construction work areas and the pipeline permanent rights-of-way. These data were used to determine the presence of federally listed animals and plants for the evaluation.
- Minnesota-listed animals and plants were evaluated using NHIS data for endangered, threatened, and special concern species within the ROI (0.5 mile from route centerlines). These data were used to determine the presence of Minnesota-listed animals and plants.
- Minnesota SGCN were evaluated using Minnesota's Wildlife Action Network (WAN) within the ROI for 0.5 mile from the route centerlines. Impacts on WAN habitats were evaluated for areas of direct construction and operations impacts by overlaying the WAN map on maps of the construction areas described above. The impact areas were quantified, and the proportion of WAN areas affected by the route alternatives were compared based on the proportion of WAN habitat available within the ROI. A description of the WAN scoring system is presented in Section 5.2.5.1.
- MBS Sites were evaluated within the ROI for 0.5 mile from the route centerlines. Impacts on MBS Site habitats were evaluated for areas of direct construction and operations impacts by overlaying the MBS Sites map on maps of the construction areas described above. The impact areas were quantified, and the proportion of MBS Site areas affected by the route alternatives were compared based on the proportion of MBS Sites available within the ROI.
- Minnesota SNAs were identified within the ROI for 0.5 mile from the route centerlines. Impacts on SNA habitats were evaluated for areas of direct construction and operations impacts by overlaying the SNA map on maps of the construction areas described above.

No single one of these datasets provides a complete indication of all relevant impacts to unique natural resources, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, the individual NHIS elemental occurances provide information about

past sitings, but the absence of past sitings does not necessarily mean a species does not or could not inhabit a certain area. Because of this, NHIS data is used together with habitat information from the GAP and WAN datasets to get a better idea of the potential for impacts.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide acreages, for example, of habitat types crossed and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to critical habitat is contained in the text of this section.

6.3.5.2 Existing Conditions

The discussion of existing conditions includes information presented in Section 5.2.5.2 but focuses on conditions in Minnesota.

6.3.5.2.1 Applicant's Preferred Route

Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Descriptions of existing conditions within the unique natural resources ROI for the Applicant's preferred route reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Federally Listed Species

The Canada lynx (*Lynx canadensis*), gray wolf (*Canis lupus*), northern long-eared bat (*Myotis septentrionalis*), Dakota skipper (*Hesperia dacotae*), Poweshiek skipperling (*Oarisma poweshiek*), rusty patched bumble bee (*Bombus affinis*), and western prairie fringed orchid (*Platanthera praeclara*) have the potential to occur within the ROI for the Applicant's preferred route (Table 6.3.5-1). While there are no documented IPaC occurrences of mussels within the ROI, Merjent (2014a) determined that 33 waterbody crossings in Minnesota have potentially suitable habitat for protected mussels and recommended field surveys. The Applicant completed mussel field surveys at 16 sites along the Applicant's preferred route in Minnesota, and no federally listed mussels were found (Merjent 2015a).

Table 6.3.5-1. Potential Occurrences of Federally Protected Species within the Region of Interest for the Applicant's Preferred Route

Species	Preferred Habitat	Status[a]	Potential Occurrence[b]	
			In Minnesota	Clearbrook to Carlton
Animals				
Mammals				
Canada lynx *(Lynx canadensis)*	Boreal regions dominated by coniferous or mixed forests. Dens in mature or old-growth forests with high density of logs. Breeds late winter to early spring.	T	Yes	Yes
Gray wolf (*Canis lupus*) Great Lakes Distinct Population Segment	Suitable habitats in the ROI include hardwood forest, mixed forest, and grasslands. Digs dens in suitable soils or uses dens initiated by other animals. Breeds February to late June.	T	Yes	Yes
Northern long-eared bat (*Myotis septentrionalis*)	Suitable summer habitat occurs in the ROI. In summer, bats roost underneath bark, in cavities, or in crevices of both live trees and snags. Mates in fall near their hibernacula (August and September) and gives birth in summer (May to July). Bats spend their winters in suitable caves and mines (October to April).	T	Yes	Yes
Insects				
Dakota skipper (*Hesperia dacotae*)	Prefers native prairies (lowland and upland prairies) containing a high diversity of wildflowers and grasses. Eggs are laid in June and July and hatch after 10 days. Larvae are dormant in fall, and pupation usually occurs in June.	T	Yes	No
Poweshiek skipperling (*Oarisma poweshiek*)	Prefers native prairies (and in some cases, fens) containing a high diversity of wildflowers and grasses. Eggs are laid mid-June to mid-July, and hatch 9 days later.	E	Yes	No

Table 6.3.5-1. Potential Occurrences of Federally Protected Species within the Region of Interest for the Applicant's Preferred Route

Species	Preferred Habitat	Status[a]	Potential Occurrence[b]	
			In Minnesota	Clearbrook to Carlton
Rusty patched bumble bee (*Bombus affinis*)	Grasslands and tallgrass prairies with areas that provide flowers, nesting sites such as abandoned rodent cavities or grass clumps, and overwintering sites in undisturbed soil for hibernating queens. Eggs are laid in spring.	E	Yes	Yes
Plants				
Vascular Plants				
Western prairie fringed orchid (*Platanthera praeclara*)	Occurs in mesic-wet tallgrass native prairie, herbaceous wetlands, and dune complexes. Emerges in May and flowers in early to mid-July.	T	Yes	No

Source: USFWS 2016.

[a] E = Endangered, T = Threatened

[b] IPaC search = area within 1 mile of route centerline

ROI = region of interest

State-Listed Species

Endangered and Threatened Species

State-listed endangered and threatened animals and plants that are within the ROI, including those that are also federally listed, are presented in Table 6.3.5-2. Presence or probable absence of state-listed species was determined based on Minnesota NHIS element occurrence records or site-specific survey results where applicable. As described in Section 5.2.5, the Applicant performed surveys along the Applicant's preferred route. Results of these surveys are included in the impact discussion. Merjent (2014a) determined that 33 waterbody crossings have potentially suitable habitat for protected mussels and recommended field surveys. The Applicant completed mussel field surveys at 16 sites along the Applicant's preferred route in Minnesota, and no state-listed mussels were found (Merjent 2015a).

Special Concern Species

State-listed special concern species that occur within the ROI for the Applicant's preferred route include 12 vertebrates, 3 invertebrates, and 11 plants (Tables 6.3.5-3 and 6.3.5-4).

Minnesota Species of Greatest Conservation Need

The WAN shows viable or persistent populations and richness hotspots for the regions in Minnesota crossed by the Applicant's preferred route (Minnesota DNR 2016f). As shown in Figure 6.3.5-1, the Applicant's preferred route would cross habitats within the WAN that could be used by multiple SGCNs. Approximately 30 percent of the area within the ROI is within the WAN.

Minnesota Biological Survey Sites of Biodiversity Significance

As shown in Figure 6.3.5-2, the Applicant's preferred route would cross t areas with MBS Sites. Areas crossed that score outstanding, high, and moderate have an increased potential of containing habitats used by rare animals and plants that potentially would be affected, as discussed below in the impact assessment. Approximately 21 percent of the area within the ROI is rated as an outstanding (less than 1 percent), high (3 percent), or moderate (17 percent) MBS Site.

Table 6.3.5-2. Known Occurrences of State-Protected Animals and Plants within the Region of Interest for the Applicant's Preferred Route

Species	Preferred Habitat	Status[a]	Occurrences[b]	
			In Minnesota	Clearbrook to Carlton
Animals				
Fish				
Pugnose shiner (*Notropis anogenus*)	Found in glacial lakes and streams with an abundance of submerged vegetation. Prefers low-velocity waters with a substrate of sand, mud, or gravel. Shallow waters in warm months and deeper waters in cold months.	T	Yes	Yes
Mollusks				
Fluted-shell (*Lasmigona costata*)	Found in streams or river beds. Likely spawns from June to July.	T	Yes	No
Plants				
Nonvascular Plants				
A species of liverwort [Woolywort] (*Trichocolea tomentella*)	Damp, shaded rocks in forested rich peatland and wet forest.	T	Yes	Yes
Vascular Plants				
Beaked spikerush (*Eleocharis rostellata*)	Coastal salt marshes, and inland in saline, alkaline, or strongly calcareous habitats (e.g., around hot springs). Fruits during summer to fall in the north.	T	Yes	Yes
Bog bluegrass (*Poa paludigena*)	Perched upon wet substrates (e.g., moss, fallen trees) in spring-fed swamps. Specifically, occurs within *Fraxinus nigra-Betula lutea* swamps along the base of steep bluffs and at the head of the spring that feeds into the swamp. Blooms in late May to early June.	T	Yes	Yes
Bristle-berry (*Rubus fulleri*)	Swamp and marsh edges, wet and sedge meadows, and uplands mainly in central Minnesota. Flowers mid- to late June.	T	Yes	Yes
Butternut (*Juglans cinerea*)	Full sunlight on well-drained soils of bottomlands and floodplains. Flowers appear in mid-spring, and fruits develop throughout the summer.	E	Yes	Yes
Clinton's bulrush (*Trichophorum clintonii*)	Rocky river ledges, argillaceous soils, clearings of fir forests, and prairie and open woods. Reproductive structures are present from early May through the end of June in southern Minnesota, and late May through June in northern Minnesota.	T	Yes	No
Gray ragwort (*Packera cana*)	Northern plains, including the upper slopes of dry prairie remnant hills in sandy or gravelly soil. Flowers from May to June.	E	Yes	No

Table 6.3.5-2. Known Occurrences of State-Protected Animals and Plants within the Region of Interest for the Applicant's Preferred Route

Species	Preferred Habitat	Status[a]	Occurrences[b]	
			In Minnesota	Clearbrook to Carlton
Hair-like beak rush (*Rhynchospora capillacea*)	Calcareous fens, especially along the margins, and spring fens. Germinates in the spring and flowers mid-summer.	T	Yes	No
Handsome sedge (*Carex formosa*)	Typically occurs in or at the edge of limey swamps, seeps, or bottomland forests, but known to occur in moist, rich upland forests. Also can occur in disturbed habitats such as road edges and disturbed prairies. Blooms throughout June and fruits throughout July.	E	Yes	No
Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	In woods and on hummocks in swamps, and in cool to warm, mostly rich, sub-acid soils. May be found in open fields at the northern end of its range. Site elevations range from near sea level to 3,600 feet. Leaves emerge in spring and spores mature through summer.	T	Yes	Yes
Purple-flowered bladderwort (*Utricularia purpurea*)	Adjacent to boggy shorelines in small to medium size lakes with high water quality. Flowers from mid-July to September.	E	Yes	Yes
Red saltwort (*Salicornia rubra*)	Salt flats, saline swales, alkaline depressions, and exposed shores of alkaline lakes. Flowers from late July into August.	T	Yes	No
Sterile sedge (*Carex sterilis*)	Mineral-rich calcareous fens of the prairie region. Mature perigynia are present from early June to late July.	T	Yes	Yes
Whorled nutrush (*Scleria verticillata*)	Restricted to the least disturbed calcareous fens in the prairie region. Blooms late June through late July.	T	Yes	No

Sources: Minnesota DNR 2016a, 2017a; Merjent 2016a.

[a] E = Endangered, T = Threatened

[b] Database search = within 0.5 mile of route centerline.

Note:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Table 6.3.5-3. Known Occurrences of Special Concern Animals within the Region of Interest for the Applicant's Preferred Route

Common Name	Scientific Name
Mammals	
Big brown bat	*Eptesicus fuscus*
Little brown bat	*Myotis lucifugus*
Northern long-eared bat	*Myotis septentrionalis*
Prairie vole	*Microtus ochrogaster*
Birds	
Greater prairie-chicken	*Tympanuchus cupido*
Nelson's sparrow	*Ammodramus nelsoni*
Northern goshawk	*Accipiter gentilis*
Red-shouldered hawk	*Buteo lineatus*
Short-eared owl	*Asio flammeus*
Trumpeter swan	*Cygnus buccinator*
Amphibians	
Four-toed salamander	*Hemidactylium scutatum*
Fish	
Least darter	*Etheostoma microperca*
Insects and Spiders	
A caddisfly	*Anabolia ozburni*
Mollusks	
Black sandshell	*Ligumia recta*
Creek heelsplitter	*Lasmigona compressa*

Source: Minnesota DNR 2016a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Table 6.3.5-4. Known Occurrences of Special Concern Plants within the Region of Interest for the Applicant's Preferred Route

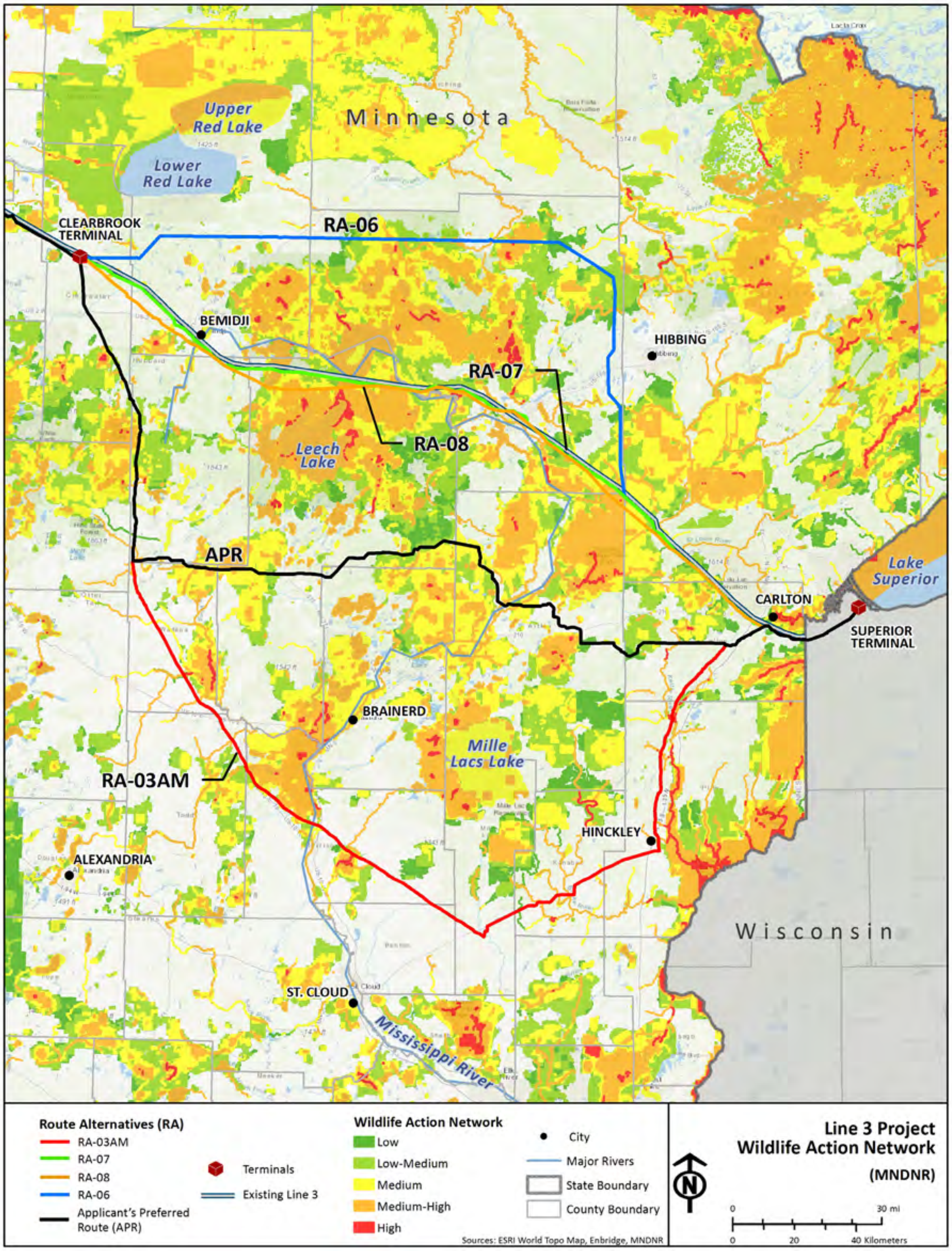
Common Name	Scientific Name
Forests	
Least moonwort	*Botrychium simplex*
Peatlands	
Few-flowered spikerush	*Eleocharis quinqueflora*
Twig rush	*Cladium mariscoides*
White adder's mouth	*Malaxis monophyllos* var. *brachypoda*
Prairies	
Blunt sedge	*Carex obtusata*
Northern single-spike sedge	*Carex scirpoidea*
Small white lady's-slipper	*Cypripedium candidum*
Wetlands/Water	
False mountain willow	*Salix pseudomonticola*
McCalla's willow	*Salix maccalliana*
Slender naiad	*Najas gracillima*
Torrey's mannagrass	*Torreyochloa pallida*

Sources: Minnesota DNR 2016a, 2017c.

Notes:

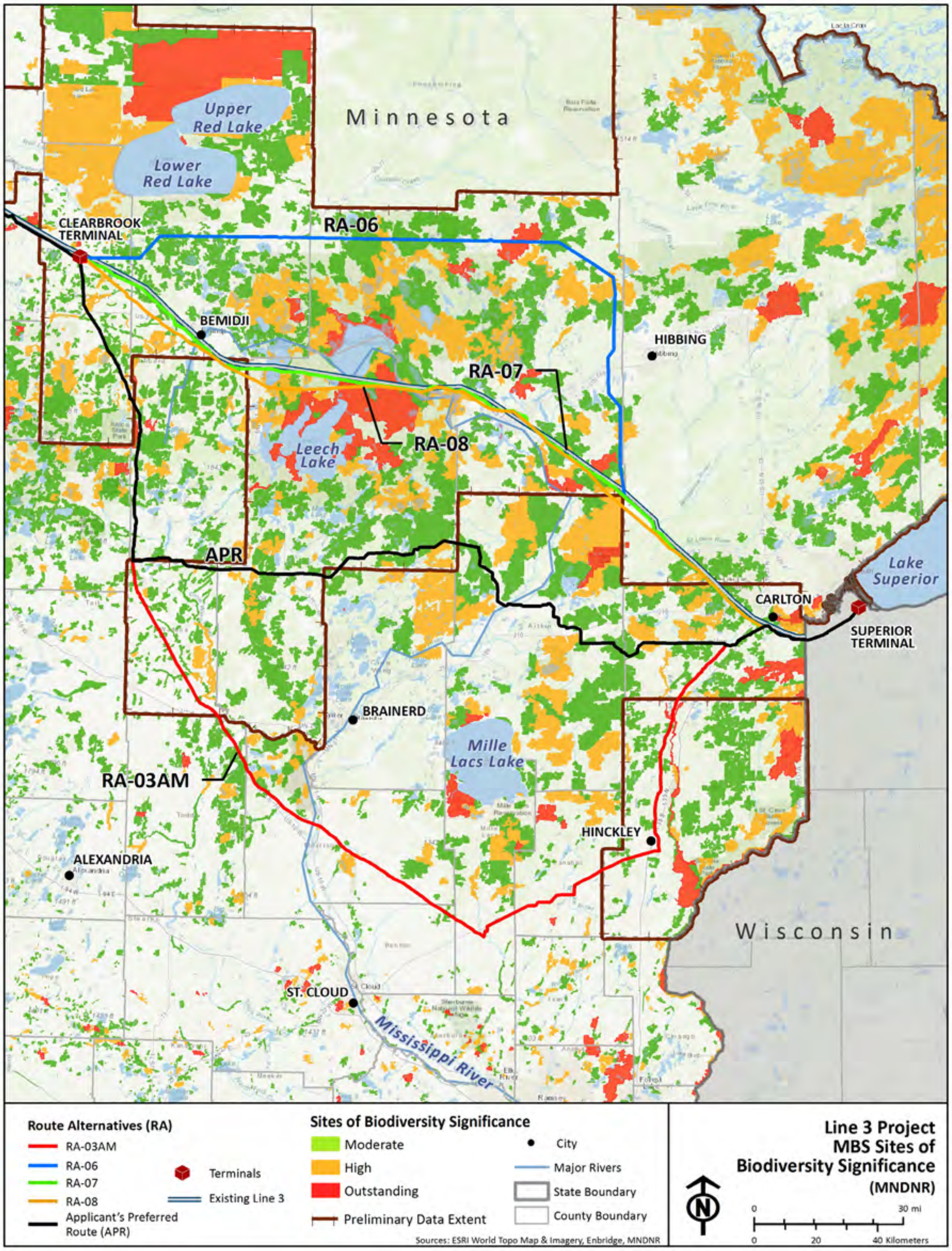
An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.



Source: Minnesota DNR 2016b.

Figure 6.3.5-1. Wildlife Action Network Crossed by the Applicant's Preferred Route and Route Alternatives



Source: Minnesota DNR 2016h.

Figure 6.3.5-2. Minnesota Biological Survey Sites of Biodiversity Significance Crossed by the Applicant's Preferred Route and Route Alternatives

Minnesota Scientific and Natural Areas

Minnesota's SNAs are state lands that preserve ecological and geological diversity, including rare species, native plants, and significant geological features (Minnesota DNR 2016c). Multiple sites in each landscape region are protected in order to capture genetic diversity and prevent the loss of important species, communities, and features (Minnesota DNR 2016c). Natural areas are distinguished by undisturbed plant communities, rare or endangered species habitat, seasonal habitat, natural geologic formations and features, and plant communities undergoing natural succession (Minnesota DNR 2016c). No SNAs would be crossed by or be within the ROI for the Applicant's preferred route.

6.3.5.2.2 Route Alternatives

The only segment in Minnesota where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton. The existing conditions relevant to unique natural resources for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Between Clearbrook and Carlton, RA-03AM is co-located with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and with roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Descriptions of existing conditions within the unique natural resources ROI for RA-03AM reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, and rusty patched bumble bee have the potential to occur within or near RA-03AM (Table 6.3.5-5).

State-Listed Species

Endangered and Threatened Species

State-listed endangered and threatened animals and plants likely to occur within the ROI for RA-03AM, including those that are also federally listed, are presented in Table 6.3.5-6. Presence or probable absence of state-listed species was determined based on Minnesota NHIS element occurrence records.

Special Concern Species

Occurrences of Minnesota special concern animals and plants, including federally listed species, within the ROI for RA-03AM are listed in Tables 6.3.5-7 and 6.3.5-8.

Table 6.3.5-5. Potential Occurrences of Federally Protected Species within the Region of Interest for Route Alternative RA-03AM

Species	Preferred Habitat	Status[a]
Mammals		
Canada lynx *(Lynx canadensis)*	Boreal regions dominated by coniferous or mixed forests. Dens in mature or old-growth forests with high density of logs. Breeds late winter to early spring.	T
Gray wolf (*Canis lupus*) Great Lakes Distinct Population Segment	Suitable habitats in the ROI include hardwood forest, mixed forest, and grasslands. Digs dens in suitable soils or uses dens initiated by other animals. Breeds February to late June.	T
Northern long-eared bat (*Myotis septentrionalis*)	Suitable summer habitat occurs in the ROI. In summer, bats roost underneath bark, in cavities, or in crevices of both live trees and snags. Mates in fall near their hibernacula (August and September) and gives birth in summer (May to July). Bats spend their winters in suitable caves and mines (October to April).	T
Insects		
Rusty patched bumble bee (*Bombus affinis*)	Grasslands and tallgrass prairies with areas that provide flowers, nesting sites such as abandoned rodent cavities or grass clumps, and overwintering sites in undisturbed soil for hibernating queens. Eggs are laid in spring.	E

Source: USFWS 2016.

[a] E = Endangered, T = Threatened

Note:

IPaC search = within 1 mile of route centerline.

ROI = region of interest

Table 6.3.5-6. Known Occurrences of State-Protected Animals and Plants within the Region of Interest for Route Alternative RA-03AM

Species	Preferred Habitat	Status[a]
Animals		
Amphibians and Reptiles		
Blanding's turtle (*Emydoidea blandingii*)	Found in productive, clean, shallow waters with abundant aquatic vegetation and soft, muddy bottoms over firm substrates—in ponds, marshes, swamps, bogs, wet prairies, river backwaters, sloughs, slow-moving rivers, protected coves, and lake shallows and inlets. Extensive marshes bordering rivers provide excellent habitat. Nests in grasses and sedge close to water.	T
Wood turtle (*Glyptemys insculpta*)	Found in moderate- to fast-flowing clear streams or rivers associated with forested riparian corridors, which provide primary overwintering, courtship, basking, and foraging habitat. Typically inhabited waterways possess a sand, gravel, or cobble substrate with limited silt or muck. Nesting occurs in well-drained open or sparsely vegetated sandy soils, typically within 200 feet of suitable aquatic habitat. Nesting habitat includes native dry prairies, moderately sloughing sand banks, sandbars, agricultural fields, or areas of disturbed sandy soils that support no or sparse ground layer vegetation.	T
Mollusks		
Elktoe (*Alasmidonta marginata*)	Found in medium to large rivers with moderate to fast velocities and sand and gravel substrates.	T
Fluted-shell (*Lasmigona costata*)	Found in streams or river beds. Likely spawns from June to July.	T
Mucket (*Actinonaias ligamentina*)	Found in medium to large rivers with coarse sand and gravel substrates.	T
Spike (*Elliptio dilatata*)	Found in small to large rivers, reservoirs, and lakes with sand and gravel substrates. Usually associated with outlet habitats dominated by swift currents when found in lakes. Spawns in early to mid-May.	T
Plants		
Vascular Plants		
Beaked spikerush (*Eleocharis rostellata*)	Coastal salt marshes, and inland in saline, alkaline, or strongly calcareous habitats (e.g., around hot springs). Fruits during summer to fall in the north.	T
Bog bluegrass (*Poa paludigena*)	Perched upon wet substrates such as moss, fallen trees, etc. in spring-fed swamps. Specifically, occurs within *Fraxinus nigra-Betula lutea* swamps along the base of steep bluffs and at the head of the spring that feeds into the swamp. Blooms in late May to early June.	T
Bristle-berry (*Rubus fulleri*)	Swamp and marsh edges, wet and sedge meadows, and uplands mainly in central Minnesota. Flowers mid- to late June.	T
Hair-like beak rush (*Rhynchospora capillacea*)	Calcareous fens, especially along the margins, and spring fens. Germinates in the spring, and flowers mid-summer.	T
Kitten-tails (*Besseya bullii*)	Savannas of the Midwest. This plant is more common in the oak openings than in the prairies. Kitten tails have been observed in grazed pastures, in mesic forests, in open woods, and on flat, grassy slopes. Blooms April through June.	T

Table 6.3.5-6. Known Occurrences of State-Protected Animals and Plants within the Region of Interest for Route Alternative RA-03AM

Species	Preferred Habitat	Status[a]
Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	In woods and on hummocks in swamps, and in cool to warm, mostly rich, subacid soils. May be found in open fields at the northern end of its range. Site elevations range from near sea level to 3,600 feet. Leaves emerge in spring and spores mature through summer.	T
Snailseed pondweed (*Potamogeton bicupulatus*)	Soft water lakes (i.e., low dissolved mineral levels) with clear water. Fruits during July and August.	E
Sterile sedge (*Carex sterilis*)	Mineral-rich calcareous fens of the prairie region. Mature perigynia are present from early June to late July.	T

Sources: Minnesota DNR 2016a, 2017a.

[a] E = Endangered, T = Threatened

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Table 6.3.5-7. Known Occurrences of Special Concern Animals within the Region of Interest for Route Alternative RA-03AM

Common Name	Scientific Name
Mammals	
Big brown bat	*Eptesicus fuscus*
Little brown bat	*Myotis lucifugus*
Northern long-eared bat	*Myotis septentrionalis*
Birds	
Greater prairie-chicken	*Tympanuchus cupido*
Nelson's sparrow	*Ammodramus nelsoni*
Northern goshawk	*Accipiter gentilis*
Red-shouldered hawk	*Buteo lineatus*
Short-eared owl	*Asio flammeus*
Trumpeter swan	*Cygnus buccinator*
Fish	
Gilt darter	*Percina evides*
Lake sturgeon	*Acipenser fulvescens*
Least darter	*Etheostoma microperca*
Southern brook lamprey	*Ichthyomyzon gagei*
Insects	
A caddisfly	*Anabolia ozburni*
Mollusks	
Black sandshell	*Ligumia recta*
Creek heelsplitter	*Lasmigona compressa*
Round pigtoe	*Pleurobema sintoxia*

Source: Minnesota DNR 2016a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Table 6.3.5-8. Known Occurrences of Special Concern Plants within the Region of Interest for Route Alternative RA-03AM

Common Name	Scientific Name
Forests	
Least moonwort	*Botrychium simplex*
Peatlands	
English sundew	*Drosera anglica*
Few-flowered spikerush	*Eleocharis quinqueflora*
Twig rush	*Cladium mariscoides*
White adder's mouth	*Malaxis monophyllos* var. *brachypoda*
Prairies	
Blunt sedge	*Carex obtusata*
Hill's thistle	*Cirsium pumilum* var. *hillii*
Northern single-spike sedge	*Carex scirpoidea*
Small white lady's-slipper	*Cypripedium candidum*
Wetlands/Water	
Autumn fimbry	*Fimbristylis autumnalis*
False mountain willow	*Salix pseudomonticola*
McCalla's willow	*Salix maccalliana*
Slender naiad	*Najas gracillima*

Sources: Minnesota DNR 2016a; 2017a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = 0.5 mile from route centerline.

Species of Greatest Conservation Need

The WAN shows viable or persistent populations and richness hotspots for regions in Minnesota (Minnesota DNR 2016f). As shown in Figure 6.3.5-1, RA-03AM would cross habitats within the WAN that could be used by multiple SGCNs.

Minnesota Biological Survey Sites of Biodiversity Significance

As shown in Figure 6.3.5-2, RA-03AM would cross areas with MBS Sites. Areas scoring outstanding, high, and moderate that are crossed by a route have an increased potential of containing habitats used by rare animals and plants that potentially would be affected, as discussed below in the impact assessment.

Minnesota Scientific and Natural Areas

RA-03AM would cross the Lake Alexander Woods SNA (Figure 6.5.3-3). The topography of the Lake Alexander SNA consists of hummocky mounds alternating with depressions (also known as knob and kettle), and the vegetation includes undisturbed mesic oak and aspen-birch forests interspersed with wetlands. A variety of wildlife use this area, including bald eagles, red-shouldered hawks (*Buteo lineatus*), and the threatened bog bluegrass (*Poa paludigena*) (Minnesota DNR 2016e).

Route Alternative RA-06

Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Descriptions of existing conditions within the unique natural resources ROI for RA-06 reflect the current state of resources in the environment along this existing infrastructure. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, rufa red knot (*Calidris canutus rufa*), and rusty patched bumble bee have the potential to occur within the ROI for RA-06 (Table 6.3.5-9).

Table 6.3.5-9. Potential Occurrences of Federally Protected Species within the Region of Interest for Route Alternative RA-06

Species	Preferred Habitat	Status[a]
Mammals		
Canada lynx *(Lynx canadensis)*	Boreal regions dominated by coniferous or mixed forests. Dens in mature or old-growth forests with high density of logs. Breeds late winter to early spring.	T
Gray wolf (*Canis lupus*) Great Lakes Distinct Population Segment	Suitable habitats in the ROI include hardwood forest, mixed forest, and grasslands. Digs dens in suitable soils or uses dens initiated by other animals. Breeds February to late June.	T
Northern long-eared bat (*Myotis septentrionalis*)	Suitable summer habitat occurs in the ROI. In summer, bats roost underneath bark, in cavities, or in crevices of both live trees and snags. Mates in fall near their hibernacula (August and September) and gives birth in summer (May to July). Bats spend their winters in suitable caves and mines (October to April).	T
Birds		
Rufa Red knot (*Calidris canutus rufa*)	Shorelines, tidal zones, sandy beaches. Nests in Arctic tundra, usually near water. Breeds late May to early June.	T
Insects		
Rusty patched bumble bee (*Bombus affinis*)	Grasslands and tallgrass prairies with areas that provide flowers, nesting sites such as abandoned rodent cavities or grass clumps, and overwintering sites in undisturbed soil for hibernating queens. Eggs are laid in spring.	E

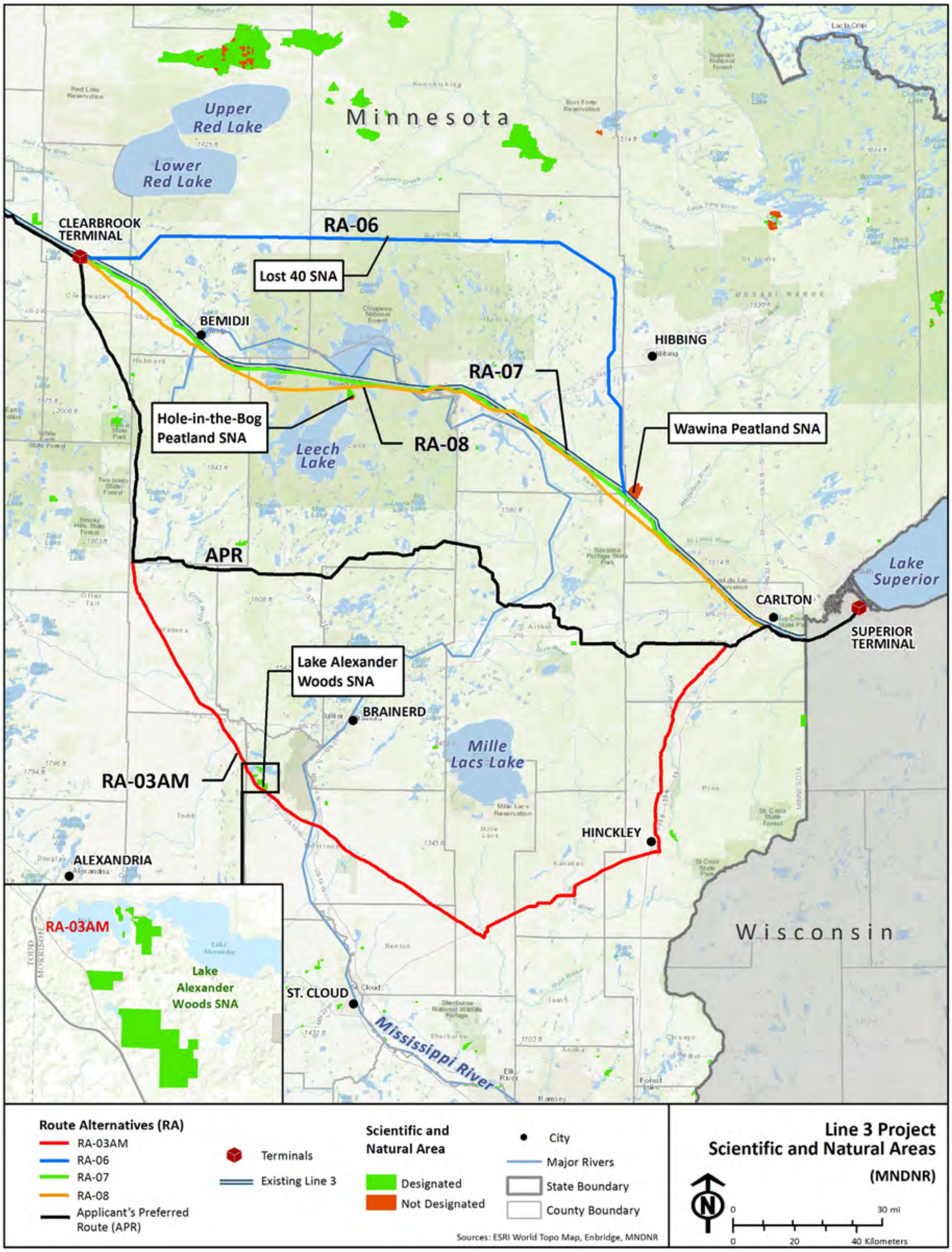
Sources: USFWS 2016.

[a] E = Endangered, T = Threatened

Note:

IPaC search = within 1 mile of route centerline

ROI = region of interest



Source: Minnesota DNR 2016i.

Figure 6.3.5-3. Scientific and Natural Areas Crossed by the Route Alternatives

State-Listed Species

Endangered and Threatened Species

State-listed endangered and threatened animals and plants likely to occur within the ROI for RA-06 are presented in Table 6.3.5-10. Presence or probable absence of state-listed species was determined based on Minnesota NHIS element occurrence records.

Table 6.3.5-10. Known Occurrences of State-Protected Animals and Plants within the Region of Interest for Route Alternative RA-06

Species	Preferred Habitat	Status[a]
Fish		
Pugnose shiner (*Notropis anogenus*)	Found in glacial lakes and streams with an abundance of submerged vegetation. Prefers low-velocity waters with a substrate of sand, mud, or gravel. Shallow waters in warm months and deeper waters in cold months.	T
Vascular Plants		
Beaked spikerush (*Eleocharis rostellata*)	Coastal salt marshes, and inland in saline, alkaline, or strongly calcareous habitats (e.g., around hot springs). Fruits during summer to fall in the north.	T
Blunt-lobed grapefern (*Botrychium oneidense*)	Second-growth forests in shallow depressions and ephemeral pools. A new leaf emerges in the summer (i.e., late June).	T
Goblin fern (*Botrychium mormo*)	Rich leaf mold on shaded forest floors in mature maple-basswood and maple-basswood-beech forests. Plants emerge from the ground in June, and sporangia open in late September.	T
Hair-like beak rush (*Rhynchospora capillacea*)	Calcareous fens, especially along the margins, and spring fens. Germinates in the spring, and flowers mid-summer.	T
Sterile sedge (*Carex sterilis*)	Mineral-rich calcareous fens of the prairie region. Mature perigynia are present from early June to late July.	T

Sources: Minnesota DNR 2016a, 2017a.

[a] E = Endangered, T = Threatened

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Special Concern Species

Occurrences of Minnesota special concern animals and plants, including federally listed species, within the ROI for RA-06 are listed in Tables 6.3.5-11 and 6.3.5-12.

Table 6.3.5-11. Known Occurrences of Special Concern Animals within the Region of Interest for Route Alternative RA-06

Common Name	Scientific Name
Mammals	
Big brown bat	*Eptesicus fuscus*
Little brown bat	*Myotis lucifugus*
Northern long-eared bat	*Myotis septentrionalis*
Birds	
Nelson's sparrow	*Ammodramus nelsoni*
Northern goshawk	*Accipiter gentilis*
Short-eared owl	*Asio flammeus*
Trumpeter swan	*Cygnus buccinator*
Amphibians	
Four-toed salamander	*Hemidactylium scutatum*
Fish	
Least darter	*Etheostoma microperca*
Mollusks	
Black sandshell	*Ligumia recta*
Creek heelsplitter	*Lasmigona compressa*

Source: Minnesota DNR 2016a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Table 6.3.5-12. Known Occurrences of Special Concern Plants within the Region of Interest for Route Alternative RA-06

Common Name	Scientific Name
Forests	
Least moonwort	*Botrychium simplex*
Peatlands	
Bog rush	*Juncus stygius* var. *americanus*
English sundew	*Drosera anglica*
Few-flowered spikerush	*Eleocharis quinqueflora*
Small green wood orchid	*Platanthera clavellata*
Twig rush	*Cladium mariscoides*
White adder's mouth	*Malaxis monophyllos* var. *brachypoda*
Prairies	
Blunt sedge	*Carex obtusata*
Northern single-spike sedge	*Carex scirpoidea*
Small white lady's-slipper	*Cypripedium candidum*
Wetlands/Water	
Discoid beggarticks	*Bidens discoidea*
False mountain willow	*Salix pseudomonticola*
McCalla's willow	*Salix maccalliana*

Sources: Minnesota DNR 2016a; 2017a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Minnesota Species of Greatest Conservation Need

The WAN shows viable or persistent populations and richness hotspots for the regions in Minnesota (Minnesota DNR 2016f). As shown in Figure 6.3.5-1, RA-06 would cross habitats within the WAN that could be used by multiple SGCNs.

Minnesota Biological Survey Sites of Biodiversity Significance

As shown in Figure 6.3.5-2, RA-06 would cross areas with MBS Sites. Areas scoring outstanding, high, and moderate that are crossed by this route alternative have an increased potential of containing habitats used by rare animals and plants that potentially would be affected, as discussed below in the impact assessment.

Minnesota Scientific and Natural Areas

As depicted in Figure 6.3.5-3, RA-06 would come within 0.5 mile of the Lost 40 and Wawina Peatland SNAs (Minnesota DNR 2016i). The Lost 40 SNA has virgin old-growth white pine-red pine forest that is considered to be the most significant stand outside of the Boundary Waters and Itasca State Park

(Minnesota DNR 2016f). The Wawina Peatland SNA is a large-patterned peatland complex with ovoid island patterns, a featureless water track, raised bog, and crested raised bog (Minnesota DNR 2016g).

Route Alternative RA-07

As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the unique natural resources ROI for RA-07 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, rufa red knot, and rusty patched bumble bee have the potential to occur within the ROI for RA-07 (Table 6.3.5-13).

Table 6.3.5-13. Potential Occurrences of Federally Protected Species within the Region of Interest for Route Alternative RA-07

Species	Preferred Habitat	Status[a]
Mammals		
Canada lynx *(Lynx canadensis)*	Boreal regions dominated by coniferous or mixed forests. Dens in mature or old-growth forests with high density of logs. Breeds late winter to early spring.	T
Gray wolf (*Canis lupus*) Great Lakes Distinct Population Segment	Suitable habitats in the ROI include hardwood forest, mixed forest, and grasslands. Digs dens in suitable soils or uses dens initiated by other animals. Breeds February to late June.	T
Northern long-eared bat (*Myotis septentrionalis*)	Suitable habitat occurs in the ROI. In summer, bats roost underneath bark, in cavities, or in crevices of both live trees and snags. Mates in fall and gives birth in summer (May to July). Caves and mines are winter hibernacula (October to April).	T
Birds		
Rufa red knot (*Calidris canutus rufa*)	Shorelines, tidal zones, sandy beaches. Nests in Arctic tundra, usually near water. Breeds late May to early June.	T
Insects		
Rusty patched bumble bee (*Bombus affinis*)	Grasslands and tallgrass prairies with areas that provide flowers, nesting sites such as abandoned rodent cavities or grass clumps, and overwintering sites in undisturbed soil for hibernating queens. Eggs are laid in spring.	E

Source: USFWS 2016.

[a] E = Endangered, T = Threatened

Note:

IPaC search = within 1 mile of route centerline.

ROI = region of interest

State-Listed Species

Endangered and Threatened Species

No state-protected animals are reported to occur along the RA-07 route. State-listed endangered and threatened plants likely to occur along RA-07 are presented in Table 6.3.5-14. Presence or absence of state-listed species was determined based on Minnesota NHIS element occurrence records.

Table 6.3.5-14. Known Occurrences of State-Protected Plants within the Region of Interest for Route Alternative RA-07

Species	Preferred Habitat	Status[a]
Beaked spikerush (*Eleocharis rostellata*)	Coastal salt marshes, and inland in saline, alkaline, or strongly calcareous habitats (e.g., around hot springs). Fruits during summer to fall in the north.	T
Goblin fern (*Botrychium mormo*)	Rich leaf mold on shaded forest floors in mature maple-basswood and maple-basswood-beech forests. Plants emerge from the ground in June, and sporangia open in late September.	T
Hair-like beak rush (*Rhynchospora capillacea*)	Calcareous fens, especially along the margins, and spring fens. Germinates in the spring, and flowers mid-summer.	T
Hidden-fruited bladderwort (*Utricularia geminiscapa*)	Wetlands, including bogs, fens, lakes, ponds, and river or lake shores. Blooms July through August.	T
Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	In woods and on hummocks in swamps, and in cool to warm, mostly rich, subacid soils. May be found in open fields at the northern end of its range. Site elevations range from near sea level to 3,600 feet. Leaves emerge in spring and spores mature through summer.	T
Ram's head orchid (*Cypripedium arietinum*)	Cool, dense white cedar, balsam, and spruce swamps; nearly pure sand over limestone beach cobble or bedrock, mulched with conifer needles; and in mesic soil of sandy loam or clay under the partial shade of conifer or mixed forest. Prefers cool, sub-acid or neutral soil, loam, or sand in upland sites and nutrient-poor peat in lowland sites. Flowers from late May through mid-June.	T
Sterile sedge (*Carex sterilis*)	Mineral-rich calcareous fens of the prairie region. Mature perigynia are present from early June to late July.	T

Sources: Minnesota DNR 2016a, 2017a.

[a] E = Endangered, T = Threatened

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline; no occurrence of state-protected animals.

Special Concern Species

Occurrences of Minnesota special concern animals and plants, including federally listed species, within the ROI for RA-07 are listed in Tables 6.3.5-15 and 6.3.5-16.

Table 6.3.5-15. Known Occurrences of Special Concern Species within the Region of Interest for Route Alternative RA-07

Common Name	Scientific Name
Mammals	
Big brown bat	*Eptesicus fuscus*
Little brown bat	*Myotis lucifugus*
Northern long-eared bat	*Myotis septentrionalis*
Birds	
Nelson's sparrow	*Ammodramus nelsoni*
Trumpeter swan	*Cygnus buccinator*
Yellow rail	*Coturnicops noveboracensis*
Mollusks	
Black sandshell	*Ligumia recta*
Creek heelsplitter	*Lasmigona compressa*

Source: Minnesota DNR 2016a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Table 6.3.5-16. Known Occurrences of Special Concern Plants within the Region of Interest for Route Alternative RA-07

Common Name	Scientific Name
Forests	
Barren strawberry	*Waldsteinia fragarioides* var. *fragarioides*
Least moonwort	*Botrychium simplex*
Mingan moonwort	*Botrychium minganense*
Pale moonwort	*Botrychium pallidum*
St. Lawrence grapefern	*Botrychium rugulosum*
Peatlands	
English sundew	*Drosera anglica*
Few-flowered spikerush	*Eleocharis quinqueflora*
Lapland buttercup	*Ranunculus lapponicus*
Twig rush	*Cladium mariscoides*
Prairies	
Blunt sedge	*Carex obtusata*
Northern single-spike sedge	*Carex scirpoidea*
Small white lady's-slipper	*Cypripedium candidum*
Wetlands/Water	
False mountain willow	*Salix pseudomonticola*
McCalla's willow	*Salix maccalliana*

Sources: Minnesota DNR 2016a, 2017a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Species of Greatest Conservation Need

The WAN shows viable or persistent populations and richness hotspots for the regions in Minnesota (Minnesota DNR 2016f). As shown in Figure 6.3.5-1, RA-07 would cross habitats within the WAN that could be used by multiple SGCNs.

Minnesota Biological Survey Sites of Biodiversity Significance

As shown in Figure 6.3.5-2, RA-07 would cross areas with MBS Sites. Areas scoring outstanding, high, and moderate that are crossed have an increased potential of containing habitats used by rare animals and plants that potentially would be affected, as discussed below in the impact assessment.

Minnesota Scientific and Natural Areas

As depicted in Figure 6.3.5-3, RA-07 would come within 0.5 mile of the Wawina Peatland SNA, which is a large-patterned peatland complex with ovoid island patterns, a featureless water track, raised bog, and crested raised bog (Minnesota DNR 2016g).

Route Alternative RA-08

RA-08 parallels the Enbridge Mainline corridor for its entire length. Descriptions of existing conditions within the unique natural resources ROI for RA-08 reflect the current state of resources in the environment within and adjacent to the existing Enbridge mainline. Where past projects have impacted or altered the condition of the environment, the altered state of the environment is the existing condition described in this section.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, rufa red knot, and rusty patched bumble bee have the potential to occur within or near RA-08 (Table 6.3.5-17).

Table 6.3.5-17. Potential Occurrences of Federally Protected Species within the Region of Interest for Route Alternative RA-08

Species	Preferred Habitat	Status[a]
Mammals		
Canada lynx *(Lynx canadensis)*	Boreal regions dominated by coniferous or mixed forests. Dens in mature or old-growth forests with high density of logs. Breeds late winter to early spring.	T
Gray wolf (*Canis lupus*) Great Lakes Distinct Population Segment	Suitable habitats in the ROI include hardwood forest, mixed forest, and grasslands. Digs dens in suitable soils or uses dens initiated by other animals. Breeds February to late June.	T
Northern long-eared bat (*Myotis septentrionalis*)	Suitable habitat occurs in the ROI. In summer, bats roost underneath bark, in cavities, or in crevices of both live trees and snags. Mates in fall and gives birth in summer (May to July). Caves and mines are winter hibernacula (October to April).	T
Birds		
Rufa red knot (*Calidris canutus rufa*)	Shorelines, tidal zones, sandy beaches. Nests in Arctic tundra, usually near water. Breeds late May to early June.	T
Insects		
Rusty patched bumble bee (*Bombus affinis*)	Grasslands and tallgrass prairies with areas that provide flowers, nesting sites such as abandoned rodent cavities or grass clumps, and overwintering sites in undisturbed soil for hibernating queens. Eggs are laid in spring.	E

Source: USFWS 2016.

[a] E = Endangered, T = Threatened

Note:

IPaC search = within 1 mile of route centerline.

ROI = region of interest

State-Listed Species

Endangered and Threatened Species

No state-protected animals are likely to occur along the RA-08 route. State-listed endangered and threatened plants likely to occur within the ROI for RA-08, including those that are also federally listed, are presented in Table 6.3.5-18. Presence or probable absence of state-listed species was determined based on Minnesota NHIS element occurrence records.

Table 6.3.5-18. Known Occurrences of State-Protected Plants within the Region of Interest for Route Alternative RA-08

Species	Preferred Habitat	Status[a]
Beaked spikerush (*Eleocharis rostellata*)	Coastal salt marshes, and inland in saline, alkaline, or strongly calcareous habitats (e.g., around hot springs). Fruits during summer to fall in the north.	T
Bog adder's mouth (*Malaxis paludosa*)	Open, acidic, sphagnum bogs; very wet forests; and occasionally along stream edges on peaty mud and among grasses. In the southern part of its range, it often occurs in deep shade, possibly because it requires cool temperatures. Flowers and fruits from mid-July to late August.	E
Clinton's bulrush (*Trichophorum clintonii*)	Rocky river ledges, argillaceous soils, clearings of fir forests, and prairie and open woods. Reproductive structures are present from early May through the end of June in southern Minnesota, and late May through June in northern Minnesota.	T
Goblin fern (*Botrychium mormo*)	Rich leaf mold on shaded forest floors in mature maple-basswood and maple-basswood-beech forests. Plants emerge from the ground in June, and sporangia open in late September.	T
Hair-like beak rush (*Rhynchospora capillacea*)	Calcareous fens, especially along the margins, and spring fens. Germinates in the spring, and flowers mid-summer.	T
Hidden-fruited bladderwort (*Utricularia geminiscapa*)	Wetlands, including bogs, fens, lakes, ponds, and river or lake shores. Blooms July through August.	T
Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	In woods and on hummocks in swamps, and in cool to warm, mostly rich, subacid soils. May be found in open fields at the northern end of its range. Site elevations range from near sea level to 3,600 feet. Leaves emerge in spring and spores mature through summer.	T
Oakes' pondweed (*Potamogeton oakesianus*)	Wetlands, including lakes, ponds, rivers, and streams. Blooms summer through fall (i.e., June to October).	E
One-flowered broomrape (*Orobanche uniflora*)	Woodland and bluff prairies with a variety of soil and light conditions. Blooms from late spring to early summer.	T
Sterile sedge (*Carex sterilis*)	Mineral-rich calcareous fens of the prairie region. Mature perigynia are present from early June to late July.	T

Source: Minnesota DNR 2016a.

[a] E = Endangered, T = Threatened

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline; no occurrences of state-protected animals.

Special Concern Species

Occurrences of Minnesota special concern animals and plants, including federally listed species, within the ROI for RA-08 are listed in Tables 6.3.5-19 and 6.3.5-20.

Table 6.3.5-19. Known Occurrences of Special Concern Animals within the Region of Interest for Route Alternative RA-08

Common Name	Scientific Name
Mammals	
Big brown bat	*Eptesicus fuscus*
Little brown bat	*Myotis lucifugus*
Northern long-eared bat	*Myotis septentrionalis*
Birds	
Nelson's sparrow	*Ammodramus nelsoni*
Northern goshawk	*Accipiter gentilis*
Red-shouldered hawk	*Buteo lineatus*
Short-eared owl	*Asio flammeus*
Trumpeter swan	*Cygnus buccinator*
Insects and Spiders	
A Caddisfly	*Anabolia ozburni*
Mollusks	
Black sandshell	*Ligumia recta*
Creek heelsplitter	*Lasmigona compressa*

Source: Minnesota DNR 2016a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Table 6.3.5-20. Known Occurrences of Special Concern Plants within the Region of Interest for Route Alternative RA-08

Common Name	Scientific Name
Forests	
Least moonwort	*Botrychium simplex*
Mingan moonwort	*Botrychium minganense*
Pale moonwort	*Botrychium pallidum*
St. Lawrence grapefern	*Botrychium rugulosum*
Peatlands	
English sundew	*Drosera anglica*
Few-flowered spikerush	*Eleocharis quinqueflora*
Twig rush	*Cladium mariscoides*
White adder's mouth	*Malaxis monophyllos* var. *brachypoda*
Prairies	
Blunt sedge	*Carex obtusata*
Northern single-spike sedge	*Carex scirpoidea*
Small white lady's-slipper	*Cypripedium candidum*
Wetlands/Water	
False mountain willow	*Salix pseudomonticola*
McCalla's willow	*Salix maccalliana*
Slender naiad	*Najas gracillima*

Sources: Minnesota DNR 2016a; 2017a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Database search = within 0.5 mile of route centerline.

Species of Greatest Conservation Need

The WAN shows viable or persistent populations and richness hotspots for the regions in Minnesota (Minnesota DNR 2016f). As shown in Figure 6.3.5-1, RA-08 would cross habitats within the WAN that could be used by multiple SGCNs.

Minnesota Biological Survey Sites of Biodiversity Significance

As shown in Figure 6.3.5-2, RA-08 would cross areas with MBS Sites. Areas rated outstanding, high, and moderate that are crossed by the alternative have an increased potential of containing habitats used by rare animals and plants that potentially would be affected, as discussed below in the impact assessment.

Minnesota Scientific and Natural Areas

RA-08 would come within 0.5 mile of the Hole-in-the-Bog Peatland SNA (Figure 6.3.5-3), which is a minimally disturbed, well-defined, crested raised bog and peatland lake (Minnesota DNR 2016d). As the only protected peatland of this type, it is Minnesota's best example of a basin-filled raised bog and is one of few outside a major glacial lake plain (Minnesota DNR 2016d).

6.3.5.3 Impact Assessment

Potential impacts on unique natural resources from construction of the Applicant's preferred route and route alternatives include the following:

- Injury or loss of aquatic invertebrates, fish, and reptiles from waterbody crossing construction;
- Injury or loss of terrestrial invertebrates, small mammals, reptiles, bird eggs and young, and plants from vegetation clearing, trench excavation, and vehicle operations;
- Loss or alteration of forage and cover habitats from vegetation clearing, site grading, and trenching;
- Disturbance from construction noise and activity; and
- Exposure to small leaks and drips from construction equipment and vehicles.

Operations impacts on unique natural resources could include:

- Continued habitat loss or alteration from pipeline right-of-way vegetation management,
- Continued habitat loss or alteration from excavation for pipeline inspection and repair, and
- Continued disturbance from noise and activity at facilities.

The potential for effects on unique natural resources depends on whether the protected unique natural resources occur near the facilities, infrastructure, activities, and habitat changes associated with construction and operation of the route alternatives, and whether these conditions may result in injury, harm, or disturbance. Impact assessments specific to route alternatives in Minnesota are presented below.

6.3.5.3.1 Applicant's Preferred Route (in Minnesota)

This impact assessment provides a description of the incremental impact that construction and operation of the Applicant's preferred route will have on the existing environment within the unique natural resources ROI for the Applicant's preferred route as described above. It should be noted that even in areas where the Applicant's preferred route parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, Dakota skipper, Poweshiek skipperling, rusty patched bumble bee, and western prairie fringed orchid have the potential to occur within the ROI for the Applicant's preferred route (Table 6.3.5-1). Of these species, the Canada lynx, gray wolf, northern long-eared bat, and rusty patched bumble bee potentially occur between Clearbrook and Carlton (Table 6.3.5-1).

Construction Impacts

If present, individual Canada lynx could be disturbed by construction noise and activity that likely would cause lynx to move to other areas, possibly returning after construction activities stop. Disturbance effects likely would be minor and temporary unless den sites are disturbed. Most den sites, which are used from April to June, would not be present within the cleared work area because den sites usually are located around downed logs and windfall trees in the forest interior. Most tree clearing for pipeline construction, ATWS, access roads, and facility sites would occur next to previously cleared utility corridors that are not likely to support den sites. Most (approximately 75 percent) of the Clearbrook-to-Carlton segment would be adjacent to pipeline, transmission line, or road corridors that previously have been disturbed by construction. The habitat fragmentation analysis in Section 6.3.4 identifies 17 forested large-block habitats between MPs 215.0 and 352.0 that could support Canada lynx and den sites.

Foraging and reproductive activities for gray wolves could be affected by exposure to Project-related noise and increased human activity. Construction of a pipeline likely would displace a few gray wolves and alter used habitats, especially if packs currently use existing rights-of-way as a travel corridor. If dens are present in the vicinity, construction-related disturbance could reduce pup survival. In addition, wolf-vehicle collisions continue to be a major contributor to wolf mortality. Typical conservation measures to reduce impacts on the gray wolf include:

- Stop construction activities if the contractor or Environmental Inspector observes a gray wolf or possible den site within the construction corridor, or if USFWS notifies the Applicant of a gray wolf sighting within 1 mile of the construction work area; the stop work order for that area of construction should continue until the wolves leave the area.
- Report any wolf sightings immediately to USFWS, USACE, and state resource agencies (e.g., Minnesota DNR).

Current use of the Applicant's preferred route by northern long-eared bats was confirmed by surveys performed by Merjent from 2014 to 2016 (2014b, 2014c, 2015b, 2015c, and 2016b). The Applicant conducted acoustic, mist-net, and telemetry surveys within forested areas that contain suitable habitat for northern long-eared bats during 2014 and 2015 to determine the summer presence or probable absence of northern long-eared bats, and if found, identify locations of maternity and/or roost trees used by northern long-eared bats. Northern long-eared bats were confirmed acoustically at survey sites in Aitkin, Carlton, Cass, Crow Wing, Hubbard, and Wadena counties in Minnesota, and in Douglas County in Wisconsin (Merjent 2014b, 2015b). In 2014 and 2015, mist-net surveys were completed at 85 sites along the Applicant's preferred route. In 2014, northern long-eared bats were captured at 54 sites in Aitkin, Carlton, Cass, Crow Wing, and Hubbard counties in Minnesota, and Douglas County in Wisconsin. Similarly, in 2015 northern long-eared bats were captured at nine sites in Aitkin, Carlton, Cass, and Wadena counties in Minnesota. A total of 23 roosts, including 9 maternity roost trees and 14 triangulated roosts on inaccessible land, were identified (5 trees in Carlton County, 10 in Cass County, 7 in Aitkin County, and 1 in Wadena County) (Merjent 2014c, 2015c). In 2016, acoustic surveys were conducted at six sites along the Applicant's preferred route in Aitkin, Clearwater, Polk, and Red Lake counties, Minnesota. No confirmed acoustic northern long-eared bats calls were recorded at the six survey sites (Merjent 2016b).

If northern long-eared bats occur in the construction area, individuals or colonies of bats could be affected if clearing or construction occurs when bats are using summer roosts. Northern long-eared bats could be disturbed by noise or human presence, causing them to abandon occupied tree roosts. Bats could be injured or killed if occupied trees are cut down or disturbed. Because female northern long-eared bats return to the same trees yearly to birth and raise their young, impacts could be substantial if roost trees are destroyed or abandoned. Because the population of northern long-eared bats is declining from white-nose syndrome and destruction of habitat among other factors, the protection of these bats—and particularly of groups of female and juvenile bats in maternity colonies—is of critical importance.

Conservation measures were included in the ESA 4(d) rule[16] to reduce potential impacts on northern long-eared bats. Under the Final 4(d) rule, incidental take involving tree removal in the mapped white nose syndrome zone is not prohibited if the following two conservation measures are followed:

- Maintain a year-round 0.25-mile radius buffer (which is equivalent to 125.7 acres) around known northern long-eared bat hibernacula.
- Protect known, occupied maternity roost trees. Incidental take is prohibited if the activity cuts or destroys a known, occupied maternity roost tree, or any other trees within a 150-foot radius around a known maternity roost tree, equivalent to 1.6 acres, during the pup season from June 1 to July 31.

If present, the Dakota skipper, Poweshiek skipperling, and rusty patched bumble bee could be affected by construction activities that disturb native vegetation. These activities would disrupt egg laying and foraging during spring and summer, and could crush dormant larvae or hibernating queens during fall and winter. These prairie-dependent insects depend on high-quality native grasslands and tallgrass prairies to provide food from flower pollen and nectar. Vegetation clearing and replacement with non-native ground covers could injure or kill these butterflies and bees, and could remove forage plants.

The Applicant completed a desktop and field assessment of potentially suitable native prairie habitat for the Dakota skipper and Poweshiek skipperling along the Applicant's preferred route. Potentially suitable Dakota skipper and Poweshiek skipperling habitat was documented at one location along the survey corridor in Polk County, and potentially suitable habitat for Poweshiek skipperling was documented at two locations in Pennington County. Suitable habitats were found in small, isolated pockets that ranged in size from 0.4 to 1.8 acres. Presence/absence surveys were conducted in 2015 at a subset of USFWS selected locations identified in the 2013/2014 habitat assessment. Sites were selected based on habitat quality and size (Merjent 2015d). Surveys did not identify the presence of Dakota skippers or Poweshiek skipperling at the three suitable habitat locations in Pennington and Polk counties in Minnesota (Merjent 2015d). Presence/absence surveys have not been performed based on the revised 2016 habitat assessment (Merjent 2016c). While it is possible that these species could occur, based on the results of the habitat survey and earlier presence/absence survey, it is unlikely that the Dakota skipper or Poweshiek skipperling would be affected by construction activities.

The Applicant's preferred route would not cross any current high use areas for rusty patched bumble bees, and construction is not likely to directly or indirectly affect any individuals or current high use areas. The Applicant's preferred route crosses through current potential low use areas where rusty patched bumble bees may disperse from current high use areas or where their occurrence is uncertain. Construction could render some potentially used habitat as unusable, such that the rusty patched bumble bee could experience short-term, minor impacts. The rusty patched bumble bee may benefit from opportunities to conserve the species within the dispersal area, and USFWS may recommend surveys. Applicable conservation measures that would benefit the rusty patched bumble bee within this

16 Regulations identified by USFWS that are deemed "necessary and advisable" for protection and conservation of a federally threatened species.

dispersal area include restoration and maintenance of high-quality habitat through control of invasive species and restoration that includes a high diversity and abundance of wildflowers appropriate for the region and local characteristics (USFWS 2017).

Western prairie fringed orchids have the potential to occur within 1 mile of the Applicant's preferred route; however, there are no known occurrences of this plant within the construction work area for the Applicant's preferred route in Minnesota. If these plants were to occur, direct impacts could include trampling and destruction during construction from grubbing, grading, and trenching. Indirect effects from construction could include conversion of already fragmented prairie habitat into other habitat types and the spread of noxious weeds and invasive plants. To minimize the spread of noxious weeds and invasive plants, the Applicant would implement measures in a Noxious Weeds and Invasive Species Control Plan. This plan would include control measures for management of noxious weeds and invasive plants during construction.

Impacts on prairie soils from construction would be long term and could require a substantial amount of recovery time, which could affect any western prairie fringed orchids present. The Applicant completed habitat analyses and field surveys of potentially suitable western prairie fringed orchid habitat from 2013 to 2016, and no orchids were located during these surveys (Merjent 2015e, 2016a). Potentially suitable habitat was identified at one location, but no western prairie fringed orchids were found. Therefore, it is unlikely that western prairie fringed orchids would be affected by construction of the Applicant's preferred route.

Summary

Measures to avoid or reduce construction impacts on federally listed animals and plants would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. The Canada lynx and gray wolf would experience temporary minor effects associated with construction activities. While habitat fragmentation represents a permanent impact on all species, the impact would be minor due to the limited extent of the fragmentation. Northern long-eared bats and occupied maternity roots are known to occur along the Applicant's preferred route. With implementation of conservation measures associated with the ESA 4(d) rule, they would experience temporary minor effects from construction. Effects on the Dakota skipper and Poweshiek skipperling are not expected. Effects on potential rusty patched bumble bee habitat could be short term and minor. With implementation of BMPs and general conservation measures, impacts from construction would be temporary and minor. Impacts specific to Minnesota key habitats with the potential to affect federally listed species are described below for WAN and MBS Sites. Effects on the federally listed western prairie fringed orchid would be negligible based on the lack of presence and the scarcity of suitable habitat.

<u>Operations Impacts</u>

Operations and maintenance activities would result in periodic noise and human/equipment activity associated with inspection overflights, ground surveillance, and maintenance and repairs. Impacts on individual Canada lynx and gray wolves would be limited to temporary disturbance or displacement. Lynx and wolves would be expected to resume use of the area following the disturbance. Disturbance could also be caused by public and private use of ATVs and snow machines along the permanent right-of-way. Operation of vehicles along the right-of-way could result in collisions with individual lynx or wolves. Minimization measures to reduce the potential for collisions could include operating equipment at speeds suitable for the driving conditions or posted speed limits. Use of the right-of-way for recreational purposes could potentially be reduced by limiting access through use of gates and posting of no trespassing signs, where appropriate. The probability of collisions with work vehicles during operations would be low. Therefore, no adverse impacts are expected as a result of collisions. Impacts to Canada lynx and gray wolf would be limited to periodic disturbance. Therefore, only temporary minor impacts on individuals of these species would be expected over the life of the project.

Operations impacts on the northern long-eared bat could include continued habitat loss or alteration (i.e., if trees are allowed to grow larger than 3 inch in diameter at breast height between tree maintenance events) and disturbance from noise and activity at aboveground facilities and from right-of-way inspection overflights or ground surveillance. Human activities during operation typically would occur during daylight hours; therefore, operations activities would not interrupt foraging activities, and impacts would be permanent and negligible. Operation of pipeline pump stations could increase nearby noise levels over existing ambient levels; however, as described in Section 6.2.2, noise would be compliant with Minnesota Noise Standards and would decrease over distance. Pump station footprints would be devoid of trees. Although bats could forage in the vicinity, they would not roost at the pump station. Unless a roost site is near a pump station, the effects from operation of pump stations would be permanent and negligible.

As described for construction, surveys did not document any individuals of the Dakota skipper or Poweshiek skipperling, and these species are unlikely to occur along the Applicant’s preferred route. Therefore, there would be no adverse impacts on either of these species.

The Applicant’s preferred route would not cross any current high use areas for rusty patched bumble bees. Therefore, no adverse impacts on any individual bees or current high use areas are expected. The Applicant’s preferred route crosses current potential low use areas where rusty patched bumble bees may disperse from current high use areas or where their occurrence is uncertain. If bees are determined to occur in these areas, measures to avoid or minimize impacts could include:

- Limiting vegetation management in high-quality habitat during the active season (March through September);
- Leaving one or more areas unmowed for the entire year in vegetation management areas;
- Using a minimum of 8 to 10 inches cutting height to prevent disturbance of overwintering queens or nesting sites; and
- Careful and targeted pesticide use to control pests and invasive species:
  - Use least toxic options, follow label directions to ensure proper use,
  - Apply as locally and directly as possible, avoid broadcast application that may be harmful to the rusty patched bumble bee or their nectar plants in areas where the species is likely to be found, and
  - Ensure that field crews recognize target weeds to avoid adverse effects on important native plants (USFWS 2017).

Fassett’s locoweed and western prairie fringed orchid are not likely to occur in the right-of-way. Surveys were not conducted for Fassett’s locoweed and no individuals of western prairie frindged orchid were not documented during field surveys. Therefore, impacts on individuals from operations are not anticipated. In the unlikely event that individuals of either species persist within the permanent right-of-way, they could be permanently affected by vegetation management activities. Given the lack of appropriate habitat and known presence, impacts would be expected to be negligible.

Summary

Operations and maintenance impacts on Canada lynx and gray wolves would be limited to periodic disturbances over the life of the project. These impacts would be temporary and minor. No adverse impacts are expected as a result of vehicle collisions. Impacts on northern long-eared bats would be permanent and negligible. Given the limited distribution and habitat types that could be used by Kirtland's warblers and piping plovers operations and maintenance impacts would be permanent and negligible. Migrant whooping cranes would not be affected by pipeline operation. No adverse impacts are anticipated on the Dakota skipper or Poweshiek skipperling, because no individuals were documented during surveys. Similarly, no adverse impacts are expected to occur to the rusty patched bumble bee, because no high use areas occur within the Applicant's preferred route. Operations would be unlikely to affect federally listed plants because of the scarcity of appropriate habitat and species presence.

State-Listed Species

<u>Endangered and Threatened Species</u>

Two Minnesota-listed aquatic animals, the pugnose shiner (*Notropis anogenus*) and fluted-shell mussel (*Lasmigona costata*), and 14 Minnesota-listed plants could occur within the construction work area for the Applicant's preferred route and could be affected during construction and operation (Tables 6.3.5-23 and 6.3.5-24). The pugnose shiner and eight Minnesota-listed plants occur between Clearbrook and Carlton. Potential impacts and conservation measures applicable for Minnesota-protected species are summarized below for construction and operation.

Construction Impacts

The pugnose shiner and fluted shell mussel have been documented in the ROI for the Applicant's preferred route. The Applicant surveyed for mussels at sixteen sites along the Applicant's preferred route, and no state-protected mussels were found (Merjent 2015b).

If present at the time of construction, the pugnose shiner and fluted-shell mussel could be affected by instream construction or construction activities that take place in the adjacent uplands. Both species are vulnerable to any deterioration in water quality, especially increased siltation. Disturbance to the stream bottom could crush or suffocate the fluted-shell mussel and would temporarily increase turbidity that could reduce feeding efficiency and damage these sensitive aquatic animals. HDD is proposed for both of the stream crossings where these two species have been documented, so any impacts due to instream construction would be avoided. Increased turbidity and siltation could still occur due to surface runoff from construction work areas. Stringent erosion and sediment control practices will minimize these potential effects. Contaminated construction equipment and water used for hydrostatic testing could introduce invasive aquatic animals such as zebra and quagga mussels that could displace and reduce habitat quality for aquatic animals. To minimize the potential for introduction of invasive species, the Applicant would implement an invasive species minimization plan. In addition, environmental inspectors would monitor construction activities to ensure compliance with permit conditions and the invasive species plan, reducing the potential for introduction of invasive species during construction.

Based on the surface water crossing method that would be used and the BMPs that would be implemented for water withdrawals and discharge, construction impacts on the pugnose shiner and fluted-shell mussel would be temporary to short term and negligible.

Minnesota-listed plants were documented at 19 survey sites along the Applicant's preferred route. The Applicant would avoid all state-listed plants at 12 of these sites (Table 6.3.5-21). Avoidance strategies include, but are not limited to, workspace area reductions or modifications, exclusion fencing, and minor route centerline adjustments.

The Applicant would not avoid populations of six Minnesota-listed plants at seven survey sites and would consult with Minnesota DNR to complete the Endangered Species permit process for takings (Table 6.3.5-22). Takings include picking, digging, or destroying. If there are no feasible alternatives to takings, the Applicant would propose compensatory mitigation to reduce the impact to an acceptable level. The magnitude of the compensation required would be related to the degree of impact on each plant species (e.g., loss of the whole population at a site versus the loss of just a few individuals), and the statewide significance of the population at the site that would be affected. Types of acceptable compensatory mitigation for taking endangered or threatened plants in Minnesota could include:

- Funding state acquisition and protection of another site where the species occurs that is currently unprotected and vulnerable to destruction,
- Funding additional survey work to locate other sites, and
- Funding research to improve Minnesota DNR's understanding of the habitat requirements or protection needs of the species.

Summary

Measures to avoid or reduce construction impacts on Minnesota-protected animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state protected species. No unavoidable impact on Minnesota-listed animals are expected. Minnesota-listed plants are known to occur within the construction work area. Therefore, effects on Minnesota-protected plants are expected to be permanent and major. All species could be indirectly affected by habitat loss and alteration.

Operations Impacts

Operation and maintenance activities include mowing, equipment maintenance, and invasive species control. Vegetation maintenance that removes riparian trees and large shrubs could increase stream temperatures by removing shade, which would reduce habitat suitability for aquatic animals. State-protected plants that persist within the permanent right-of-way after construction could be permanently affected by vegetation maintenance activities; however, given the few occurrences and potential for avoidance within this area, overall impacts would be permanent but minor.

Table 6.3.5-21. Minnesota Endangered and Threatened Plant Populations Avoided by the Applicant's Preferred Route

Survey Site	County	Common and Scientific Name	Status[a]	How Avoided
North Dakota Border to Clearbrook				
L3R_03	Kittson	Red saltwort (*Salicornia rubra*)	Threatened	Enbridge modified workspace to avoid all 91 individuals of red saltwort. [a]
L3R_04	Kittson/Marshall	Red saltwort (*Salicornia rubra*)	Threatened	All 14,949 individuals of red saltwort are outside of workspace. [a]
L3R_08	Pennington	Sterile sedge (*Carex sterilis*)	Threatened	All individuals of sterile sedge are outside of workspace.
L3R_11	Red Lake	Clinton's bulrush (*Trichophorum clintonii*)	Threatened	All individuals of Clinton's bulrush are outside of workspace.
L3R_12	Polk	Whorled nutrush (*Scleria verticillata*)	Threatened	All 787 individuals of whorled nutrush are outside of workspace. [b]
L3R_14a	Clearwater	Handsome sedge (*Carex formosa*)	Endangered	Enbridge modified workspace to avoid 11 individuals of handsome sedge. Enbridge would use exclusion fencing to avoid one individual of handsome sedge within workspace. [b]
Clearbrook to Carlton				
L3X_22/23/58	Cass	Butternut (*Juglans cinerea*)	Endangered	Enbridge developed and adopted a route deviation to avoid all 24 individual butternut trees. [c]
		Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	Threatened	There are 19 individuals of narrow triangle moonwort outside of the workspace. [d, e] Other individuals of this species will be affected.
L3X_25	Cass	Purple-flowered bladderwort (*Utricularia purpurea*)	Endangered	All individuals of purple flowered bladderwort are outside of workspace.
L3X_105	Cass	A bristle-berry (*Rubus fuller*)	Threatened	All individuals of a bristle-berry[f] are outside of workspace.
L3X_81a	Aitkin	Narrow triangle moonwort *(Botrychium lanceolatum* ssp. *angustisegmentum)*	Threatened	All individuals of narrow triangle moonwort are outside of workspace.

Table 6.3.5-21. Minnesota Endangered and Threatened Plant Populations Avoided by the Applicant's Preferred Route

Survey Site	County	Common and Scientific Name	Status[a]	How Avoided
		Bog bluegrass (*Poa paludigena*)	Threatened	Large numbers of bog bluegrass are outside of workspace. Other individuals of this species would be affected.
L3X_29	Carlton	A liverwort (*Trichocolea tomentella*)	Threatened	All individuals of *T. tomentella* are outside of workspace.
L3X_64	Carlton	Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	Threatened	All individuals of narrow triangle moonwort are outside of workspace. [g]

Source: Minnesota DNR 2017c.

[a] Number of individuals avoided is based on 2015 population count data. At survey site L3R_03, no individuals were observed during 2016 population counts.

[b] Number of individuals avoided is based on 2016 population count data.

[c] The avoidance of all butternut trees at survey site L3X_22/23/58 is based on 2013 survey data. Enbridge would install exclusion fencing at a 25-foot radius around one individual to avoid impacts on the root zone. This tree, approximately 25 feet tall with a 7-inch diameter at breast height, is within 7 feet of construction workspace and within 12 feet of additional temporary workspace. The tree size was measured on August 23, 2016. On the same site visit, there was no evidence of butternut canker (a lethal fungal disease) for this tree.

[d] Number of individuals avoided is based on a combination of 2015 and 2016 population count data.

[e] Enbridge would fence individuals that are outside of the workspace but within 5 feet of the workspace edge to facilitate avoidance during construction.

[f] This species was tentatively identified on June 20, 2016. Upon revisit on August 23, 2016, to confirm the species identification based on characteristics of mature primocanes, the individuals were no longer present due to logging of the area.

[g] No individuals were observed within workspace or within 5 feet of the edge of workspace during 2016 population counts.

Note:

No endangered or threatened plant populations were identified in the Carlton-to-Wisconsin border segment for the Applicant's preferred route.

Table 6.3.5-22. Minnesota Endangered and Threatened Plant Populations Potentially Affected by Construction and Operation of the Applicant's Preferred Route

Survey Site	County	Common and Scientific Name	Statusa	Number of Avoided Individuals	Number of Affected Individuals
North Dakota Border to Clearbrook					
L3R_07	Marshall	Sterile sedge (*Carex sterilis*)	Threatened	268 [b]	47 [c]
L3R_12	Polk	Sterile sedge (*Carex sterilis*)	Threatened	657 [d]	292
		Beaked spikerush (*Eleocharis rostellata*)	Threatened	14,665 [d]	5,036
		Hair-like beak rush (*Rhynchospora capillacea*)	Threatened	18	106
L3R_14	Clearwater	Handsome sedge (*Carex formosa*)	Endangered	62 [c, d]	3 [c]
Clearbrook to Carlton					
L3X_99	Cass	Bog bluegrass (*Poa paludigena*)	Threatened	10 (3,500) [c, e]	4 [c]
L3X _22/23/58	Cass	Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	Threatened	19 [b]	1 + 40 [f, g]
L3X _C1	Cass	Narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*)	Threatened	--	20 [f]
L3X _81a	Aitkin	Bog bluegrass (*Poa paludigena*)	Threatened	45 (7,000) [e]	242 [c]
		Bog bluegrass (*Poa paludigena*)	Threatened	257 (8,000) [e]	961 [c]
		Bog bluegrass (*Poa paludigena*)	Threatened	1,173 (5,000) [e]	744 [c]

Sources: Minnesota DNR 2017c.

a Status refers to Minnesota listing (E = endangered, T = threatened).

b Number of individuals is based on a combination of 2015 and 2016 population counts.

c Number of individuals is based on 2016 population count data.

d Enbridge would fence individuals that are outside of the workspace but within 5 feet of the workspace edge to facilitate avoidance during construction.

e First number is based on number of individuals avoided within site boundary used for 2016 population count. Second number (in parentheses) is based on estimated size of population beyond site boundary during 2016 occurrence surveys.

f Number of individuals is based on 2015 population count data.

g Enbridge would avoid all individual butternut trees at this site with the understanding that some individuals of narrow triangle moonwort (which have a shorter time to maturity and are less imperiled) would be affected as a result.

Note:

No Minnesota endangered or threatened plant populations were identified in the Carlton-to-Wisconsin border segment for the Applicant's preferred route.

"--" = no occurrence

Table 6.3.5-23. Known Occurrences of Minnesota-Protected Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for the Applicant's Preferred Route

Common Name	Scientific Name	State Status[a]	Federal Status[b]	North Dakota Border to Clearbrook			Clearbrook to Carlton			Carlton to Wisconsin Border			Total		
				Con[c]	Op[c]	Within 0.5 Mile	Con[c]	Op[c]	Within 0.5 Mile	Con[c]	Op[c]	Within 0.5 Mile	Con[c]	Op[c]	Within 0.5 Mile
Fish															
Pugnose shiner	*Notropis anogenus*	THR	NA	--	--	--	1	1	1	--	--	--	1	1	1
Mollusks															
Fluted-shell mussel	*Lasmigona costata*	THR	NA	1	1	1	--	--	--	--	--	--	1	1	1

Source: Minnesota DNR 2016a.

[a] THR = Threatened

[b] NA = not applicable

[c] Results for Applicant's preferred route within Minnesota based on Enbridge-provided footprints. Con = sum of pipeline construction work area, additional temporary workspaces, and temporary access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, pump stations, and valves.

"--" = no occurrence

Table 6.3.5-24. Known Occurrences of Minnesota-Protected Plants within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for the Applicant's Preferred Route

Common Name	Scientific Name	State Status[a]	Federal Status[b]	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Total	
				Con	Op	Con	Op	Con	Op	Con	Op
Vascular Plants											
Beaked spikerush	*Eleocharis rostellata*	THR	NA	1	1	--	--	--	--	1	1
Bog bluegrass	*Poa paludigena*	THR	NA	--	--	--	--	1	1	--	--
Butternut	*Juglans cinerea*	END	NA	--	--	1	1	--	--	1	1
Hair-like beak rush	*Rhynchospora capillacea*	THR	NA	1	1	--	--	--	--	1	1
Narrow triangle moonwort	*Botrychium lanceolatum* ssp. *angustisegmentum*	THR	NA	--	--	3	2	--	--	3	2
Red saltwort	*Salicornia rubra*	THR	NA	1	--	--	--	--	--	1	--
Sterile sedge	*Carex sterilis*	THR	NA	2	2	--	--	--	--	2	2

Sources: Minnesota DNR 2016a; Merjent 2016a.

[a] END = Endangered, THR = Threatened

[b] NA = not applicable

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Results for Applicant's preferred route within Minnesota based on Enbridge-provided footprints. Con = sum of pipeline construction work area, additional temporary workspaces, and temporary access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, pump stations, and valves

"--" = no occurrence

<u>Special Concern Species</u>

Minnesota-listed special concern species that could be affected by construction and operation of the Applicant's preferred route include mollusks, mammals, birds, fish, and plants (Tables 6.3.5-25 and 6.3.5-26).

Construction Impacts

The greatest impacts on special concern species based on known occurrence would be to mammals, birds, amphibians, and fish that occur within the Clearbrook-to-Carlton segment, while plants would experience the greatest impact in the segment from the North Dakota border to Clearbrook (Tables 6.3.5-25 and 6.3.5-26).

Given the Applicant's surveys for bats, there are several known occurrences of bats along the Applicant's preferred route. Impacts on individuals or colonies of bats may occur if clearing or construction occurs when bats are using summer roosts. Bats could be disturbed by noise or human presence, causing them to abandon occupied roosts. Bats could also be injured or killed if occupied trees are cut down. Impacts could be substantial if trees with maternity colonies are destroyed or abandoned. Implementation of the conservation measures associated with the ESA 4(d) rule that protect the northern long-eared bat would protect these bats as well.

Potential impacts on the prairie vole include disturbance due to construction noise and activity and fatalities due to heavy equipment use and earth movement within the construction work area. Prairie voles are mainly restricted to relatively undisturbed dry grasslands and would not be present throughout the entire route. Effects on mammal populations likely would be temporary and minor with implementation of BMPs.

Of the six species of birds with the potential to occur, construction impacts likely would be the greatest for the prairie-chicken (*Tympanuchus cupido*), which is a ground-nesting grassland bird that is an uncommon year-round resident of Minnesota. If construction activities occur in grassland habitat during spring and summer when the birds are breeding and fledging, activities could disrupt breeding and destroy eggs, while construction post-hatch could kill or disrupt young within nests. The remainder of the special concern birds could also be disturbed by construction activities during the breeding season. Potential impacts include nest abandonment due to disturbance, and nest/egg destruction or bird fatalities due to tree removal or earth movement. Outside of the breeding season, special concern birds could be disturbed by noise or human presence. While construction activities would be temporary, impacts associated with reduced fecundity could be longer lasting for populations. Avoiding tree removal and impacts on grasslands during the breeding season will help to minimize impacts. Four-toed salamanders occur in isolated colonies in mature upland forests interspersed with sphagnum seepages, vernal ponds, or other fish-free habitats. Upland forests provide cover, foraging, and overwintering habitat, while egg deposition and larval development occur in wetlands. Potential impacts would be limited to areas with suitable habitat, and include fatalities due to construction activities and habitat destruction, degradation, and fragmentation due to tree clearing and earth movement. Measures to minimize disturbance include minimizing wetland impacts, herbicide application, and surface runoff.

Table 6.3.5-25. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for the Applicant's Preferred Route

Common Name	Scientific Name	Federal Status[a]	North Dakota Border to Clearbrook			Clearbrook to Carlton			Carlton to Wisconsin Border			Total		
			Con	Op	Within 0.5 Mile	Con	Op	Within 0.5 Mile	Con	Op	Within 0.5 Mile	Con	Op	Within 0.5 Mile
Mammals														
Big brown bat	*Eptesicus fuscus*	NA	--	--	--	4	3	7	--	--	--	4	3	7
Little brown bat	*Myotis lucifugus*	NA	--	--	--	8	6	11	--	--	--	8	6	11
Northern long-eared bat	*Myotis septentrionalis*	THR	--	--	--	16	15	26	1	1	2	16	15	27
Prairie vole	*Microtus ochrogaster*	NA	--	--	--	--	--	1	--	--	--	--	--	1
Birds														
Greater prairie-chicken	*Tympanuchus cupido*	NA	--	--	--	9	8	11	--	--	--	9	8	11
Nelson's sparrow	*Ammodramus nelsoni*	BCC	2	2	2	--	--	-	--	--	--	2	2	2
Northern goshawk	*Accipiter gentilis*	NA	--	--	--	--	--	1	--	--	--	--	--	1
Red-shouldered hawk	*Buteo lineatus*	NA	--	--	--	--	--	1	--	--	--	--	--	1
Short-eared owl	*Asio flammeus*	BCC	1	1	1	--	--	--	--	--	--	1	1	1
Trumpeter swan	*Cygnus buccinators*	NA	--	--	--	--	--	2	--	--	--	-	-	2
Reptiles and Amphibians														
Four-toed salamander	*Hemidactylium scutatum*	NA	--	--	--	--	--	1	--	--	--	--	--	1

Table 6.3.5-25. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for the Applicant's Preferred Route

Common Name	Scientific Name	Federal Status[a]	North Dakota Border to Clearbrook			Clearbrook to Carlton			Carlton to Wisconsin Border			Total		
			Con	Op	Within 0.5 Mile	Con	Op	Within 0.5 Mile	Con	Op	Within 0.5 Mile	Con	Op	Within 0.5 Mile
Fish														
Least darter	*Etheostoma microperca*	NA	--	--	--	1	1	2	--	--	--	--	--	2
Insects														
A caddisfly	*Anabolia ozburni*	NA	--	--	--	1	--	1	--	--	--	--	--	1
Mollusks														
Black sandshell	*Ligumia recta*	NA	1	1	1	1	1	1	--	--	--	2	2	2
Creek heelsplitter	*Lasmigona compressa*	NA	2	2	2	1	1	2	--	--	--	3	3	4

Source: Minnesota DNR 2016a.

[a] NA = not applicable

Note:

Results for Applicant's preferred route within Minnesota based on Enbridge-provided footprints: Con = sum of pipeline construction work area, ATWS, and temporary access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, pump stations, and valves.

"--" = no occurrence

Table 6.3.5-26. Known Occurrences of Special Concern Plants within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for the Applicant's Preferred Route

Common Name	Scientific Name	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Total	
		Con	Op	Con	Op	Con	Op	Con	Op
Blunt sedge	*Carex obtusata*	1	1	--	--	--	--	1	1
False mountain willow	*Salix pseudomonticola*	2	1	--	--	--	--	2	1
Few-flowered spikerush	*Eleocharis quinqueflora*	2	2	--	--	--	--	2	2
McCalla's willow	*Salix maccalliana*	1	--	--	--	--	--	1	--
Least moonwort	*Botrychium simplex*	--	--	3	1	--	--	3	1
Northern single-spike sedge	*Carex scirpoidea*	2	2	--	--	--	--	2	2
Slender naiad	*Najas gracillima*	--	--	1	1	--	--	1	1
Small white lady's-slipper	*Cypripedium candidum*	1	1	--	--	--	--	1	1
Torrey's mannagrass	*Torreyochloa pallida*	--	--	2	2	--	--	2	2

Source: Minnesota DNR 2016a.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Results for Applicant's preferred route within Minnesota based on Enbridge-provided footprints: Con = sum of pipeline construction work area, additional temporary workspaces, and temporary access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, pump stations, and valves.

"--" = no occurrence

General construction impacts and measures to avoid or reduce impacts on rare and protected species would be the same as those described for vegetation and fish and wildlife in Sections 5.2.3 and 5.3.3, respectively. Construction impacts on fish, aquatic insects, and mussels would be short term and negligible to minor during construction of the stream crossings.

Impacts on special concern plants would be the same as described above for federally and state-protected species; the impacts would be long term and minor.

Operations Impacts

Pipeline operation would include vegetation management and pipeline inspections that could include excavation and repair or replacement of sections of the pipeline. Vegetation management would be conducted to prevent trees and large shrubs from growing over the pipeline. Mammals, birds, and amphibians that depend on closed canopies may avoid the permanent right-of-way, which may act as a barrier to travel for some species, fragmenting SGCN habitat. General effects of fragmentation, including habitat loss and alteration, would be permanent and minor; these types of impacts are further described in Section 5.2.4. Impacts on greater prairie-chickens from habitat fragmentation would also be permanent, although clearing and maintenance of herbaceous cover may benefit this bird.

Species of Greatest Conservation Need

Approximately 30 percent of the segments from the North Dakota border to Clearbrook and from Clearbrook to Carlton contain areas within the WAN (Table 6.3.5-27). Most of the WAN habitats, 78 percent, that would be affected by construction and operation of the Applicant’s preferred route are rated low-medium and medium, and no WAN habitats that would be affected by the route were rated high (Table 6.3.5-27). The lack of high-quality WAN habitats indicates that the habitat affected would not be likely to be a SCGN richness hotspot. Most of the 97 miles (about 77 percent) of the Applicant’s preferred route that crosses through WAN habitats in Minnesota would occur within existing utility or transportation corridors; although 23 miles (23 percent) would cross a new right-of-way, potentially contributing to fragmentation of these WAN habitats. Most of the new corridor that crosses WAN habitats is between Clearbrook and Carlton. Overall impacts on WAN habitats, and the SGCN that they support, from construction and operation would be permanent and minor and caused by habitat loss and alteration, which is described in more detail in Section 5.2.4.

Table 6.3.5-27. Estimated Impacts on Wildlife Action Network Habitat from Construction and Operation of the Applicant's Preferred Route in Minnesota (acres)

Wildlife Action Network Rating	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Total	
	Con	Op	Con	Op	Con	Op	Con	Op
Low	121.4	42.8	141.7	61.3	9.8	3.5	272.9	107.6
Low-medium	302.6	116.9	424.6	182.4	--	--	727.2	299.4
Medium	47.3	20.4	440.5	205.0	--	--	487.8	225.4
Medium-high	38.8	17.6	34.1	18.7	--	--	72.9	36.3
High	--	--	--	--	--	--	--	--
WAN TOTAL	**510.2**	**197.8**	**1,040.9**	**467.4**	**9.8**	**3.5**	**1,560.9**	**665.1**
Segment total	***1,587.3***	***661.4***	***3,207.0***	***1,337.4***	***139.8***	***58.3***	***4,934.1***	***2,057.1***
Proportion in WAN	***32.1%***	***29.9%***	***32.5%***	***35.0%***	***7.0%***	***6.0%***	***31.6%***	***32.3%***

Source: Minnesota DNR 2016b.

Notes:

Enbridge-provided footprints: Con = sum of pipeline construction work area, ATWS, pipe yards, and temporary access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, pump stations, and valves.

WAN = Wildlife Action Network

"--"= no occurrence

Minnesota Biological Survey Sites of Biodiversity Significance

The proportion of the Applicant's preferred route that occurs in an MBS Site within the ROI, the construction work area, and the permanent right-of-way are similar; therefore, the overall route would not disproportionately affect MBS Sites. Most of this area is rated as moderate. Construction would affect an estimated 877 acres of MBS Sites, and operations would affect an estimated 403 acres of these designated lands (Table 6.3.5-28). Potential impacts and conservation measures applicable for MBS Sites are described in Section 5.2.5.3 and summarized below for construction and operations.

Construction Impacts

Construction of the Applicant's preferred route would affect an estimated 877 acres of MBS Sites (Table 6.3.5-28). Outstanding MBS Sites (7 acres) within the construction work areas are primarily within the segment from the North Dakota border to Clearbrook in Pennington County. Within the construction work areas that overlap this MBS Site, MBS has documented a northern mixed cattail marsh, a rare type of wetland that is considered imperiled in Minnesota. However, this is in an existing utility corridor that has already been affected by previous construction activities.

All impacts on MBS Sites ranked high (78 acres) within the construction work areas would occur within the Clearbrook-to-Carlton segment of the Applicant's preferred route. This section crosses two MBS Sites ranked high: the LaSalle Creek MBS Site in Hubbard County and the Automba 1 MBS Site in Carlton County. Although an existing utility corridor crosses the LaSalle Creek MBS Site, the centerline of the Applicant's preferred route does not follow the existing corridor. Instead, the centerline creates a new crossing of LaSalle Creek, which would result in new impacts on high-quality rare native plant communities, including habitat destruction and fragmentation. The Automba 1 MBS Site also contains an existing utility corridor, and the centerline of the Applicant's preferred route mostly follows this corridor. However, the construction work area would widen the existing corridor and result in habitat destruction.

Construction activities would result in destruction of native plant communities (and rare plants) within the construction work area and in the footprints of aboveground facilities. In turn, this would decrease the habitat available for rare animals that depend on the MBS Site. Depending on whether the corridor goes through the edge or the interior of the MBS Site and whether there is an existing utility corridor, construction activities would decrease the size of the MBS Site, fragment the MBS Site, or widen an existing corridor. Utility corridors can be effective barriers to animal movements, especially small mammals, amphibians, and reptiles. The wider the corridor, the more animals likely to be affected. Construction activities also may temporarily affect the hydrology of wetlands within the construction work area. Approximately 61 miles of the Applicant's preferred route would be constructed within new rights-of-way, creating a new corridor. Of this new corridor, 17 miles (28 percent) would cross moderate, high, and outstanding ranked MBS Sites, potentially fragmenting habitats within 14 MBS Sites—most of which (16 miles) is between Clearbrook and Carlton.

Construction activities also would affect the portions of MBS Sites that are adjacent to the construction work area. Potential impacts caused by surface runoff from the construction work area include increased sedimentation and the introduction or spread of invasive species. Sedimentation can affect surrounding uplands or wetlands, as well as waterways in the vicinity of the construction.

The Applicant has committed to preparation of the following plans, procedures, and general vegetation protection measures during construction:

- Co-locate the construction within and near existing utility corridors to minimize environmental impacts;
- Co-locate the Project with existing rights-of-way where feasible;
- Minimize and confine all construction equipment and vehicles to the approved designated construction work area and ATWS;
- Develop and adhere to Project-specific construction methods and procedures for vegetation clearing methods, including treatment of existing vegetation, topsoil segregation, storage, and reapplication;
- Restore preconstruction contours and use slope breakers, sediment barriers, mulch, geotextile fabric, and other erosion control devices to stabilize the disturbed areas during the vegetative regrowth phase and reduce runoff into the adjacent environment;
- Design and plan Project pipeline construction areas (parking, access, and temporary work areas) to reduce environmental impacts on sensitive plant communities;
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species; and
- Use weed-free mulch, topsoil, and seed mix.

Impacts on MBS Sites from construction activities would be short term (i.e., until vegetation cover is reestablished) and major given their occurrence along the Applicant's preferred route.

Table 6.3.5-28. Estimated Impacts on Minnesota Biological Survey Sites of Biodiversity Significance within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for the Applicant's Preferred Route in Minnesota (acres)

	North Dakota Border to Clearbrook			Clearbrook to Carlton			Carlton to Wisconsin Border			Applicant's Preferred Route Total		
MBS Sites Rating	**Con**	**Op**	**Within 0.5 Mile**	**Con**	**Op**	**Within 0.5 Mile**	**Con**	**Op**	**Within 0.5 Mile**	**Con**	**Op**	**Within 0.5 Mile**
Outstanding	5.8	3.0	664.1	1.6	1.6	381.2	0	0	0	7.4	4.6	1,045.4
High	0	0	461.1	77.6	39.7	5,731.2	0	0	0	77.6	39.7	6,192.3
Moderate	19.7	9.6	722.3	749.1	340.7	35,549.2	23.2	8.6	788.7	791.9	358.8	37,060.1
MBS SITES TOTAL	**25.4**	**12.6**	**1,847.5**	**828.3**	**381.9**	**46,244.9**	**23.2**	**8.6**	**788.7**	**876.9**	**403.2**	**44,297.8**
Segment total	***1,587.3***	***661.4***	***69,683.4***	***3,207.0***	***1,337.4***	***140,068.0***	***139.8***	***58.3***	***6,130.9***	***4,934.1***	***2,057.1***	***215,882.3***
Proportion in MBS Sites	***1.6%***	***1.9%***	***2.7%***	***25.8%***	***28.6%***	***33.0%***	***16.6%***	***14.8%***	***12.9%***	***17.8%***	***19.6%***	***20.5%***

Source: Minnesota DNR 2016h.

Notes:

Enbridge-provided footprints: Con = sum of pipeline construction work area, additional temporary workspaces, pipe yards, and temporary access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, pump stations, and valves.

MBS Sites = Minnesota Biological Survey Sites of Biodiversity Significance

Operations Impacts

Operations would continue to affect an estimated 403 acres of MBS Sites (Table 6.3.5-11). Vegetation maintenance to remove trees and large shrubs within the pipeline permanent right-of-way would reduce the habitat availability for rare animals. The utility corridor would be a permanent habitat loss and would continue to be a barrier or impediment to travel for some animals.

Conversely, the pipeline corridor can provide easy access to more remote MBS Sites and may result in increased human use of the corridor and the MBS Sites. This can negatively affect the ecological integrity of these MBS Sites by causing habitat degradation (e.g., operation of off-road vehicles in native plant communities) or by increasing the spread of invasive species.

Long-term vegetation management during operation would result in a major permanent change to MBS Sites.

Minnesota Scientific and Natural Areas

No impact on SNAs would occur from construction or operations of the Applicant's preferred route.

6.3.5.3.2 Route Alternatives (from Clearbrook to Carlton)

The only segment in Minnesota where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton. The impacts relevant to unique natural resources for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

This impact assessment provides a description of the incremental impact that construction and operation of RA-03AM will have on the existing environment within the unique natural resources ROI for RA-03AM as described above. It should be noted that even in areas where RA-03AM parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, and rusty patched bumble bee have the potential to occur within or near RA-03AM (Table 6.3.5-5). The types of impacts on all of these species from construction and operation of RA-03AM would be the same as those described above for the Applicant's preferred route. An evaluation of potential effects for each species is provided below.

Construction Impacts

Individual Canada lynx and gray wolves would experience temporary minor effects from disturbance by construction noise and activity associated with construction of RA-03AM. Most of the route (95 percent) would be co-located with existing pipeline, electrical transmission line, or road corridors that previously have been disturbed by construction. No large-block forested habitats occur within the non-co-located sections, and none would be fragmented by construction of the RA-03AM route. Typical conservation measures to reduce construction disturbance to gray wolves include stopping construction if a gray wolf or possible den site is observed until the wolf leaves the area, and reporting any wolf sighting to USFWS, USACE, and Minnesota DNR.

Current use of portions of RA-03AM by northern long-eared bats was confirmed by surveys performed by Merjent from 2014 to 2016 (Merjent 2015b, 2015c, 2016b). Northern long-eared bats were confirmed at acoustic survey sites in Carlton and Hubbard counties, where the RA-03AM route would be the same as the Applicant's preferred route (Merjent 2014b, 2015b). In 2014 and 2015, mist-net surveys were completed at 85 sites along the Applicant's preferred route. Northern long-eared bats were captured during mist-net surveys conducted in 2014 and 2015 at survey sites in Carlton County (Merjent 2014c, 2015c). If northern long-eared bats occur in the construction area, temporary minor impacts could occur if individuals or colonies of bats are disturbed by noise or human presence, causing them to abandon occupied tree cavities. If bats are injured or killed, or if occupied trees or maternity roosts are destroyed or abandoned, the impacts would be short term and major. Conservation measures associated with the ESA 4(d) rule to reduce potential impacts on northern long-eared bats include protecting known, occupied maternity roost trees and other trees within a 150-foot radius around maternity roost trees during the pup season from June 1 to July 31.

The rusty patched bumble bee could experience temporary minor effects associated with vegetation clearing and the use of construction equipment and vehicles. Vegetation clearing and replacement with non-native ground covers could injure or kill these butterflies and bees, and could remove forage plants. The RA-03AM route would not cross any current high use areas for rusty patched bumble bees, and construction is not likely to directly or indirectly affect any individuals or current high use areas. The RA-03AM route would cross current potential low use areas where rusty patched bumble bees may disperse from adjacent high use areas or where their occurrence is uncertain. Construction could render some potentially used habitat in the dispersal area as unusable, and the rusty patched bumble bee could experience short-term minor impacts. The rusty patched bumble bee may benefit from measures designed to conserve the species within the dispersal area and USFWS may recommend surveys. Although habitat surveys have not been completed for RA-03AM, no native prairie habitats appear to occur within the area that would be crossed by RA-03AM based on Minnesota DNR mapped native plant communities (Minnesota DNR 2017b). Conservation measures that would benefit the rusty patched bumble bee within these potential dispersal areas during construction include restoration and maintenance of high-quality habitat through control of invasive species, and restoration that includes a high diversity and abundance of wildflowers appropriate for the region and local characteristics (USFWS 2017).

Summary. Measures to avoid or reduce construction impacts on federally listed animals and plants would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. The Canada lynx and gray wolf would experience temporary minor effects associated with noise and human activities during construction. While habitat fragmentation represents a permanent impact on all species, the impact would be minor based on the limited extent of the fragmentation. Northern long-eared bats are known to occur along RA-03AM; with implementation of conservation measures associated with the ESA 4(d) rule, they would experience temporary minor effects from construction. Effects on potential habitat for rusty patched bumble bees could be short term and minor. Impacts specific to Minnesota key habitats with the potential to affect federally listed species are described below under WAN and MBS Sites.

Operations Impacts

Operations and maintenance activities would result in periodic noise and human/equipment activity associated with inspection overflights, ground surveillance, and maintenance and repairs. Noise and increased human activity could interrupt foraging and reproductive activities for individual gray wolves and Canada lynx. However, the impacts would be limited to temporary disturbance or displacement. Lynx and wolves would be expected to resume use of the area following the disturbance. Disturbance could also be caused by public and private use of ATVs and snow machines along the permanent right-of-way. Operation of vehicles along the right-of-way could result in collisions with individual lynx or wolves. Minimization measures to reduce the potential for collisions could include operating equipment at speeds suitable for the driving conditions or posted speed limits. Use of the right-of-way for recreational purposes could potentially be reduced by limiting access through use of gates and posting of no trespassing signs, where appropriate. The probability of collisions with work vehicles during operations would be low. Therefore, no adverse impacts are expected as a result of collisions. Impacts to Canada lynx and gray wolf would be limited to periodic disturbance. Therefore, only temporary minor impacts on individuals of these species would be expected over the life of the project.

Operations impacts on the northern long-eared bat could include continued habitat loss or alteration (i.e., if trees are allowed to grow larger than 3 inch in diameter at breast height between tree maintenance events) and disturbance from noise and activity at aboveground facilities and from right-of-way inspection overflights or ground surveillance. Human activities during operations typically would occur during daylight hours; therefore, operations activities would not interrupt foraging activities, and impacts would be permanent and negligible.

The RA-03AM route would not cross any current high use areas for rusty patched bumble bees. Therefore, no adverse impacts on any individual bees or current high use areas are expected. The RA 03AM route would cross current potential low use areas where rusty patched bumble bees may disperse from adjacent high use areas or where their occurrence is uncertain. Although habitat surveys have not been completed for RA-03AM, no native prairie habitats appear to occur within the area that would be crossed by RA-03AM based on Minnesota DNR mapped native plant communities (Minnesota DNR 2017b). If bees are determined to occur in these areas, measures to avoid or minimize impacts could be implemented as described for the Applicant's preferred route.

Summary. Measures to avoid or reduce construction impacts on federally listed animals and plants would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. Operations and maintenance impacts on Canada lynx and gray wolves would be limited to periodic disturbances over the life of the project. These impacts would be temporary and minor. No adverse impacts are expected as a result of vehicle collisions. Impacts on northern long-eared bats would be permanent and negligible. No adverse impacts are expected to occur to the rusty patched bumble bee, because no high use areas occur within RA-03AM.

State-Listed Species

Endangered and Threatened Species

Minnesota-protected animals occurring within the ROI for RA-03AM include two reptiles, four mollusks, and eight plants (Tables 6.3.6-6 and 6.3.5-29).

Table 6.3.5-29. Known Occurrences of Minnesota-Protected Species within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-03AM

Common Name	Scientific Name	State Status[a]	Federal Status[b]	Con[c]	Op[d]	Within 0.5 Mile
Animals						
Amphibians and Reptiles						
Blanding's turtle	*Emydoidea blandingii*	THR	NA	5	5	8
Wood turtle	*Glyptemys insculpta*	THR	NA	--	--	1
Mollusks						
Elktoe	*Alasmidonta marginata*	THR	NA	--	--	2
Fluted-shell	*Lasmigona costata*	THR	NA	1	1	5
Mucket	*Actinonaias ligamentina*	THR	NA	1	1	5
Spike	*Elliptio dilatata*	THR	NA	--	--	1
Plants						
Beaked spikerush	*Eleocharis rostellata*	THR	NA	--	--	1
Bog bluegrass	*Poa paludigena*	THR	NA	1	1	1
Bristle-berry	*Rubus fulleri*	THR	NA	--	--	1
Hair-like beak rush	*Rhynchospora capillacea*	THR	NA	--	--	1
Kitten-tails	*Besseya bullii*	THR	NA	--	--	1
Narrow triangle moonwort	*Botrychium lanceolatum* ssp. *angustisegmentum*	THR	NA	--	--	1
Snailseed pondweed	*Potamogeton bicupulatus*	END	NA	--	--	1
Sterile sedge	*Carex sterilis*	THR	NA	--	--	1

Sources: Minnesota DNR 2016a; Merjent 2016a.

[a] THR = Threatened

[b] NA = not applicable

[c] Con = estimated construction impact area in acres based on 120-foot-wide construction work area.

[d] Op = estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

"--" = no occurrence

Construction Impacts. The Blanding's turtle (*Emydoidea blandingii*) and wood turtle (*Glyptemys insculpta*) inhabit aquatic habitats and adjacent uplands. If they are present, construction activities could result in direct mortality to turtles or nests, which could be crushed by machinery, buried under excavated soil, or trapped in trenches. Surface water disturbances during construction also would affect aquatic habitats potentially used by turtles. Applicable conservation measures that would avoid and minimize potential impacts on Blanding's turtles and wood turtles include:

- Turtles in imminent danger should be moved, by hand, out of harm's way;
- Silt fencing should be set up to keep turtles out of construction areas;

- If erosion control mesh will be used, limit the mesh to wildlife-friendly materials; Minimize access and maintenance roads to a minimum to reduce road kill (tunnels should be considered in areas with concentrations of turtle crossings);
- Roads should be ditched, not curbed or below grade;
- Culverts between wetland areas, or between wetland areas and nesting areas, should be 36 inches or greater in diameter, and elliptical or flat-bottomed;
- Roads crossing streams should be bridged, or use oversized culverts (at least twice as wide as the normal width of open water) and flat-bottomed or elliptical;
- Check trenches prior to backfilling to avoid burying trapped turtles, and return the site to the original grade; and
- Revegetate with native grasses and forbs (Minnesota DNR 2008).

Impacts on turtles during construction likely would be short-term and minor. Measures to avoid or reduce construction impacts on Minnesota-listed animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state-protected species.

Mussel surveys were not completed for the route alternatives. Effects on mollusks from construction would depend on whether live mussels are present at the crossing locations and the method used to construct the crossing. Four state-listed threatened mussels have been documented within 0.5 mile of RA-03AM and may occur at stream crossings if suitable habitat is present. If stream crossings are constructed using the HDD method and standard BMPs are implemented for surface runoff and water withdrawals and discharges, construction impacts would be temporary and negligible for state-listed mollusks. If the wet or dry open-cut crossing methods are used, mussel beds could be destroyed; and temporary increases in turbidity could cause damage to gills, cover mussels with sediment, and decrease habitat suitability.

Botanical surveys were not conducted along RA-03AM, except for where it overlaps with the Applicant's preferred route. Minnesota-listed plants were documented during surveys at one site for RA-03AM where it overlaps with the Applicant's preferred route. Direct impacts on the occurrence of narrow triangle moonwort (*Botrychium lanceolatum* ssp. *angustisegmentum*) at the site in Carlton County would be avoided because the plants are outside of the construction work area (Table 5.2.5-16). The Minnesota DNR NHIS data also contain a known occurrence from 1991 of bog bluegrass potentially within the construction work area in a northern wet ash swamp in a moderate rated MBS Site in Morrison County. The current size and extent of this population are unknown. If construction proceeds in this area, botanical surveys likely would be needed to inform the takings permit process. If the bog bluegrass occurs within the construction work area, it could be destroyed during grubbing, grading, and trenching; and habitats could be degraded by the introduction or spread of noxious weeds and invasive plants. To minimize the spread of noxious weeds and invasive plants, the Applicant would implement measures in a Noxious Weeds and Invasive Species Control Plan. This plan would include control measures for management of noxious weeds and invasive plants during construction. Nevertheless, impacts on bog bluegrass could be permanent and major.

Other state-protected plants have been documented within the ROI and these species may occur within the construction work area if suitable habitat is present. Given that there are 368 acres of MBS Sites (a measure of rare species habitat) within the construction area of RA-03AM, it is likely that additional state-protected plants would be discovered if surveys were conducted along this route. If state-protected plants are present, the plants have the potential to be directly affected by construction. Some construction impacts may be avoidable through survey and flagging and through refinement of the construction work areas. BMPs to minimize overall impacts on vegetation and prevent the spread of noxious weeds and invasive plants would be implemented as noted above. For state-protected plants within the construction work area, impacts could range from short term to permanent and minor to major.

Measures to avoid or reduce construction impacts on state-protected animals and plants would be developed in consultation with the appropriate state agencies, if required, to ensure that any unavoidable impacts would not jeopardize the continued existence of state-protected species.

Summary. Measures to avoid or reduce construction impacts on Minnesota-protected animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state protected species. Impacts on turtles would be minor and short-term. Construction impacts on mussels would depend on the location and crossing method employed and would range from no impact to temporary and negligible impacts when HDD is used, to short term and minor if mussels occur at a location crossed using the open-cut method. No impact would occur on the narrow triangle moonwort in Carlton County, as it is outside of the construction work area. Impacts on bog bluegrass could be permanent and major. Impacts on any other state-protected plants that may occur in the construction work area could range from short term to permanent and minor to major depending on the implementation of BMPs to minimize overall impacts and to prevent the spread of noxious weeds and invasive plants.

Operations Impacts. Operations and maintenance activities that could result in impacts include mowing, equipment maintenance, inspection of the permanent right-of-way, integrity digs to repair or replace segments of pipe, and invasive species control.

Operation of RA-03AM has the potential to impact state-listed threatened turtles. Vegetation management that prevents trees and large shrubs from reestablishing in riparian habitats could increase stream temperatures by removing shade, which would reduce habitat suitability for aquatic animals. Vegetation management and integrity digs could crush turtle adults, nests, and eggs. Mowing can kill turtles and make it easier for predators to locate turtles.

Conservation measures related to vegetation management in infrequently mowed areas along access roads and the permanent pipeline right-of-way include:

- Use of mechanical methods (chemicals should not be used), and
- Limit maintenance periods to the fall through spring (i.e., after October 1 and before June 1) (Minnesota DNR 2008).

Potential impacts on the Blanding’s turtle and the wood turtle during operations could be minor and permanent. If bog bluegrass continues to persist within the permanent right-of-way, these plants would be permanently affected by vegetation management. All state-listed species could be indirectly affected by habitat loss and alteration resulting from maintenance of the permanent right-of-way. Measures to avoid or reduce construction impacts on Minnesota-listed animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state protected species. Overall impacts would be permanent and minor.

Special Concern Species

Minnesota special concern animals and plants within the ROI for RA-03AM are listed in Tables 6.3.5-7 and 6.3.5-8. NHIS occurrences for Minnesota-listed special concern species that could be affected by construction and operation of RA-03AM are listed in (Tables 6.3.5-30 and 6.3.5-31).

Table 6.3.5-30. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-03AM

Common Name	Scientific Name	Federal Status[a]	Con[b]	Op[c]	Within 0.5 Mile
Mammals					
Big brown bat	*Eptesicus fuscus*	NA	2	1	3
Little brown bat	*Myotis lucifugus*	NA	2	1	3
Northern long-eared bat	*Myotis septentrionalis*	THR	2	2	3
Birds					
Greater prairie-chicken	*Tympanuchus cupido*	NA	1	1	3
Northern goshawk	*Accipiter gentilis*	NA	--	--	1
Red-shouldered hawk	*Buteo lineatus*	NA	--	--	3
Trumpeter swan	*Cygnus buccinator*	NA	--	--	1
Fish					
Gilt darter	*Percina evides*	NA	--	--	2
Lake sturgeon	*Acipenser fulvescens*	NA	--	--	1
Least darter	*Etheostoma microperca*	NA	--	--	1
Southern brook lamprey	*Ichthyomyzon gagei*	NA	--	--	2
Insects					
A caddisfly	*Anabolia ozburni*	NA	--	--	1
Mollusks					
Black sandshell	*Ligumia recta*	NA	3	3	7
Creek heelsplitter	*Lasmigona compressa*	NA	6	6	13
Round pigtoe	*Pleurobema sintoxia*	NA	1	1	4

Source: Minnesota DNR 2016a.

[a] NA = not applicable, THR = Threatened

[b] Con = estimated construction impact area in acres based on 120-foot-wide construction work area.

[c] Op = estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

"--" = no occurrence

Table 6.3.5-31. Known Occurrences of Special Concern Plants within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-03AM

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]
Autumn fimbry	*Fimbristylis autumnalis*	NA	1	1
Least moonwort	*Botrychium simplex*	NA	1	--
Twig rush	*Cladium mariscoides*	NA	1	1

Source: Minnesota DNR 2016a.

[a] NA = not applicable

[b] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[c] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Protected plant surveys have not been conducted for the route.

Construction Impacts. Construction impacts on bats, birds, fish, insects, and mollusks would generally be the same as described above for the Applicant’s preferred route. There are three additional fish species and one additional mussel species that are known to occur in the ROI of RA-03AM, but impacts would be the same as discussed for the Applicant’s preferred route. There are no known occurrences of the prairie vole or four-toed salamander in the ROI of RA-03AM, so impacts on these species would not be anticipated.

There are known occurrences of 13 Minnesota special concern plants within the ROI for RA-03AM and these species may occur within the construction work area if suitable habitat is present. Three of the species have been documented within the construction work area and could be destroyed by construction activities. These three plants occur in forests – least moonwort (*Botrychium simplex*), peatlands – twig rush (*Cladium mariscoides*), and wetlands – autumn fimbry (*Fimbristylis autumnalis*). Given the 368 acres of MBS Sites (habitat for rare species) within the construction work area of RA-03AM and that botanical surveys were not conducted along the entire route, it is likely that additional special concern plants would be documented within the construction work area if surveys were conducted. The list of special concern species known to occur in the ROI for RA-03AM is very similar to the list for the ROI of the Applicant’s preferred route. Potential Impacts on special concern plants would be the same as described above for the Applicant’s preferred route.

Operations Impacts. Pipeline operation would require ongoing vegetation management to prevent trees and large shrubs from growing over the pipeline. Mammals and birds that depend on closed canopies may avoid the permanent right-of-way, which may act as a barrier to travel for some species, and fragment the habitats of the area. In addition, vegetation management that prevents trees and large shrubs from reestablishing in riparian habitats could increase stream temperatures by removing shade, which would reduce habitat suitability for aquatic animals. Plants that persist within the permanent right-of-way after construction could be permanently affected by vegetation management activities. Overall, impacts on special concern species from operations activities would be permanent and minor.

Species of Greatest Conservation Need

Compared to the other route alternatives, the lowest proportion (12 percent) of WAN occurs in the construction work area and permanent right-of-way for RA-03AM (Table 6.3.5-32). The majority of WAN habitats that would be affected by construction and operations are rated low-medium and medium. The scarcity of high-quality WAN lands indicates that the habitat affected probably would not be SCGN richness hotspots. Although RA-03AM is the only alternative that could affect high-rated WAN habitats that may provide SCGN richness hotspots, the area affected would be less than 1 acre. All of the WAN habitats crossed by RA-03AM occur within existing pipeline corridors and therefore have experienced previous disturbances. Overall impacts on WAN land, and the SGCN that they support, from construction and operations would be permanent and minor based on habitat loss and alteration.

Table 6.3.5-32. Estimated Impacts on Wildlife Action Network Habitat within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-03AM (acres)

Wildlife Action Network Ratings	Construction[a]	Operations[b]
Low	1.1	0.4
Low-medium	257.4	107.1
Medium	194.0	80.7
Medium-high	29.3	12.2
High	0.7	0.3
WAN TOTAL	**482.6**	**200.7**
RA-03AM total	***4,000.4***	***1,666.9***
Proportion in WAN	***12.1%***	***12.0%***

Source: Minnesota DNR 2016b.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

WAN = Wildlife Action Network

Minnesota Biological Survey Sites of Biodiversity Significance

The proportion of the RA-03AM route between Clearbrook and Carlton that passes through the MBS Sites within the ROI, the construction work area, and the permanent right-of-way are roughly similar (Table 6.3.5-33); therefore, the overall route would not disproportionately affect MBS Sites. The majority of the affected area is rated as moderate. Potential impacts and conservation measures applicable for MBS Sites are described in Section 5.2.5 and summarized below for construction and operation.

Table 6.3.5-33. Estimated Impacts on Minnesota Biological Survey Sites of Biodiversity Significance within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-03AM (acres)

MBS Site Rating	Construction[a]	Operations[b]	Within 0.5 Mile
Outstanding	0.6	0.3	595.3
High	38.0	15.9	3,132.4
Moderate	329.2	139.5	20,478.7
MBS SITES TOTAL	**367.8**	**155.6**	**24,206.3**
RA-03AM total	***4,000.4***	***1,666.9***	***175,189.0***
Proportion in MBS Sites	***9.2%***	***9.3%***	***13.8%***

Source: Minnesota DNR 2016h.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

MBS Sites = Minnesota Biological Survey Sites of Biodiversity Significance

Construction Impacts

Construction would affect 368 acres of MBS Sites in the construction work area (Table 6.3.5-33). Construction activities in the construction work area likely would reduce the overall diversity of the MBS Site and create a barrier to animal movements, as described above for the Applicant's preferred route. MBS Sites provide habitat for rare species and may contain additional occurrences of state-protected species.

Of the 26 miles of the RA-03AM route that crosses through moderate to outstanding rated MBS Sites, all but 1 mile would be within an existing pipeline, electrical transmission line, or road corridor. Construction impacts on MBS Sites would be short term and minor given their persistent occurrence along the route.

Operations Impacts

Operations would continue to affect an estimated 207 acres of MBS Sites previously affected during construction. Operations vegetation maintenance to remove trees and large shrubs within the pipeline permanent right-of-way would reduce the capacity for these sites to provide diverse habitats for wildlife, including habitats for protected, conservation concern, and rare animals. The permanent right-of-way would represent a permanent habitat loss and would continue to be a barrier or impediment to travel for some animals. Increased human access, as described above for the Applicant preferred route, could negatively affect the ecological integrity of these MBS Sites by causing habitat degradation or increasing the spread of invasive species.

Long-term vegetation management would result in a minor permanent change to MBS Sites.

Minnesota Scientific and Natural Areas

RA-03AM is the only route alternative that would cross an SNA, potentially affecting 0.4 acre of the Lake Alexander Woods SNA during construction and 0.2 acre during operations. Minnesota DNR would not grant a license or easement to cross any SNA; therefore, the RA-03AM route would need to be modified to avoid this crossing.

Route Alternative RA-06

This impact assessment provides a description of the incremental impact that construction and operation of RA-06 will have on the existing environment within the unique natural resources ROI for RA-06 as described above. It should be noted that even in areas where RA-06 parallels existing infrastructure and existing conditions have been altered by previous projects, this project will have incremental impacts on the environment and these are the impacts represented in this discussion.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, rufa red knot, and rusty patched bumble bee have the potential to occur within the ROI for RA-06 (Table 6.3.5-9). The types of impacts on Canada lynx, gray wolf, northern long-eared bat, and rusty patched bumble bee from construction and operation of RA-06 would be similar to those described for the Applicant's preferred route. All of the Clearbrook-to-Carlton segment would be within a new pipeline corridor, much of it crossing through areas with no previous ground disturbance. In addition, construction of RA-06 would fragment forested large-block habitats, which could reduce habitat suitability for Canada lynx. Impacts on these species are summarized below, along with a discussion of impacts specific to the rufa red knot.

Construction Impacts

Individual Canada lynx and gray wolves would experience temporary effects associated with increased noise and human activity. Typical conservation measures to reduce construction disturbance to gray wolves include stopping construction if a gray wolf or possible den site is observed until the wolf leaves the area, and reporting any wolf sighting to USFWS, USACE, and Minnesota DNR. RA-06 is not co-located with other pipelines, utilities, or roads along much of its length and would cross 60 large-block habitats that would be fragmented by construction. This would affect more than 100 acres along approximately 114 miles (or about 58 percent of the route) between approximately MPs 140.0 and 295.0. Habitat fragmentation would reduce habitat suitability for the Canada lynx and would result in a permanent, major impact on Canada lynx. Impacts to wolves would be temporary and minor, as they are a habitat generalist.

NHIS data document one occurrence of the northern long-eared bat within the construction work area for RA-06. If northern long-eared bats occur in the construction area during the construction period, temporary minor impacts could occur if individuals or colonies of bats are disturbed by noise or human presence and abandon occupied tree cavities. Short-term major impacts could result if bats are injured or killed, or if occupied trees or maternity roosts are destroyed or abandoned. Conservation measures associated with the ESA 4(d) rule to reduce potential impacts on northern long-eared bats include protecting known, occupied maternity roost trees and other trees within a 150-foot radius around maternity roost trees during the pup season from June 1 to July 31.

The rusty patched bumble bee could experience temporary minor effects associated with vegetation clearing and the presence of construction equipment and vehicles. This prairie-dependent species depends on high-quality native grasslands and tallgrass prairies to provide food from flower pollen and nectar. Vegetation clearing and replacement with non-native ground covers could injure or kill these bumble bees, and remove forage plants. Although habitat surveys have not be completed for RA-06, no native prairie habitats appear to be crossed (Minnesota DNR 2017b). The route would cross within about 180 feet of a current high use area in Clearwater County within the bee dispersal area. Construction could render some potentially used habitat in the dispersal area as unusable, resulting in short-term minor impacts on the rusty patched bumble bee. Conservation measures may benefit the species within the dispersal area, and USFWS may recommend surveys. Conservation measures that would benefit the rusty patched bumble bee within this dispersal area during construction include limiting vegetation management in high-quality habitat during the active season (March through September); using a minimum of 8 to 10 inches cutting height for mowers; and careful and targeted pesticide use, as described above (USFWS 2017).

The rufa red knot may use wetlands, cultivated fields, or shorelines of waterbodies in the vicinity of RA-06 as migratory stopover habitat. Construction activities have the potential to disturb rufa red knots, especially if disturbance coincides with important migration stopover locations. Noise or presence of humans and equipment during construction could cause rufa red knots to startle and flush from wetlands or fields or to avoid the area entirely. Short-term impacts on wetlands and cultivated fields from clearing during construction could affect the availability of foraging and sheltering habitats. However, wetlands in the vicinity of RA-06 are predominantly forested, which is not the preferred habitat of the rufa red knot; therefore, construction would be unlikely to affect overall availability of stopover habitat for rufa red knots, and the impacts on an individual bird's survival or reproductive capacity would be short term and negligible.

Summary. Measures to avoid or reduce construction impacts on federally listed animals would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. The gray wolf would experience temporary minor effects associated with construction activities. Impacts to Canada lynx would be permanent and major from habitat loss and fragmentation. Northern long-eared bats are known to occur in the ROI for RA-06; with implementation of conservation measures associated with the ESA 4(d) rule, the species would experience temporary minor effects from construction. Potential effects on rusty patched bumble bee habitat could be short term and minor. Potential impacts on the rufa red knot would be short term and negligible based on a lack of preferred habitat. Potential impacts specific to Minnesota key habitats that may affect federally listed species are described below under WAN and MBS Sites.

Operations Impacts

Operations and maintenance impacts on individual gray wolves, Canada lynx, and rufa red knots would be minor and temporary as a result of periodic inspection overflights, ground surveillance, and maintenance and repairs. Lynx, wolves, and red knots would be expected to resume use of the area following the disturbance. Disturbance could also be caused by public and private use of ATVs and snow machines along the permanent right-of-way. Operation of vehicles along the right-of-way could result in collisions with individual lynx or wolves. Minimization measures to reduce the potential for collisions could include operating equipment at speeds suitable for the driving conditions or posted speed limits. Use of the right-of-way for recreational purposes could potentially be reduced by limiting access through use of gates and posting of no trespassing signs, where appropriate. The probability of collisions with work vehicles during operations would be low.

Operations impacts on the northern long-eared bat could include continued habitat loss or alteration (i.e., if trees are allowed to grow larger than 3 inch in diameter at breast height between tree maintenance events) and disturbance from noise and activity at aboveground facilities and from right-of-way inspection overflights or ground surveillance. Human activities during operations typically would occur during daylight hours; therefore, operations activities would not interrupt foraging activities, and impacts would be permanent and negligible.

The RA-06 route would cross near current high use areas for rusty patched bumble bees. Although habitat surveys have not been completed for RA-06, no native prairie habitats appear to occur within the area that would be crossed by RA-06 based on Minnesota DNR mapped native plant communities (Minnesota DNR 2017b). Therefore, no adverse impacts on any individual bees or current high use areas are expected. If bees are determined to occur in these areas, measures to avoid or minimize impacts could be implemented as described for the Applicant's preferred route.

Summary. Measures to avoid or reduce construction impacts on federally listed animals and plants would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. Operations and maintenance impacts on Canada lynx, gray wolves, and rufa red knots would be limited to periodic disturbances over the life of the project. These impacts would be temporary and minor. No adverse impacts are expected as a result of vehicle collisions. Impacts on northern long-eared bats would be permanent and negligible. No adverse impacts are expected to occur to the rusty patched bumble bee, because no high use areas occur within RA-06.

State-Listed Species

Endangered and Threatened Species

Minnesota-protected animals that occur within the ROI for RA-06 include the pugnose shiner and five protected plant species[17] (Table 6.3.6-10). Impacts on these species from construction and operation of RA-06 would be the same as described for the Applicant's preferred route; a conclusion of effects is summarized below.

Construction Impacts. Effects on the pugnose shiner from construction would be the same as described for the Applicant's preferred route. If surface waters are crossed by the HDD method and BMPs are in place for water withdrawals and discharge, construction impacts on the pugnose shiner would be temporary and negligible.

Based on the Minnesota DNR NHIS data, there are no known occurrences of state-protected plants within the RA-06 construction work area between Clearbrook and Carlton. However, given that there are 1,160 acres of MBS Sites (habitat for rare species) within the construction work area for RA-06, it is likely that additional state-protected plants would be found within the construction work area if botanical surveys were conducted. If state-listed plants are present within the construction zone, they could be destroyed during grubbing, grading, and trenching activities. In addition, their habitats could be degraded by the introduction or spread of noxious weeds and invasive plants. Noxious weed and invasive plant management measures would be in place during and after construction. To minimize the spread of noxious weeds and invasive plants, the Applicant would implement measures in a Noxious Weeds and Invasive Species Control Plan. This plan would include measures to control noxious weeds and invasive plants during construction. Some construction impacts may be avoidable through surveys, flagging areas of concern, and refinement of the construction work areas. Potential impacts on state-protected plants would be short term and minor.

Measures to avoid or reduce construction impacts on Minnesota-listed animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state-protected species.

17 Protected plant surveys have not been completed for the route alternatives.

Operations Impacts. Vegetation maintenance that removes riparian trees and large shrubs could increase stream temperatures by removing shade, which would reduce habitat suitability for the pugnose shiner. If listed plants persist within the permanent right-of-way, they would be permanently affected by vegetation maintenance activities; however, given their expected limited distribution within this area, overall impacts would be minor. All state-listed species could be indirectly affected by habitat loss and alteration resulting from maintenance of the permanent right-of-way and periodic integrity digs. Measures to avoid or reduce construction impacts on Minnesota-listed animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state protected species.

Special Concern Species

Minnesota special concern animals and plants within the ROI for RA-06 are listed in Tables 6.3.5-11 and 6.3.5-12. NHIS occurrences for Minnesota-listed special concern animals that could be affected by construction and operation of RA-06 are listed in Table 6.3.5-34. There are no known occurrences of special concern plants in the construction work area or permanent right-of-way for RA-06; however, protected plant surveys have not been completed for the route.

Table 6.3.5-34. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-06

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]	Within 0.5 Mile
Mammals					
Big brown bat	*Eptesicus fuscus*	NA	--	--	1
Little brown bat	*Myotis lucifugus*	NA	--	--	1
Northern long-eared bat	*Myotis septentrionalis*	THR	1	1	2
Birds					
Northern goshawk	*Accipiter gentilis*	NA	--	--	1
Trumpeter swan	*Cygnus buccinator*	NA	--	--	1
Amphibians and Reptiles					
Four-toed salamander	*Hemidactylium scutatum*	NA	--	--	1
Fish					
Least darter	*Etheostoma microperca*	NA	1	1	1
Mollusks					
Black sandshell	*Ligumia recta*	NA	1	1	1

Source: Minnesota DNR 2016a.

[a] NA = not applicable, THR = Threatened

[b] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[c] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

Notes:

Protected plant surveys have not been conducted for the route.

"--" = no occurrence

Construction Impacts. Construction impacts on state-listed special concern animals would be the same as described above for the Applicant's preferred route. Impacts on state-listed special concern plants would be similar to those for the Applicant's preferred route, although there is some difference in the species that would be potentially affected.

Operations Impacts. Mammals and birds that depend on closed canopies may avoid the maintained permanent right-of-way, which may act as a barrier to travel for some species and may fragment habitats. In addition, vegetation management that prevents riparian trees and large shrubs from reestablishing could increase stream temperatures by removing shade, which would reduce habitat suitability for aquatic animals. Habitat would be permanently altered by vegetation management, resulting in long-term minor impacts on special concern animals and plants that occur in the permanent right-of-way. Overall, impacts on special concern species from operations activities would be permanent and minor.

Species of Greatest Conservation Need

Approximately 41 percent of the route for RA-06 occurs within WAN areas (Table 6.3.5-35). The majority of WAN habitats that would be affected by construction and operations are rated low-medium and medium; no high-rated WAN lands would be affected by the RA-06 route. The lack of high-quality WAN lands indicates that the habitat affected would not likely be SCGN richness hotspots. About 66 miles (or 81 percent) of the approximately 81 miles of WAN habitats that would be crossed by RA-06 would be within a new pipeline corridor. Therefore, overall construction- and operations-related impacts on WAN land, and the SGCN that they support, would be permanent and major, and caused by habitat loss and alteration.

Table 6.3.5-35. Estimated Impacts on Wildlife Action Network Habitat within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-06 (acres)

Wildlife Action Network Ratings	Construction[a]	Operations[b]
Low	201.3	83.4
Low-medium	442.5	183.9
Medium	395.2	164.5
Medium-high	135.8	56.7
High	--	--
WAN TOTAL	**1,174.8**	**488.5**
RA-06 total	***2,861.8***	***1,192.4***
Proportion in WAN	***41.1%***	***41.0%***

Source: Minnesota DNR 2016b.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

WAN = Wildlife Action Network

"--" = no occurrence

Minnesota Biological Survey Sites of Biodiversity Significance

A high proportion (40 percent) of the RA-06 construction and operations impact area is within MBS Sites, similar to the proportion within the ROI (Table 6.3.5-36). The majority of the MBS Sites are rated moderate, but approximately 10 percent of the construction work area is within outstanding and high rated MBS Sites. All of the Clearbrook-to-Carlton segment would be within a new pipeline corridor, much of it crossing through areas with no previous ground disturbance.

Table 6.3.5-36. Estimated Impacts on Minnesota Biological Survey Sites of Biodiversity Significance within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-06 (acres)

MBS Site Rating	Construction[a]	Operations[b]	Within 0.5 Mile
Outstanding	58.7	24.4	2,979.3
High	225.6	93.1	9,311.2
Moderate	875.4	363.2	39,878.0
MBS SITE TOTAL	**1,159.6**	**480.7**	**52,168.5**
RA-06 total	***2,861.8***	***1,192.4***	***125,825.0***
Proportion in MBS Sites	***40.5%***	***40.3%***	***41.5%***

Source: Minnesota DNR 2016h.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

MBS Sites = Minnesota Biological Survey Sites of Biodiversity Significance

Construction Impacts

About 1,160 acres of MBS Sites would be affected by construction of RA-06 (Table 6.3.5-36). Construction and post-construction reclamation through these sites likely would alter vegetation structure and reduce their overall diversity. Of the 79 miles of the RA-06 route that crosses moderate to outstanding rated MBS Sites, 68 miles would be new pipeline corridor. Of those 68 miles, 4 miles would extend through outstanding rated MBS Sites, 15 miles through high rated MBS Sites, and 49 miles through moderate rated MBS Sites.

Construction impacts on MBS Sites would be short term and major given the abundance of outstanding and high rated sites that have not been previously fragmented by a pipeline corridor, and the time required for reestablishment of vegetation. However, changes to the native plant communities would be permanent.

Operations Impacts

Operations would affect 481 acres of MBS Sites. Vegetation maintenance during operations to remove trees and large shrubs within the pipeline permanent right-of-way would reduce the capacity for these sites to provide these diverse habitats for wildlife, including habitats for protected, conservation concern, and rare animals. Long-term vegetation management would result in a permanent major impact on MBS Sites.

Minnesota Scientific and Natural Areas

RA-06 would not cross any SNA, and no impact on SNAs would result from construction or operation of the route alternative.

Route Alternative RA-07

This impact assessment provides a description of the incremental impact that construction and operation of RA-07 will have on the existing environment within the unique natural resources ROI for RA-07 as described above. It should be noted that although construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects, this project will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, rufa red knot, and rusty patched bumble bee have the potential to occur within the ROI for RA-07. The types of impacts on Canada lynx, gray wolf, and northern long-eared bat from construction and operation of RA-07 would be similar to those described for the Applicant's preferred route, and the types of impacts on the rufa red knot would be similar to those described for RA-06. The effects on each of these species are summarized below.

Construction Impacts

The Canada lynx and gray wolf would experience temporary minor effects from construction of RA-07. This route alternative would be constructed within the existing Line 3 pipeline corridor and would not contribute to additional habitat fragmentation. Typical conservation measures to reduce construction disturbance to gray wolves include stopping construction if a gray wolf or possible den site is observed within 1 mile of the construction area; enforcing the stop work order until the wolf leaves the area; and reporting any wolf sighting to USFWS, USACE, and Minnesota DNR.

NHIS data document one occurrence of the northern long-eared bat within the construction work area for RA-07. If northern long-eared bats occur in the construction area, temporary minor impacts could occur if individuals or colonies of bats are disturbed by noise or human presence and they abandon occupied tree cavities. Short term major impacts could result if bats are injured or killed, or if occupied trees or maternity roosts are destroyed or abandoned. Conservation measures associated with the ESA 4(d) rule to reduce potential impacts on northern long-eared bats include protecting known, occupied maternity roost trees and other trees within a 150-foot radius around maternity roost trees during the pup season from June 1 to July 31.

The rusty patched bumble bee could experience temporary major effects associated with vegetation clearing and the presence of construction vehicles. These prairie-dependent insects depend on high-quality native grasslands and tallgrass prairies to provide food from flower pollen and nectar. Vegetation clearing and replacement with non-native ground covers could injure or kill these bumble bees and could remove forage plants. The RA-07 route would cross a current high use area and dispersal area in Clearwater County, where bumble bees could experience short-term major impacts related to construction. Conservation measures may benefit the species within the dispersal area, and USFWS may recommend surveys. Conservation measures that would minimize construction impacts and benefit the rusty patched bumble bee within the high use and dispersal area during construction include restoration and maintenance of high-quality habitat through control of invasive species and restoration that includes a high diversity and abundance of wildflowers appropriate for the region and local characteristics (USFWS 2017).

Construction activities have the potential to disturb rufa red knots, especially if disturbance coincides with important migration stopover locations. Emergent wetlands in the vicinity of the RA-07 route could provide stopover habitat. Noise or the presence of humans and construction equipment could cause rufa red knots to startle and flush from wetlands or fields, or to avoid the area entirely. Short-term impacts on wetlands and cultivated fields from clearing during construction could affect the availability of foraging and sheltering habitats. Construction would be unlikely to affect the overall availability of stopover habitat for rufa red knots, and impacts on an individual bird's survival or reproductive capacity would be short term and negligible.

Construction impacts specific to Minnesota key habitats with the potential to affect federally listed species are described below under WAN and MBS Sites.

Summary. Measures to avoid or reduce construction impacts on federally listed animals and plants would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. The Canada lynx and gray wolf would experience temporary minor effects associated with construction of RA-07. With implementation of conservation measures associated with the ESA 4(d) rule, northern long-eared bats in the construction area could experience temporary minor impacts. The rufa red knot could be affected by construction activities that occur in the vicinity of stopover habitats; however, disturbances to emergent wetlands in the vicinity of the RA-07 route are unlikely to affect the overall availability of stopover habitat for rufa red knots. Thus, impacts on an individual bird's survival or reproductive capacity would be short term and negligible. The RA-07 route would cross a current high use area and dispersal area in Clearwater County for rusty patched bumble bees. The bees could experience short-term major construction-related impacts.

Operations Impacts

Operations and maintenance impacts on individual gray wolves, Canada lynx, and rufa red knots would be minor and temporary as a result of periodic inspection overflights, ground surveillance, and maintenance and repairs. Lynx, wolves, and red knots would be expected to resume use of the area following the disturbance. Disturbance could also be caused by public and private use of ATVs and snow machines along the permanent right-of-way. Operation of vehicles along the right-of-way could result in collisions with individual lynx or wolves. Minimization measures to reduce the potential for collisions could include operating equipment at speeds suitable for the driving conditions or posted speed limits. Use of the right-of-way for recreational purposes could potentially be reduced by limiting access through use of gates and posting of no trespassing signs, where appropriate. The probability of collisions with work vehicles during operations would be low.

Operations impacts on the northern long-eared bat could include continued habitat loss or alteration (i.e., if trees are allowed to grow larger than 3 inch in diameter at breast height between tree maintenance events) and disturbance from noise and activity at aboveground facilities and from right-of-way inspection overflights or ground surveillance. Human activities during operations typically would occur during daylight hours; therefore, operations activities would not interrupt foraging activities, and impacts would be permanent and negligible.

The rusty patched bumblebee could experience permanent, major effects associated with ongoing vegetation management activities, particularly caused by mowing and integrity digs. Conservation measures may benefit the species within the high use and dispersal areas, and USFWS may recommend surveys. Conservation measures that would benefit the rusty patched bumble bee within this dispersal area during operations include limiting vegetation management in high-quality habitat during the active season (March through September); using a minimum of 8 to 10 inches cutting height for mowers; and careful and targeted pesticide use, as described above (USFWS 2017).

Summary. Measures to avoid or reduce construction impacts on federally listed animals would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. Operations and maintenance impacts on Canada lynx, gray wolves, and rufa red knot would be limited to periodic disturbances over the life of the project. These impacts would be temporary and minor. No adverse impacts are expected as a result of vehicle collisions. Impacts on northern long-eared bats would be permanent and negligible. The rusty patched bumblebee could experience permanent, major effects because RA-07 crosses through a current high use area and dispersal area.

State-Listed Species

Endangered and Threatened Species

No Minnesota protected animals occur within the ROI for RA-07, although seven protected plants could occur[18] (Table 6.3.6-14). RA-07 would be constructed within the existing Line 3 pipeline corridor. If state-protected plants persist along the existing pipeline corridor, impacts from construction and operation of RA-07 would be the same as described for the Applicant's preferred route. Effects on these species are discussed below.

Construction Impacts. Botanical surveys were not conducted from Clearbrook to Carlton on route alternative RA-07. Where RA-07 overlaps with the Applicant's preferred route, the potential impacts would be the same as described for the Applicant's preferred route. In addition, the Minnesota DNR NHIS contains a known occurrence of state-listed threatened species within the construction work area. This record was documented within a moderate rated MBS Site in Cass County in 2010 and consisted of two plants. The current size and extent of this population is unknown. If construction proceeds in this area, botanical surveys likely would be needed to inform the takings permit process.

The other state-protected plants documented within the ROI have the potential to occur within the construction work area if suitable habitat is present. Given that the portion of the RA-07 route from Clearbrook to Carlton contains 1,279 acres of MBS Sites that provide habitat for rare plants, it is likely that additional occurrences of state-protected species would be identified if botanical surveys were conducted along this segment.

Plants within the construction area could be destroyed during vegetation clearing and grading, and potential habitat could be degraded by the introduction or spread of noxious weeds and invasive plants. Some construction impacts may be avoidable through survey, flagging areas to avoid, and refinement of the construction work areas. BMPs to minimize overall vegetation impacts and prevent the spread of noxious weeds and invasive plants would be implemented. Noxious weed and invasive plant management measures would be in place during and after construction. To minimize the spread of noxious weeds and invasive plants, the Applicant would implement measures in a Noxious Weeds and Invasive Species Control Plan. This plan would include measures to control noxious weeds and invasive

18 Protected plant surveys have not been completed for the route alternatives.

plants during construction. If this population is unavoidable, the resultant impacts would be permanent and potentially major. Impacts on other state-protected plants, should they be present in construction zones, would be short term and minor.

Measures to avoid or reduce construction impacts on Minnesota-listed animals and plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state-protected species.

Operations Impacts. Operations and maintenance activities include mowing, equipment maintenance, invasive species control, integrity digs, and aerial surveillance of the permanent right-of-way. If listed plants occur within the permanent right-of-way, they would be permanently affected by maintenance activities. The goblin fern population is located outside of the RA-07 permanent right-of-way. If this population persists during operation, potential impacts could include indirect effects due to decreased shade cause by the reduced canopy cover along the margin of the maintained permanent right-of-way. These indirect habitat impacts may be sufficient to prevent the population from persisting, which would result in a permanent, major impact on the population.

All state-listed plant species that persist in areas within or adjacent to the permanent right-of-way could be indirectly affected by habitat loss and alteration resulting from maintenance of the permanent right-of-way. Measures to avoid or reduce impacts on Minnesota-listed plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state-protected species.

Special Concern Species

Minnesota special concern animals and plants within the ROI for RA-07 are listed in Tables 6.3.5-15 and 6.3.5-16. NHIS occurrences of Minnesota-listed special concern animals and plants that could be affected by construction and operation of RA-06 are listed in Tables 6.3.5-37 and 6.3.5-38.

Table 6.3.5-37. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-07

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]	Within 0.5 Mile
Mammals					
Big brown bat	*Eptesicus fuscus*	NA	--	--	1
Little brown bat	*Myotis lucifugus*	NA	--	--	1
Northern long-eared bat	*Myotis septentrionalis*	THR	1	1	2
Birds					
Nelson's sparrow	*Ammodramus nelsoni*	BCC	1	1	1
Trumpeter swan	*Cygnus buccinator*	NA	1	1	1
Yellow rail	*Coturnicops noveboracensis*	BCC	1	1	1
Mollusks					
Black sandshell	*Ligumia recta*	NA	2	1	3

Table 6.3.5-37. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-07

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]	Within 0.5 Mile
Creek heelsplitter	*Lasmigona compressa*	NA	1	1	2

Source: Minnesota DNR 2016a.

[a] BCC = Birds of Conservation Concern, NA = not applicable, THR = Threatened

[b] Estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3).

[c] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

"--" = no occurrence

Table 6.3.5-38. Known Occurrences of Special Concern Plants within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-07

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]
Barren strawberry	*Waldsteinia fragarioides* var. *fragarioides*	NA	1	1
Few-flowered spikerush	*Eleocharis quinqueflora*	NA	1	1
Lapland buttercup	*Ranunculus lapponicus*	NA	1	--
Least moonwort	*Botrychium simplex*	NA	5	5
Mingan moonwort	*Botrychium minganense*	NA	4	4
Pale moonwort	*Botrychium pallidum*	NA	4	4
St. Lawrence grapefern	*Botrychium rugulosum*	NA	4	4

Source: Minnesota DNR 2016a.

[a] NA = not applicable

[b] Estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3).

[c] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Protected plant surveys have not been conducted for the route.

"--" = no occurrence

Construction Impacts. Construction impacts on bats, birds, mollusks, and plants would be the same as described for the Applicant's preferred route. Construction impacts on bats and birds primarily would result from these species moving away from the area because of increased human activity and noise. Impacts would be temporary and minor, as the species likely would return after construction is completed. Construction impacts on mollusks would be short term and negligible to minor during construction of surface water crossings. Impacts on special concern plants would be long term and minor.

Operations Impacts. Pipeline operation would require ongoing vegetation management to prevent trees and large shrubs from reestablishing within the permanent right-of-way. Mammals and birds that depend on closed canopies may avoid the permanent right-of-way, which may act as a barrier to travel for some species. In addition, vegetation management that prevents riparian trees and large shrubs from reestablishing could increase stream temperatures by removing shade, which could reduce habitat suitability for aquatic animals. Habitat within the permanent right-of-way would be permanently altered by periodic vegetation management activities, resulting in permanent minor impacts on special concern animals and plants—especially bats and forest plants, including barren strawberry, least moonwort, mingan moonwort, pale moonwort, and St. Lawrence grapefern that occur in the permanent right-of-way. Overall, impacts on special concern species from operations activities would be permanent and minor.

Species of Greatest Conservation Need

Approximately 41 percent of the route for RA-07 occurs within WAN areas (Table 6.3.5-39). The majority of WAN habitats that would be affected by construction and operation are rated low-medium and medium, there are no high-rated WAN lands that would be affected by the RA-06. The lack of high-quality WAN lands indicates that the habitat affected would not likely be SCGN richness hotspots. All of the 68.5 miles of WAN habitats crossed by RA-07 would be within an existing pipeline corridor. Therefore, overall construction- and operations-related impacts on WAN land, and the SGCN that they support, would be permanent and minor due to habitat loss and alteration, which is described in more detail in Section 5.2.4.

Table 6.3.5-39. Estimated Impacts on the Wildlife Action Network Habitat within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-07 (acres)

Wildlife Action Network Ratings	Construction[a]	Operations[b]
Low	151.5	35.2
Low-medium	954.9	235.0
Medium	370.9	87.3
Medium-high	249.9	57.9
High	--	--
WAN TOTAL	**1,727.2**	**415.5**
RA-07 total	***4,139.7***	***1,016.5***
Proportion in WAN	***41.7%***	***40.9%***

Source: Minnesota DNR 2016b.

[a] Estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3).

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

WAN = Wildlife Action Network

"--" = no occurrence

Minnesota Biological Survey Sites of Biodiversity Significance

The proportion of MBS Sites that would be affected by the RA-07 route between Clearbrook and Carlton would be similar for the ROI, construction work area, and permanent right-of-way (Table 6.3.5-40).

Therefore, the overall route would not disproportionately affect MBS Sites. RA-07 would be constructed within the existing pipeline corridor, and the majority of the affected area is rated as moderate.

Table 6.3.5-40. Estimated Impacts on Minnesota Biological Survey Sites of Biodiversity Significance within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-07 (acres)

MBS Site Rating	Construction[a]	Operations[b]	Within 0.5 Mile
Outstanding	126.5	21.9	3,532.6
High	238.1	46.9	8,742.0
Moderate	914.2	214.9	25,340.0
MBS SITE TOTAL	**1,278.7**	**283.7**	**37,614.6**
RA-07 total	***4,139.7***	***1,016.5***	***107,004.0***
Proportion in MBS Sites	***30.9%***	***27.9%***	***35.1%***

Source: Minnesota DNR 2016h.

[a] Estimated construction impact area in acres based on 205-foot-wide construction work area (10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3).

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

MBS Site = Minnesota Biological Survey Site of Biodiversity Significance

Construction Impacts

Construction would affect 1,279 acres (RA-07) of MBS Sites. Construction and post-construction reclamation through these MBS Sites likely would change the vegetation structure and reduce the overall diversity. Construction impacts on MBS Sites would be short term, lasting until vegetation cover is reestablished, and minor, given their persistent occurrence along the route.

Operations Impacts

Operations would affect 334 acres of MBS Sites. Vegetation management activities that prevent the reestablishment of trees and large shrubs within the pipeline permanent right-of-way would reduce the capacity for these sites to provide diverse habitats for wildlife, including habitats for protected, special concern, and rare animals. The Applicant's long-term vegetation management program would result in a permanent change to a minor portion of the overall available MBS Sites; however, this would not differ from current conditions within the permanent right-of-way for the existing Line 3 pipeline.

Minnesota Scientific and Natural Areas

No impact on SNAs would occur from construction or operations for RA-07.

Route Alternative RA-08

This impact assessment provides a description of the incremental impact that construction and operation of RA-08 will have on the existing environment within the unique natural resources ROI for RA-08 as described above. It should be noted that although construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects, this project

will have incremental impacts on the environment. These incremental impacts are the impacts represented in this discussion.

Federally Listed Species

The Canada lynx, gray wolf, northern long-eared bat, rufa red knot, and rusty patched bumble bee have the potential to occur within the ROI for RA-08. The types of impacts on Canada lynx, gray wolf, northern long-eared bat, and rusty patched bumble bee from construction and operation of RA-08 would be similar to those described for the Applicant's preferred route, and impacts on the rufa red knot would be similar to those described for RA-06. Effects on these species are discussed below.

Construction Impacts

The Canada lynx and gray wolf would experience temporary minor effects associated with construction of RA-08. The route would be constructed within an existing pipeline corridor, and the addition of this pipeline would increase the width of the existing corridor; however, it would not result in additional habitat fragmentation. Typical conservation measures to reduce construction disturbance to gray wolves include stopping construction if a gray wolf or possible den site is observed within 1 mile of the construction area; enforcing the stop work order until the wolf leaves the area; and reporting any wolf sighting to USFWS, USACE, and Minnesota DNR.

NHIS data document one occurrence of the northern long-eared bat within the construction work area for RA-08. If northern long-eared bats are present in the construction area, temporary and minor impacts could occur if individuals or colonies of bats are disturbed by noise or human presence, causing them to abandon occupied tree cavities. Short-term major impacts could result if bats are injured or killed, or if occupied trees or maternity roosts are destroyed or abandoned. Conservation measures associated with the ESA 4(d) rule to reduce potential impacts on northern long-eared bats include protecting known occupied maternity roost trees and other trees within a 150-foot radius from maternity roost trees during the pup season from June 1 to July 31.

The rusty patched bumble bee could experience temporary major effects associated with vegetation clearing and the presence of construction equipment and vehicles. These prairie-dependent insects depend on high-quality native grasslands and tallgrass prairies to provide food from flower pollen and nectar. Vegetation clearing and replacement with non-native ground covers could injure or kill these bumble bees, and could remove forage plants. The RA-08 route would cross a current high use area and dispersal area in Clearwater County, where bumble bees could experience short-term major construction impacts. Conservation measures may benefit the species within the dispersal area, and USFWS may recommend surveys. Conservation measures that would minimize the impacts of construction and benefit the rusty patched bumble bee within this dispersal area include restoration and maintenance of high-quality habitat through control of invasive species and restoration that includes a high diversity and abundance of wildflowers appropriate for the region and local characteristics (USFWS 2017).

Construction activities have the potential to disturb rufa red knots, especially if disturbance coincides with important migration stopover locations. Noise or presence of humans and construction equipment could cause rufa red knots to startle and flush from wetlands or fields, or to avoid the area entirely. Emergent wetlands in the vicinity of the RA-08 route could provide stopover habitat, and short-term impacts on wetlands and cultivated fields from clearing during construction could affect the availability of foraging and sheltering habitats. However, construction would be unlikely to affect the overall availability of stopover habitat for rufa red knots, and the potential impacts on an individual bird's survival or reproductive capacity would be short term and negligible.

Summary. Measures to avoid or reduce construction impacts on federally listed animals and plants would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. The Canada lynx and gray wolf would experience temporary minor effects associated with construction of RA-08. Northern long-eared bats are present in the construction area. With implementation of conservation measures associated with the ESA 4(d) rule, the species would experience temporary minor effects from construction, if individuals or colonies of bats are disturbed by noise or human presence and they abandon occupied tree cavities. The rufa red knot could be affected by construction activities occurring in the vicinity of their stopover habitat. However, disturbances to emergent wetlands used for stopover habitat in the vicinity of the route are unlikely to affect the overall availability of stopover habitat for rufa red knots. Therefore, the potential impact on an individual bird's survival or reproductive capacity would be short term and negligible. The RA-08 route would cross a current high use area and dispersal area for rusty patched bumblebees in Clearwater County; construction through that area would result in short-term major impacts.

Impacts specific to Minnesota key habitats with the potential to affect federally listed species are described below under WAN and MBS Sites.

Operations Impacts

Operations and maintenance impacts on individual gray wolves, Canada lynx, and rufa red knots would be minor and temporary as a result of periodic inspection overflights, ground surveillance, and maintenance and repairs. Lynx, wolves, and red knots would be expected to resume use of the area following the disturbance. Disturbance could also be caused by public and private use of ATVs and snow machines along the permanent right-of-way. Operation of vehicles along the right-of-way could result in collisions with individual lynx or wolves. Minimization measures to reduce the potential for collisions could include operating equipment at speeds suitable for the driving conditions or posted speed limits. Use of the right-of-way for recreational purposes could potentially be reduced by limiting access through use of gates and posting of no trespassing signs, where appropriate. The probability of collisions with work vehicles during operations would be low.

Operations impacts on the northern long-eared bat could include continued habitat loss or alteration (i.e., if trees are allowed to grow larger than 3 inches in diameter at breast height between tree maintenance events) and disturbance from noise and activity at aboveground facilities and from right-of-way inspection overflights or ground surveillance. Human activities during operations typically would occur during daylight hours; therefore, operations activities would not interrupt foraging activities, and impacts would be permanent and negligible.

The rusty patched bumblebee could experience permanent major effects associated with vegetation management activities that include mowing. Conservation measures may benefit the species within the high use and dispersal areas, and USFWS may recommend surveys. Conservation measures that would benefit the rusty patched bumble bee within this dispersal area during operations include limiting vegetation management in high-quality habitat during the active season (March through September); using a minimum of 8 to 10 inches cutting height for mowers; and careful and targeted pesticide use, as described above (USFWS 2017).

Summary. Measures to avoid or reduce construction impacts on federally listed animals would be developed in consultation with USFWS to ensure that any unavoidable impacts would not jeopardize the continued existence of species protected by the ESA. Operations and maintenance impacts on Canada lynx, gray wolves, and rufa red knot would be limited to periodic disturbances over the life of the project. These impacts would be temporary and minor. No adverse impacts are expected as a result of vehicle collisions. Impacts on northern long-eared bats would be permanent and negligible. The rusty patched bumblebee could experience permanent, major effects because RA-08 crosses through a current high use area and dispersal area.

State-Listed Species

Endangered and Threatened Species

No state-listed animals are likely to occur within the ROI for RA-08; 10 protected plants could occur[19] (Table 6.3.5-18). Of the 10 Minnesota-listed plants within the ROI, four potentially occur within the construction work area—Clinton's bulrush (*Trichophorum clintonii*), goblin fern, hidden-fruited bladderwort (*Utricularia geminiscapa*), and one-flowered broomrape (*Orobanche uniflora*). Impacts on these species from construction and operation of RA-08 would be the same as described for the Applicant's preferred route.

Construction Impacts. Minnesota DNR NHIS data contain four known occurrences of state-protected plants within the construction work area. Goblin fern was documented within a high rated MBS Site in Cass County in 1992 and 1996. Approximately 665 flowering stems of one-flowered broomrape were documented in 2009 along the edge of a pipeline corridor in Cass County. Three plants of Clinton's bulrush were documented in 2011 in Beltrami County. A minimum of 20 individual plants of hidden-fruit bladderwort were observed in 2009 growing in a northern spruce bog in Cass County. The current size and extent of these populations are unknown. If construction proceeds in this area, botanical surveys likely would be needed to inform the takings permit process.

As there are 889 acres of MBS Sites within the construction work area of the Clearbrook-to-Carlton segment of RA-08, it is likely that additional occurrences of state-protected species would be identified if botanical surveys were conducted along this segment.

Minnesota-protected plants within the construction work area could be destroyed during clearing, grading, and trenching. Their habitats could be degraded by the introduction or spread of noxious weeds and invasive plants, which would result in permanent major impacts. To minimize the spread of noxious weeds and invasive plants, the Applicant would implement measures in a Noxious Weeds and Invasive Species Control Plan. This plan would include control measures for management of noxious weeds and invasive plants during construction.

Other state listed plants could experience short-term minor impacts. Some construction impacts may be avoidable through survey, flagging to identify and avoid plants, and refinement of the construction work areas. BMPs to minimize overall vegetation impacts and prevent the spread of noxious weeds and invasive plants would be implemented as noted above. If it is not possible to avoid these populations, impacts would be permanent and potentially major. Measures to avoid or reduce construction impacts

[19] Protected plant surveys have not been completed for the route alternatives.

on Minnesota-listed plants would be developed in consultation with Minnesota DNR to ensure that any unavoidable impacts would not jeopardize the continued existence of state protected species.

Operations Impacts. If state-protected plants persist within the permanent right-of-way, they would be permanently affected by vegetation management activities and integrity digs. Given their expected limited distribution within the permanent right-of-way, the overall impact on listed plants would be short term and minor.

Special Concern Species

Minnesota-listed special concern animals and plants that could be affected by construction and operation of the route alternative are listed in Tables 6.3.5-41 and 6.3.5-42.

Construction Impacts. Construction impacts on Minnesota-listed special concern mammals, birds, mollusks, and plants would be the same as described for the Applicant's preferred route. Construction impacts on mammals and birds primarily would result from these species moving away from the area because of increased human activity and noise. Impacts would be temporary and minor, as the species likely would return after construction is complete. Construction impacts on mollusks would be short term and negligible to minor during construction of the surface water crossings. Construction impacts on special concern plants would be long term and minor.

Operations Impacts. Pipeline operation would require ongoing vegetation management to prevent trees and large shrubs from growing over the pipeline. Mammals and birds that depend on closed canopies may avoid the permanent right-of-way, which may act as a barrier to travel for some species, fragmenting habitat. The RA-08 route would be co-located with an existing pipeline corridor and would widen the corridor but would not contribute to new fragmentation. In addition, vegetation management that prevents the reestablishment of riparian trees and large shrubs could increase stream temperatures by removing shade, which could reduce habitat suitability for mollusks. If special concern plants were to persist within the permanent right-of-way, they would be permanently affected by vegetation management activities. Given the lack of occurrence, the impact would be minor. Overall, impacts on special concern species from operations activities would be permanent and minor.

Table 6.3.5-41. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-08

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]	Within 0.5 Mile
Mammals					
Big brown bat	*Eptesicus fuscus*	NA	--	--	1
Little brown bat	*Myotis lucifugus*	NA	--	--	1
Northern long-eared bat	*Myotis septentrionalis*	THR	1	1	2
Birds					
Northern goshawk	*Accipiter gentilis*	NA	--	--	2
Red-shouldered hawk	*Buteo lineatus*	NA	1	1	6
Trumpeter swan	*Cygnus buccinator*	NA	1	1	1
Mollusks					
Black sandshell	*Ligumia recta*	NA	--	--	3

Table 6.3.5-41. Known Occurrences of Special Concern Animals within the Construction Work Area, Permanent Right-of-Way, and Region of Interest for Route Alternative RA-08

Common Name	Scientific Name	Federal Status[a]	Construction[b]	Operations[c]	Within 0.5 Mile
Creek heelsplitter	*Lasmigona compressa*	NA	--	--	3

Source: Minnesota DNR 2016a.

[a] NA = not applicable, THR = Threatened

[b] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[c] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

"--" = no occurrence

Table 6.3.5-42. Known Occurrences of Special Concern Plants within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-08

Common Name	Scientific Name	Federal Status	Construction[a]	Operations[b]
Few-flowered spikerush	*Eleocharis quinqueflora*	None	1	--
Least moonwort	*Botrychium simplex*	None	3	2
Mingan moonwort	*Botrychium minganense*	None	4	4
Slender naiad	*Najas gracillima*	None	1	1
White adder's mouth	*Malaxis monophyllos* var. *brachypoda*	None	1	1

Source: Minnesota DNR 2016a.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

Notes:

An occurrence can consist of one or more observations of one or more individuals temporally and spatially.

Protected plant surveys have not been conducted for the route.

"--" = no occurrence

Species of Greatest Conservation Need

Approximately 45 percent of the RA-08 route occurs within WAN areas (Table 6.3.5-43). The majority of WAN habitats that would be affected by construction and operation are rated low-medium and medium. No high rated WAN lands would be affected by the RA-08 route. The lack of high-quality WAN lands indicates that the habitat affected would not likely be SCGN richness hotspots. All of the 74.2 miles of WAN habitats crossed by RA-08 would be within an existing pipeline corridor. Therefore, overall construction- and operations-related impacts on WAN land, and the SGCN that they support, would be permanent and minor, and would be caused by habitat loss and alteration.

Table 6.3.5-43. Estimated Impacts on Wildlife Action Network Habitat within the Construction Work Area and Permanent Right-of-Way for Route Alternative RA-08 (acres)

Wildlife Action Network Ratings	Construction[a]	Operations[b]
Low	104.7	43.7
Low-medium	372.9	155.1
Medium	388.0	161.7
Medium-high	213.9	89.2
High	--	--
WAN TOTAL	**1,079.5**	**449.7**
RA-08 total	***2,397.7***	***999.0***
Proportion in WAN	***45.0%***	***45.0%***

Source: Minnesota DNR 2016b.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

WAN = Wildlife Action Network

"--"= no occurrence

Minnesota Biological Survey Sites of Biodiversity Significance

The proportion of MBS Sites that would be affected by the RA-08 route between Clearbrook and Carlton would be similar for the ROI, construction work area, and permanent right-of-way (Table 6.3.5-44). Therefore, the overall route would not disproportionately affect MBS Sites. In addition, the route of RA-08 would be entirely within an existing pipeline corridor.

Construction Impacts

Construction would affect 889 acres of MBS Sites in the construction work area between Clearbrook and Carlton. Construction and post-construction reclamation through these sites likely would reduce their overall diversities. Construction impacts on MBS Sites would be short term (lasting until vegetation cover is reestablished) and minor given their persistent occurrence along the route, which is located within an existing pipeline corridor.

Table 6.3.5-44. Estimated Impacts on Minnesota Biological Survey Sites of Biodiversity in the Construction Work Area, Permanent Right-of-Way and Region of Interest for Route Alternative RA-08 (acres)

MBS Sites Rating	Construction[a]	Operations[b]	Within 0.5 Mile
Outstanding	124.0	51.7	5,958.8
High	271.6	112.7	12,931.6
Moderate	493.3	205.2	22,777.1
MBS SITE TOTAL	**888.8**	**369.6**	**41,667.6**
RA-08 total	***2,397.7***	***999.0***	***105,470.0***
Proportion in MBS Sites	***37.1%***	***37.0%***	***39.5%***

Source: Minnesota DNR 2016h.

[a] Estimated construction impact area in acres based on 120-foot-wide construction work area.

[b] Estimated operations impact area in acres based on 50-foot-wide right-of-way centered on the pipeline route.

MBS Site = Minnesota Biological Survey Site of Biodiversity Significance

Operations Impacts

Operations would affect 370 acres of MBS Sites. Vegetation management during operations to prevent the reestablishment of trees and large shrubs within the permanent right-of-way would reduce the capacity for these sites to provide diverse habitats for wildlife, including habitats for protected, conservation concern, and rare animals. Long-term vegetation management would result in a permanent change to a minor portion of the overall available MBS Sites.

Minnesota Scientific and Natural Areas

No impacts on SNAs would occur from construction and operation of RA-08.

6.3.5.4 Summary and Mitigation

6.3.5.4.1 Summary

Potential effects on protected and rare species were directly assessed by quantifying occurrences based on IPaC searches and NHIS data, and indirectly through evaluation of habitat-based measures in Minnesota, including the WAN, MBS Sites, and SNAs. Potential effects on federally and state-protected and rare animals and plants depend on whether they occur near the route options (the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08) and whether they are present when activities are occurring that may result in injury, harm, or disturbance. Table 6.3.5-45 presents a summary of construction- and operations-related impacts on unique resources for the Applicant's preferred route and the route alternatives.

The data and analyses regarding unique natural resources presented in this EIS can be used by the regulatory agencies to assess potential impacts on unique natural resources. In addition, USACE is preparing a Biological Assessment for the Project that would be used by USFWS as part of its determination on whether the Project would jeopardize the continued existence of any federally listed species or would result in destruction or adverse modification of their critical habitat. Potential effects on protected species would require avoidance and conservation measures, and formal ESA consultation and federal and state incidental take permits may be required where unavoidable impacts are likely to occur.

Construction impacts could include (1) injury or loss of aquatic and terrestrial invertebrates; amphibians reptiles, and small mammals; bird eggs and young; and plants; (2) loss or alteration of forage and cover habitats; and (3) disturbance from noise and activity. Operations effects could include permanent habitat loss or alteration and continued disturbance from noise and activity at aboveground facilities and from pipeline inspection overflights, ground surveillance, and pipeline integrity excavation. Creation of new pipeline rights-of-way may contribute to fragmentation of habitats, creating barriers to movements for amphibians, reptiles, and small mammals; facilitated movements for some predators; new edge habitats; and potential reduction in the abundance and diversity of forest-nesting birds. Potential direct injury or mortality of protected animals may be avoided or minimized through typically required conservation measures, although reduction in habitat quality resulting from facility and pipeline construction may indirectly affect protected animals because of a permanent reduction in the habitat's ability to support some protected species.

Construction Impacts

Construction activities have the potential to disturb special-status animals, plants, and habitats because of increased noise and human activity, use of construction equipment, and vegetation removal. Injury, mortality, or disturbance of special-status species and alteration of habitat types also could occur as a result of these activities.

Construction noise and increased human activity likely would cause more mobile species (e.g., larger mammals, bats, and birds) to move to other areas; they would possibly return after construction activities stop. If these disturbances occurred during sensitive reproductive periods, animals could abandon their young or nesting/denning area, resulting in a decrease in survival and possible reproductive failure of individual mating pairs. Less mobile species that occur within the construction work area would not be able to avoid construction activities and could be crushed and killed.

Surface water crossings could affect aquatic species that are present. Disturbance to the stream bottom during the use of dry or wet open-cut crossing methods could crush or suffocate aquatic species and their nests. The temporarily increased turbidity could reduce feeding efficiency and damage these sensitive aquatic animals in the vicinity. Contaminated construction equipment and water used for hydrostatic testing could introduce invasive aquatic animals such as zebra and quagga mussels that could displace and reduce habitat quality for aquatic animals. Use of HDD to cross waterbodies would avoid mortality and injury of special-status aquatic species, and impacts on their habitat.

Vegetation removal could injure or kill special-status species if they are present when clearing or construction activities occur. Mobile special-status animals would be likely to move to other areas, while less-mobile species could be crushed and killed. Protected plants may be lost during construction, and changes to soils and surrounding vegetation communities may leave habitats unsuitable after construction. Avoidance may be possible, once precise locations are determined through surveys such as those completed for the Applicant's preferred route. Some protected and special concern plants may be preserved and continue to persist within pipeline rights-of-way. In general, construction of aboveground facility sites and establishment of the pipeline rights-of-way would alter existing habitat types (including WAN and MBS Sites) and increase fragmentation.

Construction of the Applicant's preferred route or any of the route alternatives has the potential to affect special-status species and habitats. All route options could affect four or five federally protected species. Of the federally listed species, four occur within the construction work areas for the Applicant's preferred route and RA-03AM; and five occur within the construction work areas for RA-06, RA-07, and

RA-08. Based on the potential for species to occur and total known occurrences, effects on state-listed species would be the greatest for RA-03AM and the Applicant's preferred route. Construction of RA-06, RA-07, and RA-08 would affect fewer species, and construction of RA-07 and RA-08 would affect only plants because no state-protected animals are known to occur within the ROIs for these route alternatives. In general, direct impacts on federally and state-listed and special concern vertebrate and invertebrate animals would be temporary and minor with implementation of BMPs and conservation measures; potential impacts on listed plants would be permanent and minor.

All routes would pass though WAN areas and MBS Sites. The percent of the route distance that would affect WAN habitat would be the greatest for RA-08, RA-07, and RA-06 (41 to 45 percent); 30 percent of the Applicant's preferred route would affect WAN acreage, and 12 percent of RA-03AM would affect WAN habitat. The majority of WAN areas crossed by the Applicant's preferred route, RA-03AM, RA-07, and RA-08 would be in existing corridors, limiting the impacts. WAN acreage crossed by RA-06 would be in a new pipeline corridor, resulting in habitat loss and alteration, with potential reduced use by SGCNs. There is no high ranked WAN habitat along the RA-06 route, indicating that the WAN habitat is unlikely to provide SGCN richness hotspots. Overall, the lack of high-quality WAN lands across all alternatives indicates that the habitat affected would not likely be SCGN richness hotspots. Impacts on WAN habitats, and the associated SGCNs they support, crossed by the Applicant's preferred route, RA-03AM, RA-07, and RA-08 would be minor and permanent based on the extent of and ratings for WAN habitats affected and the proximity of routes to existing pipeline and utility corridors. Construction of RA-06 would result in permanent major impacts on WAN habitat because a new pipeline corridor would be created.

The percent of MBS Sites affected would be the greatest for RA-06 and RA-08 and the least for RA-03AM. Areas where routes cross MBS Sites would experience long-term impacts. Because these areas, for all route options, represent a small proportion of available MBS Sites in Minnesota, the overall impact would be minor. Minnesota SNAs would be unaffected by all routes except RA-03AM, where less than an acre would be affected by construction. Minnesota DNR would not grant a license or easement to cross any SNA; therefore, this route would need to be altered slightly if it is selected.

Operations Impacts

Pipeline right-of-way maintenance activities during operations would include mowing, equipment maintenance, invasive species control, right-of-way monitoring, and integrity digs to repair or replace pipe segments. Vegetation maintenance that removes riparian trees and large shrubs could increase stream temperatures by removing shade, which would reduce habitat suitability for aquatic animals. Activities in and around water, as well as upland vegetation maintenance could result in direct mortality of less mobile species through crushing, if species are present while the activity is occurring. State-listed plants that persist within the permanent right-of-way after construction could be permanently affected by vegetation maintenance activities.

All special-status species within the ROIs for the route options could be indirectly affected by habitat loss and alteration. The maintained permanent right-of-way of each route option could act as a barrier to travel for some animals such as amphibians, reptiles, and small mammals, and could fragment SGCN habitat. Habitat fragmentation can increase edge habitats favored by some animals and avoided by others; and can create a barrier to movements for some animals while facilitating movements of others, especially predators.

With implementation of BMPs and appropriate species-specific conservation measures for pipeline operations, most impacts during operations would be caused by temporary disturbance and permanent habitat alteration, resulting in overall minor impacts for all route options for the life of the Project.

6.3.5.4.2 Mitigation

In addition to the Applicant-proposed measures described above, which would be incorporated into the Project, the Applicant would comply with conditions specified in permits required by agencies with jurisdiction. Typical conservation measures to reduce impacts on unique resources are identified in the discussions above for specific species. These measures likely would be required by the applicable agencies, and additional mitigation for potential impacts could be required.

Actions identified by Minnesota DNR to further minimize disturbance to MBS Sites include, but are not limited to:

- Do not park equipment or stockpile supplies within MBS Sites,
- Do not place spoil within MBS Sites,
- Limit construction activities to frozen ground conditions, and
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Federally Protected Species					
Construction Impacts					
Potential for injury, mortality, or disturbance of federally listed ESA species	Minor/temporary impacts • 3 mammals Minor/short-term impacts • 1 insect	Minor/temporary impacts • 3 mammals Minor/short-term impacts • 1 insect	Major/permanent impacts • 1 mammal Minor/short-term impacts • 2 mammals • 1 insect Negligible/short-term impacts • 1 bird	Major/short-term impacts • 1 insect Minor/temporary impacts • 3 mammals Negligible/short-term impacts • 1 bird	Major/short-term impacts • 1 insect Minor/temporary impacts • 3 mammals Negligible/short-term impacts • 1 bird
Operations Impacts					
Potential for injury, mortality, or disturbance of federally listed ESA species	Minor/temporary impacts • 2 mammals Negligible/permanent impacts • 1 mammal • No impact • 1 insect	Minor/temporary impacts • 2 mammals Negligible/permanent impacts • 1 mammal • No impact • 1 insect	Minor/temporary impacts • 2 mammals • 1 bird Negligible/permanent impacts • 1 mammal • No impact • 1 insect	Major/permanent impacts • 1 insect Minor/temporary impacts • 2 mammals • 1 bird Negligible/permanent impacts • 1 mammal	Major/permanent impacts • 1 insect Minor/temporary impacts • 2 mammals • 1 bird Negligible/permanent impacts • 1 mammal
State-Listed Endangered or Threatened Species					
Construction Impacts					
Impacts on herptiles	No impact	Minor/short-term impacts • 2 species	No impact	No impact	No impact

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Impacts on fish	Negligible/temporary impacts • 1 species	No impact	Negligible/temporary impacts • 1 species	No impact	No impact
Impacts on mussels	No impact	Negligible to minor/ temporary to short-term • 4 species	No impact	No impact	No impact
Impacts on plants	Major/permanent impacts • 2 species No Impact • 4 species	Minor to major/ short-term to permanent impacts • 8 species	Minor/permanent impacts • 5 species	Major/permanent impacts • 1 species Minor/short-term impacts • 6 species	Major/permanent impacts • 4 species Minor/short-term impacts • 6 species
Operations Impacts					
Impacts on herptiles	No impact	Minor/short-term impacts • 2 species	No impact	No impact	No impact
Impacts on fish	No impact • 1 species	No impact	Negligible/temporary impacts • 1 species	No impact	No impact
Impacts on mussels	No impact	Negligible to minor/ temporary to short-term impacts • 4 species	No impact	No impact	No impact
Impacts on plants	Minor/short-term to permanent impacts • 8 species	Minor/short-term to permanent impacts • 8 species	Minor/short-term to permanent impacts • 5 species	Minor/short-term to permanent impacts • 7 species	Minor/short-term to permanent impacts • 10 species

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Species of Special Concern					
Construction Impacts					
Impacts on mammals	Minor to major/ temporary to permanent impacts • 4 species	Minor to major/ temporary to permanent impacts • 3 species	Minor to major/ temporary to permanent impacts • 3 species	Minor to major/ temporary to permanent impacts • 3 species	Minor to major/ temporary to permanent impacts • 3 species
Impacts on birds	Major/short-term impacts • 6 species	Major/short-term impacts • 4 species	Major/short-term impacts • 2 species	Major/short-term impacts • 3 species	Major/short-term impacts • 2 species
Impacts on herptiles	Negligible to major/short-term impacts • 1 species	No impact	Negligible to major/short-term impacts • 1 species	No impact	No impact
Impacts on fish	Negligible to major/short-term impacts • 1 species	Negligible to major/short-term impacts • 4 species	Negligible to major/short-term impacts • 1 species	No impact	No impact
Impacts on mussels	Negligible to major/short-term impacts • 3 species	Negligible to major/short-term impacts • 3 species	Negligible to major/short-term impacts • 1 species	Negligible to major/short-term impacts • 2 species	Negligible to major/short-term impacts • 2 species
Impacts on aquatic insects	Negligible/short-term impacts • 1 species	Negligible/short-term impacts • 1 species	No impact	No impact	No impact
Impacts on plants	Major/permanent impacts • 9 species	Major/permanent impacts • 3 species	No impact	No impact	Major/permanent impacts • 5 species
Operations Impacts					
Impacts on mammals	Minor/permanent impacts • 4 species	Minor/permanent impacts • 3 species	Minor to major/ temporary to permanent impacts • 3 species	Minor to major/ temporary to permanent impacts • 3 species	Minor to major/ temporary to permanent impacts • 3 species

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Impacts on birds	Major/permanent impacts • 6 species	Major/permanent impacts • 4 species	Minor/short-term impacts • 2 species	Minor/short-term impacts • 3 species	Minor/short-term impacts • 2 species
Impacts on herptiles	Minor/permanent impacts • 1 species	No impact	Minor/permanent impacts • 1 species	No impact	No impact
Impacts on fish	Minor/permanent impacts • 1 species	Minor/permanent impacts • 4 species	Minor/permanent impacts • 1 species	No impact	No impact
Impacts on mussels	Negligible to major permanent/minor short-term impacts • 3 species	Negligible to major permanent/minor short-term impacts • 3 species	Negligible to major permanent/minor short-term impacts • 1 species	Negligible to major permanent/minor short-term impacts • 2 species	Negligible to major permanent/minor short-term impacts • 2 species
Impacts on insects	Negligible/short-term impacts • 1 species	Negligible/short-term impacts • 1 species	No impact	No impact	No impact
Impacts on plants	Minor/permanent impacts • 9 species	Minor/permanent impacts • 3 species	No impact	No impact	Minor/permanent impacts • 5 species
Species of Greatest Conservation Need					
Construction Impacts					
Impacts on habitat for Species of Greatest Conservation Need	Minor/permanent impacts • 22.4 miles of new corridor • 1,041 acres	Minor/permanent impacts • 0 mile of new corridor • 483 acres	Major/permanent impacts • 0 mile of new corridor • 1,175 acres	Minor/permanent impacts • 0 mile of new corridor • 1,727 acres	Minor/permanent impacts • 0 mile of new corridor • 1,080 acres

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Operations Impacts					
Impacts on habitat for Species of Greatest Conservation Need	Minor/permanent impacts • 467 acres	Minor/permanent impacts • 201 acres	Minor/permanent impacts • 489 acres	Minor/permanent impacts • 416 acres	Minor/permanent impacts • 450 acres
Minnesota Biological Survey Sites of Biodiversity Significance					
Construction Impacts					
Impacts on outstanding-ranked MBS Sites (acres)	Major/short-term impacts • 16 miles in new corridor • 2 acres	Minor/short-term impacts • 1 mile in new corridor • 1 acres	Major/short-term impacts • 68 miles in new corridor • 59 acres	Minor/short-term impacts • 0 mile in new corridor • 127 acres	Minor/short-term impacts • 0 mile in new corridor • 124 acres
Impacts on high-ranked MBS Sites (acres)	Major/short-term impacts • 16 miles in new corridor • 78 acres	Minor/short-term impacts • 1 mile in new corridor • 38 acres	Major/short-term impacts • 68 miles in new corridor • 226 acres	Minor/short-term impacts • 0 mile in new corridor • 238 acres	Minor/short-term impacts • 0 mile in new corridor • 272 acres
Total affected acres	• 828 acres	• 368 acres	• 1,160 acres	• 1,279 acres	• 889 acres
Operations Impacts					
Impacts on outstanding-ranked MBS Sites (acres)	Major/permanent impacts • 2 acres	Minor/permanent impacts • <1 acre	Major/permanent impacts • 24 acres	Minor/permanent impacts • 22 acres	Minor/permanent impacts • 52 acres
Impacts on high-ranked MBS Sites (acres)	Major/permanent impacts • 40 acres	Minor/permanent impacts • 16 acres	Major/permanent impacts • 93 acres	Minor/short-term impacts • 47 acres	Minor/short-term impacts • 113 acres
Total affected acres	• 382 acres	• 156 acres	• 481 acres	• 284 acres	• 370 acres

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Minnesota Scientific and Natural Areas					
Construction Impacts					
Impacts on Scientific and Natural Areas (SNAs)	No impact	No impact Avoidance required for Lake Alexander Woods SNA	No impact	No impact	No impact
Operations Impacts					
Impacts on Scientific and Natural Areas (SNAs)	No impact	No impact Avoidance required for Lake Alexander Woods SNA	No impact	No impact	No impact

MBS Sites = Minnesota Biological Survey Sites of Biodiversity Significance

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to unique natural resources. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, the individual NHIS elemental occurrences provide information about past sitings, but the absence of past sitings does not necessarily mean a species does not or could not inhabit a certain area. Because of this, NHIS data is used together with habitat information from the GAP and WAN datasets to get a better idea of the potential for impacts. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-556 to 6-605. The table above, for example provides acreages of habitat types crossed and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to critical habitat is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-556 to 6-576. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-576 to 6-585. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.3.5-45. Summary of Potential Impacts on Unique Natural Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[e] Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-585 to 6-592. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-592 to 6-598. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-598 to 6-605. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.3.5.5 References

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6.3.6 Public Lands

Public lands are lands managed or held by federal, state, and county governments for a variety of public benefits—including preservation of natural areas, wildlife habitat, timber, mineral resources, water resources and other natural resources, recreation areas, and other public interests. Because construction and operation of the Applicant’s preferred route and the route alternatives may affect the future use of federal, state, and county land, the public lands analysis assessed:

- Potential impacts on public lands, including compatibility of the Project with designated uses of specific public lands.

In addition to the analysis of compatibility with the designated use of public lands in this section, impacts on the public resources contained within public lands are generally described (e.g., vegetation, wildlife, and recreation) although not correlated to specific public lands, and the measures that would be implemented to minimize potential impacts on those resources can be found in several other sections within Chapter 6, including Sections 6.3.1, 6.3.3, 6.3.4, and 6.5.2.

This section first describes the existing amounts of federal, state, and county land within an area along the Applicant’s preferred route and each of the route alternatives where these lands could be affected by construction and operation of the Project. Potential Project-related impacts of construction and operation then are discussed and compared across each of the five routing options (the Applicant’s preferred route, RA-03AM, RA-06, RA-07, and RA-08). A summary and comparison of the impacts for the Applicant’s preferred route and the route alternatives are included at the end of the section.

Potential impacts on public lands from a release of crude oil are addressed in Chapter 10.

6.3.6.1 Regulatory Context and Methodology

6.3.6.1.1 Regulatory Context

Regulations that govern public lands vary significantly depending on the government entity that manages the land and the specific purpose for which the land was obtained. Therefore, identification of the authorizing agency and the relevant regulatory provisions are provided for each land type (federal, state, and county) within each routing option. The Applicant’s preferred route and all of the route alternatives cross varying amounts of federal, state, and county land.

6.3.6.1.2 Methodology

The ROI for the analysis of impacts on public lands was focused on Minnesota only and included the construction and operations footprints for the Applicant’s preferred route and the route alternatives. All federal, state, and county land in Minnesota directly crossed by construction and operations areas within the ROI was assessed for the Applicant’s preferred route and route alternatives. See Section 6.3.1 for discussion of public waters that would be crossed by the Applicant’s preferred route and the route alternatives. The analysis was undertaken by first identifying and inventorying in GIS all public lands in the counties crossed by the Applicant’s preferred route and the route alternative. The following construction and operations footprints were overlaid to quantify resources affected by construction and operation:

- The route and estimated footprints for the pipeline and associated facilities for the Applicant’s preferred route;

- The 120-foot-wide construction footprint and 50-foot-wide permanent right-of-way for route alternatives (except portions of RA-07 where a 205-foot-wide construction work area was overlaid; see Chapter 4);

Public lands within the ROI for the Applicant's preferred route and route alternatives were identified using GIS datasets and layers in the following data source:

- Protected Areas Database of the United States (PAD-US).Where data were available, ownership and identification of the authorizing agency for each land type are provided, along with a discussion of compatibility with relevant regulatory provisions.

No single element of these public lands data provides a complete indication of all relevant impacts to public lands, but together the data about ownership and use provide a reasonably comprehensive indication of potential impacts. For example, while the datasets identify where federal, state, and county lands occur within the ROI, this information must be coupled with information about public uses of the land (eg. wildlife management, forest, etc.) to gain a better understanding of the possible impacts.

Furthermore, quantitative information in the tables should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide acreages, for example, of WMAs crossed; however, a more complete discussion of the qualitative nature of impacts that could occur to WMAs is contained in the text of this section.

6.3.6.2 Existing Conditions

This section identifies public lands that could be affected by the Applicant's preferred route and the route alternatives. Appendix A includes maps of the federal and state lands within the ROI.

Federal Land

Federal lands are lands in the United States for which ownership is claimed by the U.S. federal government. The primary purpose of federal land is to benefit the people of the United States, with conservation of the natural resources as a priority; most federally owned lands are open to the public for recreational use. Primary federal landholders of the land that would be crossed by the Applicant's preferred route and route alternatives include the Department of the Interior (DOI), which includes agencies such as BLM, USFWS, NPS, and the Department of Agriculture—which includes USFS. The types of land in federal ownership in this analysis include forests that are managed by USFS, refuge land managed by USFWS, National Heritage Parks managed by NPS, and other land managed by BLM. Compatibility of the Project with designated uses varies by authorizing agencies; therefore, a general discussion of the responsible agency based on land ownership and any associated regulatory provisions is provided. When multiple federal properties that are operated by more than one federal agency or bureau would be crossed by a project, an application would be filed with BLM.

State Land

State lands are lands that are held under state management. State lands that would be crossed by the Applicant's preferred route and route alternatives include state WMAs, AMAs, and state forests. These lands are administered by each state's respective DNR. Compatibility of the Project with designated uses varies by authorizing agencies; therefore, a general discussion of the responsible agency based on land ownership and any associated regulatory provisions is provided.

In certain instances, more than one government agency may have an interest in a specific piece of land; thus, additional regulatory authorizations would be needed. For example, if the State of Minnesota purchased and designated land as a WMA but used federal grant money as part of that purchase, the federal government has different and additional regulatory processes for considering proposed encroachments such as pipelines.

County Land

County lands are lands that are held in trust for the public, for which ownership is claimed by county governments. As with federal and state land, their primary purpose is to benefit the public. These lands typically include county parks, forests, and other special management areas. Compatibility of the Project with designated uses varies by authorizing agencies; therefore, a general discussion of the responsible agency based on land ownership and any associated regulatory provisions is provided

Counties in Minnesota may acquire land through tax forfeiture. Some of this land is then sold or exchanged; if the lands are classified as conservation lands, they may be retained and managed for designated conservation purposes or as forestry land. Some lands bordering lakes and streams cannot be sold by the counties.

6.3.6.2.1 Applicant's Preferred Route

The following section describes existing conditions in Minnesota for public lands. Information enabling comparison of the route alternatives to the Applicant's preferred route is provided below

Federal Land

The only federal land that would be crossed by the Applicant's preferred route would be:

- North Country National Scenic Trail – The North Country National Scenic Trail stretches across seven states from New York to North Dakota (North Country Trail Association 2016). The National Scenic Trail program is administered through NPS. It includes trails that are 100 miles or longer and provides non-motorized recreational opportunities. At the location of the proposed crossing, the trail is administered by Hubbard County. However, compatibility of the Project with designated uses would be determined by the authorizing agency, which is NPS, and ultimately DOI. In 2015, the House Committee on Natural Resources passed a bill granting the Secretary of DOI the power to negotiate rights-of-way for gas pipelines through national park lands.

State Land

In total, the amount of state land in the ROI for the Applicant's preferred route, including access roads, ATWS, and MLVs, is 526 acres (Table 6.3.6-1). This includes about 17 acres between two WMAs: the Grayling Marsh WMA (14 acres) and Lawler WMA (3 acres), and approximately 0.4 acre of the LaSalle Creek AMA.

The Applicant's preferred route would cross approximately 422 acres in eight state forests:

- Foothills State Forest (42 acres),
- Hill River State Forest (103 acres),

- Huntersville State Forest (97 acres),
- Land O'Lakes State Forest (130 acres),
- Mississippi Headwaters State Forest (25 acres),
- Paul Bunyan State Forest (less than 0.1 acre),
- Savanna State Forest (9 acres), and
- Waukenabo State Forest (16 acres).

Table 6.3.6-1. State Lands Crossed by the Applicant's Preferred Route (acres)

Segment	State Land							
	Construc-tion Work Area	Permanent Right-of-Way	ATWS	Temp Access Road	Perm Access Road	Valves[a]	Con Total[b]	Op Total[b]
North Dakota border to Clearbrook	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clearbrook to Carlton	439.6	199.4	32.1	27.6	27.0	0.2	525.5	226.6
Carlton to Wisconsin border	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**439.6**	**199.4**	**32.1**	**27.6**	**27.0**	**0.2**	**525.5**	**226.6**

Source: PAD-US – USGS 2016.

[a] Includes valve sites and valve driveways. Because valve sites are within the permanent right-of-way, total Project impacts may be slightly overestimated from double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations.

Notes:

Acres for the construction work area and the permanent right-of-way are based on Enbridge-provided footprints for the Applicant's preferred route.

Perm = permanent, Temp = temporary

These forests, WMAs, and AMA are managed by Minnesota DNR as multiple-use areas. They are primarily used for fish and wildlife resource protection, forestry, and recreation. Compatibility of the Project with designated uses would be determined during easement negotiations with the authorizing agency, which is Minnesota DNR.

Although not directly affected by pipeline construction or standard operations, the Applicant's preferred route would pass directly east of Itasca State Park, and an existing road that passes through the park would be used as an access road. This state park is one of Minnesota's flagship state parks, with over 500,000 annual visits. The park was established in 1891 to preserve remnant stands of virgin pine and to protect the basin that is the source of the Mississippi River. The Itasca State Park is one of Minnesota's National Natural Landmarks.

County Land

In total, approximately 548 acres of county land would be within the ROI for construction work area of the Applicant's preferred route with an additional 102 acres disturbed for ATWS, access roads and valves. Counties with lands crossed would be Cass (274 acres), Carlton (128 acres), Hubbard (119 acres), and Clearwater (27 acres). During operation about 228 acres would be affected by the permanent right-of-way, including 114 acres in Cass County, 53 acres in Carlton County, 50 acres in Hubbard County, and 11 acres in Clearwater County. While the exact designated use of this land is unknown, it is likely to be land in county parks and/or forests; therefore, compatibility with designated uses would be determined by the relevant county governments

Table 6.3.6-2. County Lands Crossed by the Applicant's Preferred Route (acres)

Segment	State Land							
	Construction Work Area	Permanent Right-of-Way	ATWS	Temp Access Road	Perm Access Road	Valves[a]	Con Total[b]	Op Total[b]
North Dakota border to Clearbrook	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clearbrook to Carlton	547.7	228.1	36.3	29.1	36.5	0.1	649.7	264.7
Carlton to Wisconsin border	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**547.7**	**228.1**	**36.3**	**29.1**	**36.5**	**0.1**	**649.7**	**264.7**

Source: County-owned parcels were identified using the "owner" name within each county's GIS parcel data. Because parcel data and "owner" naming conventions vary from county to county, DOC-EERA identified county-owned parcels as best as possible. Note that Red Lake County had no GIS parcel data, and Aitkin County had no ownership information on their parcel data; therefore, these counties were not included in the analysis

[a] Includes valve sites and valve driveways. Because valve sites are within the permanent right-of-way, total Project impacts may be slightly overestimated from double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations

Notes:

Acres for the construction work area and the permanent right-of-way are based on Enbridge-provided footprints for the Applicant's preferred route.

Perm = permanent; Temp = temporary

6.3.6.2.2 Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to public lands for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Table 6.3.6-3 lists the acreage of federal, state, and county lands crossed by RA-03AM during construction and operation.

Table 6.3.6-3. Public Lands Crossed by Route Alternative RA-03AM (acres)

Segment	Federal Lands[a,b]		State Lands[a,b]		County Lands[b,c]	
	Con	Op	Con	Op	Con	Op
Clearbrook to Carlton	25.4	10.6	32.5	13.5	261.7	119.2

[a] Source: PAD-US – USGS 2016.

[b] Con = 120-foot-wide construction footprint, Op = 50-foot-wide permanent right-of-way.

[c] Source: County-owned parcels were identified using the "owner" name within each county's GIS parcel data. Because parcel data and owner naming conventions vary from county to county, DOC-EERA identified county-owned parcels as best as possible. Note that Red Lake County had no GIS parcel data, and Aitkin County had no ownership information on their parcel data; therefore, these counties were not included in the analysis.

Federal Land

Approximately 25 acres of the ROI for RA-03AM are within the Crane Meadows NWR, which is managed by USFWS. The land is primarily used for bird and wildlife resource management; and is open for public access and general wildlife-dependent recreation such as hunting, wildlife watching, and photography. Therefore, the Applicant would be required to comply with the designated uses and regulatory provisions established through USFWS as the authorizing agency. Non-federal oil and gas operations on NWRs and the associated regulatory provisions are contained within 50 CFR, Part 29, Subparts C and D. Specifically, Section 29.32(a)(2) of Subpart C states that, "Persons conducting mineral operations on Service-administered lands and waters must comply with all applicable Federal and State laws and regulations for the protection of wildlife and the administration of the area."

State Land

The state land consists of 26 acres within the Mississippi Headwaters State Forest, 5 acres within the Neitermeier WMA, and 0.2 acre within the LaSalle Creek AMA. This forest, WMA, and AMA are managed by Minnesota DNR as multiple-use areas. They are primarily used for fish and wildlife resource protection, forestry, and recreation. Compatibility of the Project with designated uses would be determined during easement negotiations with the authorizing agency, which is Minnesota DNR.

Although not directly affected by pipeline construction or standard operations, RA-03AM would pass directly east of Itasca State Park, and an existing road that passes through the park would be used as an access road.

County Land

Construction work areas for RA-03AM includes land in seven counties during construction: 108 acres in Hubbard County, 69 acres in Mille Lacs County, 31 acres in Carlton County, 27 acres in Clearwater County, 25 acres in Pine County, 2 acres in Kenabec County, and 0.3 acre in Morrison County. The operational right-of-way includes 45 acres in Hubbard County, 36 acres in Mille Lacs County, 14 acres in Pine County, 13 acres in Carlton County, 11 acres in Clearwater County, 0.5 acre in Kenabec County, and 0.1 acre in Morrison County. While the exact designated use of this land is unknown, it is likely to be land in county parks or forests; therefore, compatibility with designated uses would be determined by the relevant county governments.

Route Alternative RA-06

Table 6.3.6-4 lists the acreage of federal, state, and county lands crossed by RA-06 during construction and operation.

Table 6.3.6-4. Public Lands Crossed by Route Alternative RA-06 (acres)

Segment	Federal Lands[a,b]		State Lands[a,b]		County Lands[b,c]	
	Con	Op	Con	Op	Con	Op
Clearbrook to Carlton	90.5	37.7	794.0	330.8	10.8	4.5

[a] Source: PAD-US – USGS 2016.

[b] Con = 120-foot-wide construction footprint, Op = 50-foot-wide permanent right-of-way.

[c] Source: County-owned parcels were identified using the "owner" name within each county's GIS parcel data. Because parcel data and owner naming conventions vary from county to county, DOC-EERA identified county-owned parcels as best as possible. Note that Red Lake County had no GIS parcel data, and Aitkin County had no ownership information on their parcel data; therefore, these counties were not included in the analysis.

Federal Land

RA-06 would cross approximately 86 acres of Chippewa National Forest, which is managed by USFS, and 4 acres of BLM-owned land. The forest is managed to protect forest and water resources and provides a variety of recreational opportunities; therefore, the Applicant would be required to comply with the designated uses as established by USFS as the authorizing agency. Grants for pipeline rights-of-way through BLM land are administered under the Mineral Leasing Act of 1920. Specifically, 43 CFR 2880 states, "As authorized by MLA [Mineral Leasing Act], the BLM will issue right-of-way grants for oil and natural gas gathering, and distribution pipelines and related facilities (not authorized by appropriate leases), and oil and natural gas transmission pipelines and related facilities." Therefore, the Applicant would need to apply for a right-of-way grant.

State Land

Construction of RA-06 would cross 794 acres of state lands, including 294 acres of Big Fork State Forest, 37 acres of Fond du Lac State Forest, 458 acres of George Washington State Forest, 0.2 acre of Clearwater River AMA, 5 acres of Little Otter Creek AMA, and 0.3 acre of Venning Creek AMA. These forests and AMAs are managed by Minnesota DNR as multiple-use areas. They are primarily used for fish and wildlife resource protection, forestry, and recreation. Compatibility of the Project with designated uses would be determined during easement negotiations with the authorizing agency, which is Minnesota DNR.

County Land

RA-06 would cross county land in two counties: 10 acres in Carlton County and 0.7 acre in St. Louis County. During operation, RA-06 would affect 4 acres in Carlton County and 0.3 acre in St. Louis County. While the exact designated use of this land is unknown, it is likely to be land in county parks or forests; therefore, compatibility with designated uses would be determined by the relevant county governments.

Route Alternative RA-07

Table 6.3.6-5 lists the acreage of federal, state, and county lands crossed by RA-07 during construction and operation.

Table 6.3.6-5. Public Lands Crossed by Route Alternative RA-07 (acres)

Segment	Federal Lands[a,b]		State Lands[a,b]		County Lands[b,c]	
	Con	Op	Con	Op	Con	Op
Clearbrook to Carlton	157.1	36.5	900.1	219.6	82.7	34.6

[a] Source: PAD-US – USGS 2016.

[b] Con = 205-foot-wide construction footprint, Op = 50-foot-wide permanent right-of-way.

[c] Source: County-owned parcels were identified using the "owner" name within each county's GIS parcel data. Because parcel data and owner naming conventions vary from county to county, DOC-EERA identified county-owned parcels as best as possible. Note that Red Lake County had no GIS parcel data, and Aitkin County had no ownership information on their parcel data; therefore, these counties were not included in the analysis.

Federal Land

RA-07 would cross 157 acres of Chippewa National Forest, which is managed by USFS. The forest is managed to protect forest and water resources, and provides a variety of recreational opportunities. Therefore, the Applicant would be required to comply with the designated uses as established by USFS as the authorizing agency.

State Land

Construction of RA-07 would cross approximately 900 acres of state lands, including three state forests (Bowstring State Forest [698 acres], Fond du Lac State Forest [63 acres], Mississippi Headwaters State Forest [131 acres]) and two AMAs (Clearwater River AMA [0.3 acre] and Little Otter Creek AMA [8 acres]). These forests and AMAs are managed by Minnesota DNR as multiple-use areas. They are primarily used for fish and wildlife resource protection, forestry, and recreation. Compatibility of the Project with designated uses would be determined during easement negotiations with the authorizing agency, which is Minnesota DNR.

County Land

Construction of RA-07 would affect county land in seven counties: 61 acres in Hubbard County, 10 acres in Carlton County, 5.5 acres in Clearwater County, 3 acres in Cass County, 2 acres in Beltrami County, and 0.5 acre in Itasca County. The operational right-of-way would include 26 acres in Hubbard County, 4 acres in Carlton County, 2 acres in Clearwater County, 1 acre in Cass County, 0.7 acre in Beltrami County, 0.3 acre in St. Louis County, and 0.2 acre in Itasca County. While the exact designated use of this land is unknown, it is likely to be land in county parks or forests. Therefore, compatibility with designated uses would be determined by the relevant county governments.

Route Alternative RA-08

Table 6.3.6-6 lists the acreage of federal, state, and county lands crossed by RA-08 during construction and operation.

Table 6.3.6-6. Public Lands Crossed by Route Alternative RA-08 (acres)

Segment	Federal Lands[a,b]		State Lands[a,b]		County Lands[b,c]	
	Con	Op	Con	Op	Con	Op
Clearbrook to Carlton	84.4	35.2	583.7	243.2	47.9	19.9

a Source: PAD-US – USGS 2016.

b Con = 120-foot-wide construction footprint, Op = 50-foot-wide permanent right-of-way.

c Source: County-owned parcels were identified using the "owner" name within each county's GIS parcel data. Because parcel data and owner naming conventions vary from county to county, DOC-EERA identified county-owned parcels as best as possible. Note that Red Lake County had no GIS parcel data, and Aitkin County had no ownership information on their parcel data; therefore, these counties were not included in the analysis.

Federal Land

RA-08 would cross 84 acres of Chippewa National Forest, which is managed by USFS. The forest is managed to protect forest and water resources, and provides a variety of recreational opportunities. Therefore, the Applicant would be required to comply with the designated uses as established by USFS as the authorizing agency.

State Land

Construction of RA-08 would cross 584 acres of state lands, including two AMAs (Bruce Creek AMA [0.3 acre] and Little Otter Creek AMA [4 acres]), five state forests (Bowstring State Forest [410 acres], Fond du Lac State Forest [36 acres], Mississippi Headwaters State Forest [68 acres], Savanna State Forest [38 acres], and Welsh Lake State Forest]15 acres]), and two WMAs (Bemidji Slough WMA [4 acres] and Swan River Deer Yard WMA [7 acres]). These forests, WMAs, and AMAs are managed by Minnesota DNR as multiple-use areas. They are primarily used for fish and wildlife resource protection, forestry, and recreation. Compatibility of the Project with designated uses would be determined during easement negotiations with the authorizing agency, which is Minnesota DNR.

County Land

RA-08 would cross county-owned land in six counties: 24 acres of county land in Hubbard County, 10.6 acres in Carlton County, 6 acres in Clearwater County, 5 acres in Itasca County, 2 acres in St. Louis County, and 0.2 acre in Beltrami County. During operation, the RA-08 route would include 10 acres in Hubbard County, 4 acres in Carlton County, 2 acres in Clearwater County, 2 acres in Itasca County, 1 acre in St. Louis County, and 0.1 acre in Beltrami County. While the exact designated use of this land is unknown, it is likely to be land in county parks or forests. Therefore, compatibility with designated uses would be determined by the relevant county governments.

6.3.6.3 Impact Assessment

The impact assessment focuses on compatibility of construction and operation of the Applicant's preferred route and route alternatives with designated uses of specific federal, state, and county public lands. In addition to the analysis of compatibility with the designated use of public lands in this section, impacts on the public resources contained within public lands (e.g., vegetation, wildlife, and recreation) and the measures that would be implemented to minimize potential impacts on those resources can be found in several other sections within Chapter 6, including Sections 6.3.1, 6.3.3, 6.3.4, 6.2.3, and 6.5.2.

6.3.6.3.1 Applicant's Preferred Route (in Minnesota)

Construction Impacts

In Minnesota, the Applicant's preferred route would cross 0.4 mile of federal land associated with the North County Scenic Trail federal land. It would cross approximately 440 acres of state land, including AMAs, WMAs, and state forests, and 548 acres of county land.

Depending on the specific resource or feature being affected, impacts on public lands from construction would vary. The use of public lands would be temporarily restricted during the period of active construction. Construction in any location would last for several days to several weeks, depending on a variety of factors such as land use type, topography, weather, and other environmental conditions. Limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. However, the affected area would represent a relatively small area in proportion to the total amount of public land within the specific forest or resource management area that remains undisturbed or unaffected. Given that construction impacts would be limited to small areas within the overall forest and resource management area, and that the original use of these larger areas would be maintained during construction, it is likely that construction of the pipeline would result in a temporary to long-term and minor to negligible impact related to compatibility with the designated uses of these public lands. Removal of forested habitat would be a long-term impact; depending on the route and the forest, the magnitude could be major.

There would be no direct impacts on Itasca State Park; during construction of the Applicant's preferred route, however, access to the park and visitor experience could be indirectly affected.

Operations Impacts

Operation of the pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation along public lands. During operation, the permanent right-of-way for the Applicant's preferred route includes 2 acres of federal land, 199 acres of state land, and 228 acres of county land. The permanent right-of-way would be periodically cleared of vegetation, and no trees would be permitted to grow. With the exception of the 37 acres of county land and 27 acres of state lands that would be permanently converted to permanent access roads and valve sites (see Tables 6.3.6-1 and 6.3.6-2), the pipeline itself would be buried so there would be no ongoing restriction to surface use, except at valve locations. Therefore, the public land could continue to be managed for its designated uses, and impacts associated with operation would likely be long-term but negligible to minor. The exception to this would be on forested land where the management objective is timber production, and no trees would be permitted to grow within the permanent right-of-way of the pipeline corridor. Given the amount of affected land in state forests compared to the overall forested land that remains available for timber production, it is likely that operation of the pipeline would result in a permanent but minor impact related to compatibility with the designated use of forested land for timber production.

6.3.6.3.2 Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

Construction Impacts

During construction, federal, state, and county lands affected by RA-03AM would total approximately 320 acres (Table 6.3.6-3). The largest portion of this land would be county land (262 acres); followed by 33 acres of state forests, WMAs, and AMAs; and 25 acres of federal land within the Crane Meadows NWR, which is managed by USFWS.

Depending on the specific resource or feature being affected, impacts on public lands from construction would vary. The use of public lands would be temporarily restricted during the period of active construction. Construction in any location would last for several days to several weeks, depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. However, the affected area would represent a relatively small area in proportion to the total amount of public land within the specific forest or resource management area that remains undisturbed or unaffected. Given that construction impacts are limited to small areas within the overall forest and resource management area, and that the original use of these larger areas would be maintained during construction, it is likely that construction of the pipeline would result in a temporary to long-term and minor to negligible impact related to compatibility with the designated uses of these public lands. Removal of forested habitat would be a long-term impact; depending on the route and the forest, the magnitude could be major.

There would be no direct impacts on Itasca State Park; during construction of RA-03AM, however, access to the park and visitor experience would be indirectly affected.

Operations Impacts

Operation of the pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation along public lands. During operation, the permanent right-of-way for the RA-03AM route would include 143 acres of public lands, most of which would be county-owned lands (Table 6.3.6-3).

With the exception of public lands that would be permanently converted to permanent access roads and valve sites, the pipeline itself would be buried so there would be no ongoing restriction to surface use, except at valve locations. The public land could continue to be managed for its designated uses; therefore, impacts associated with operation are likely to be long term but negligible to minor. The exception to this would be on forested land where the management objective is timber production, and no trees would be permitted to grow within the permanent right-of-way of the pipeline corridor. However, given the amount of affected land in state forests compared to the overall forested land that remains available for timber production, it is likely that operation of the pipeline would result in a permanent but minor impact related to compatibility with the designated use of forested land for timber production.

Route Alternative RA-06

Construction Impacts

During construction, the federal, state, and county lands affected by RA-06 would total approximately 895 acres (Table 6.3.6-4). The largest portion of this land would be state land (794 acres), followed by approximately 90 acres of federal land (86 acres of the Chippewa National Forest, which is managed by USFS, and 4 acres of BLM-owned land).

Depending on the specific resource or feature being affected, impacts on public lands from construction would vary. The use of public lands would be temporarily restricted during the period of active construction. Construction in any location would last for several days to several weeks, depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. However, the affected area would represent a relatively small area in proportion to the total amount of public land within the specific forest or resource management area that remains undisturbed or unaffected. Given that construction impacts are limited to small areas within the overall forest and resource management area and that the original use of these larger areas would be maintained during construction, it is likely that construction of the pipeline would result in a temporary to long-term and minor to negligible impact related to compatibility with the designated uses of these public lands. Removal of forested habitat would be a long-term impact; depending on the route and the forest, the magnitude could be major.

Operations Impacts

Operation of the pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation along public lands. During operation, the permanent right-of-way for RA-06 includes 38 acres of federal land, 331 acres of state land, and 5 acres of county land.

With the exception of public lands that would be permanently converted to permanent access roads and valve sites, the pipeline itself would be buried so there would be no ongoing restriction to surface use, except at valve locations. The public land could continue to be managed for its designated uses; therefore, impacts associated with operation are likely to be long term but negligible to minor. The exception to this would be on forested land where the management objective is timber production, and no trees would be permitted to grow within the permanent right-of-way of the pipeline corridor. However, given the amount of affected land in state forests compared to the overall forested land that remains available for timber production, it is likely that operation of the pipeline would result in a permanent but minor impact related to compatibility with the designated use of forested land for timber production.

Route Alternative RA-07

Construction Impacts

During construction, the federal, state, and county lands affected by RA-07 would total approximately 1,140 acres (Table 6.3.6-5). The largest portion of this land would be state land (900 acres), followed by 157 acres of federal land through the Chippewa National Forest, which is managed by USFS.

Depending on the specific resource or feature being affected, impacts on public lands from construction would vary. The use of public lands would be temporarily restricted during the period of active construction. Construction in any location would last for several days to several weeks, depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. However, the affected area would represent a relatively small area in proportion to the total amount of public land within the specific forest or resource management area that remains undisturbed or unaffected. Given that construction impacts are limited to small areas within the overall forest and resource management area and that the original use of these larger areas would be maintained during construction, it is likely that construction of the pipeline would result in a temporary to long-term and minor to negligible impact related to compatibility with the designated uses of these public lands. Removal of forested habitat would be a long-term impact; depending on the route and the forest, the magnitude could be major.

Operations Impacts

With the exception of public lands that would be permanently converted to permanent access roads and valve sites, the pipeline itself would be buried so there would be no ongoing restriction to surface use, except at valve locations. The public land could continue to be managed for its designated uses; therefore, impacts associated with operation are likely to be long term but negligible to minor. The exception to this would be on forested land where the management objective is timber production, and no trees would be permitted to grow within the permanent right-of-way of the pipeline corridor. However, given the amount of affected land in state forests compared to the overall forested land that remains available for timber production, it is likely that operation of the pipeline would result in a permanent but minor impact related to compatibility with the designated use of forested land for timber production.

Route Alternative RA-08

Construction Impacts

During construction, the federal, state, and county lands affected by RA-08 would total approximately 716 acres (Table 6.3.6-6). The largest portion of this land would be state land (584 acres), followed by 84 acres of federal land through the Chippewa National Forest, which is managed by USFS.

Depending on the specific resource or feature being affected, impacts on public lands from construction would vary. The use of public lands would be temporarily restricted during the period of active construction. Construction in any location would last for several days to several weeks, depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. However, the affected area would represent a relatively small area in proportion to the total amount of public land within the specific forest or resource management area that remains undisturbed or unaffected. Given that construction impacts are limited to small areas within the overall forest and resource management area and that the original use of these larger areas would be maintained during construction, it is likely that construction of the pipeline would result in a temporary to long-term and minor to negligible impact related to compatibility with the designated uses of these public lands. Removal of forested habitat would be a long-term impact; depending on the route and the forest, the magnitude could be major.

Operations Impacts

Operation of the pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation along public lands. During operation, the permanent right-of-way for RA-08 includes 35 acres of federal land, 243 acres of state land, and 20 acres of county land.

With the exception of public lands that would be permanently converted to permanent access roads and valve sites, the pipeline itself would be buried so there would be no ongoing restriction to surface use, except at valve locations. The public land could continue to be managed for its designated uses; therefore, impacts associated with operation are likely to be long term but negligible to minor. The exception to this would be on forested land where the management objective is timber production, and no trees would be permitted to grow within the permanent right-of-way of the pipeline corridor. However, given the amount of affected land in state forests compared to the overall forested land that remains available for timber production, it is likely that operation of the pipeline would result in a permanent but minor impact related to compatibility with the designated use of forested land for timber production.

6.3.6.4 Summary and Mitigation

6.3.6.4.1 Summary

Table 6.3.6-7 presents the results of the analysis of potential compatibility impacts on public lands from construction and operation of the Applicant's preferred route and the route alternatives. Depending on the specific resource or feature being affected, impacts on public lands from construction would vary. The use of public lands would be temporarily restricted during the period of active construction. Construction in any location would last for several days to several weeks, depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; limited use, access restrictions, and noise and visual disturbance could occur during this timeframe.

The duration and magnitude of the construction impacts related to the compatibility of the Applicant's preferred route and route alternatives with the designated uses of public land would range from negligible to minor and temporary to long-term impacts. The low level of impact occurs for two reasons. The limitation represents a small portion of the overall land designated for public use in most affected areas, and any impacts on this land would be restored following construction. Therefore, any impacts related to the compatibility of the pipeline with the designated uses of the land would be limited to the duration of construction and site restoration. Construction of the Applicant's preferred route would have the largest effect in terms of total land area on county-owned land (548 acres), whereas the RA-07 route would have the largest total impact on federally and state-owned land (157 acres and 900 acres, respectively).

During operations, impacts on public lands related to compatibility of a pipeline (for any route option) with their designated uses would be long term to permanent and negligible to major. With the exception of public lands that would be permanently converted to permanent access roads and valve sites, the pipeline itself would be buried so there would be limited restriction to surface use, except at valve locations. Therefore, the public land could continue to be managed for its designated uses, and impacts associated with operation are likely to be long term but negligible to minor. The exception to this would be on forested land within the permanent right-of-way of the pipeline corridor where there would be permanent minor impacts on forest production, recreation and habitat. Given the area of the affected land relative to the public land that remains available for timber production, it is likely that continued operation of the pipeline (for any route option) would result in a permanent but minor impact related to compatibility of a pipeline with the designated use of the affected land.

6.3.6.4.2 Mitigation

As previously noted, crossing through public lands would prompt authorizing agencies to ensure that the Applicant's preferred route or a route alternative complies with the designated uses of the land; therefore, the various agencies would require mitigation and the Applicant would need to coordinate with the authorizing agency.

In the area where the Applicant preferred route crosses the North Country National Scenic Trail, the Applicant will minimize the removal of trees and vegetation to the greatest extent possible within visual distances of the route of the North Country National Scenic Trail. Additionally, after construction activities in the area of the trail crossing have been completed, the Applicant will:

- Clear all evidence of construction materials from the site immediately along the trail as well as areas that may be observable from the trail;
- Restore the shape and structure of the treadway to its original condition and ensure that water does not pool or otherwise collect and flow along the trail;
- Re-vegetate the construction workspace adjacent to the trail to the greatest extent possible with site-appropriate trees, shrubs, and ground vegetation.

With implementation of Applicant-proposed measures and compliance with conditions specified in required permits by the authorizing agencies, no mitigation has been identified to further minimize impacts on federal, state, and county lands—with the exception of forested land within the permanent right-of-way, which would not be allowed to re-establish. A potential mitigation would be to purchase and dedicate private forest land to timber production as an offset; or to compensate the state, federal, or county government for any merchantable timber lost.

Table 6.3.6-7. Summary of Potential Impacts Related to Compatibility of the Applicant's Preferred Route and Route Alternatives with Designated Uses of Public Land[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Federal land	Temporary/negligible to minor impacts • 5 acres	Temporary/negligible to minor impacts • 25 acres	Temporary/negligible to minor impacts • 91 acres	Temporary/negligible to minor impacts • 157 acres	Temporary/negligible to minor impacts • 84 acres
State land	Temporary to long-term/negligible to minor impacts • 440 acres	Temporary to long-term/negligible to minor impacts • 33 acres	Temporary to long-term/negligible to minor impacts • 794 acres	Temporary to long-term/negligible to minor impacts • 900 acres	Temporary to long-term/negligible to minor impacts • 584 acres
County land	Temporary/negligible to minor impacts • 548 acres	Temporary/negligible to minor impacts • 262 acres	Temporary/negligible to minor impacts • 11 acres	Temporary/negligible to minor impacts • 83 acres	Temporary/negligible to minor impacts • 48 acres
Operations Impacts					
Federal land	Long-term to permanent/ negligible to minor impacts • 2 acres	Long-term to permanent/ negligible to minor impacts • 11 acres	Long-term to permanent/ negligible to minor impacts • 38 acres	Long-term to permanent/negligible to minor impacts • 37 acres	Long-term to permanent/negligible to minor impacts • 35 acres
Impacts on state land	Long-term to permanent/ negligible to minor impacts • 199 acres	Long-term to permanent/ negligible to minor impacts • 14 acres	Long-term to permanent/ negligible to minor impacts • 331 acres	Long-term to permanent/negligible to minor impacts • 220 acres	Long-term to permanent/negligible to minor impacts • 243 acres
Impacts on county land	Long-term to permanent/ negligible to minor impacts • 228 acres	Long-term to permanent/ negligible to minor impacts • 119 acres	Long-term to permanent/ negligible to minor impacts • 5 acres	Long-term to permanent/negligible to minor impacts • 35 acres	Long-term to permanent/negligible to minor impacts • 20 acres

Table 6.3.6-7. Summary of Potential Impacts Related to Compatibility of the Applicant's Preferred Route and Route Alternatives with Designated Uses of Public Land[a,b]

[a] No single element of the public lands data in this summary table provides a complete indication of all relevant impacts to public lands, but together data about ownership and use provide a reasonably comprehensive indication of potential impacts. For example, while the datasets identify where federal, state, and county lands occur within the ROI, this information must be coupled with information about public uses of the land (e.g., wildlife management, forest, etc.) in the text to gain a better understanding of the range of possible impacts. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.

[b] Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-626 to 6-631. The table above, for example, provides acreages of state land within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to state land is contained in the text of this section (terms defined in Section 6.1.3).

[c] Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on page 6-627. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[d] Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on page 6-628. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[e] Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on page 6-629. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-629 to 6-630. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-630 to 6-631. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.3.6.5 References

Minnesota Department of Natural Resources (Minnesota DNR). 2016. Wildlife Management Areas. http://dnr.state.mn.us/wmas/description.html. Accessed on December 9, 2016.

North Country Trail Association. 2016. Trail association website. https://northcountrytrail.org/trail/. Accessed on December 11, 2016.

U.S. Geological Survey (USGS). 2016. Gap Analysis Program. May 2016. Protected Areas Database of the United States (PAD-US), Version 1.4 Combined Feature Class.

6.3.7 Air Quality

Construction and operation of the Applicant's preferred route and route alternatives may affect air quality in Minnesota through the emission of air pollutants that, directly or indirectly, enter the atmosphere and contribute to increased air pollution. Air quality is defined by the ambient concentration of certain pollutants (i.e., criteria pollutants) in the atmosphere determined by EPA to be of concern to the health and welfare of the general public and the environment.

Pipeline construction causes air pollution primarily through emissions from construction equipment (i.e., non-road engines), mobile sources (i.e., vehicles), and construction-related activities (i.e., burning, blasting, and road travel). This analysis evaluates air quality impacts from construction of the Applicant's preferred route and route alternatives by assessing:

- Air pollutants, including GHG emissions, generated by construction; and
- Stored carbon releases from tree removal within the construction work areas.

Under normal operations, oil pipelines emit small amounts of fugitive emissions. More significant emissions may result from storage tanks at terminals and pump stations that use internal combustion engines. The pump stations for the Applicant's preferred route would use electric-drive motors that do not emit air pollutants but do create air emissions indirectly from the electricity generation required to operate them. Furthermore, an underlying issue associated with oil pipelines has been their potential to affect climate change through increased concentrations of GHGs in the atmosphere. This analysis evaluates air impacts from operations for the Applicant's preferred route and route alternatives by assessing:

- Air pollutants, including GHG emissions, from pipeline operations; and
- Loss of carbon storage capability (i.e., carbon sequestration) from tree removal within the pipeline rights-of-way.

This section first describes the existing condition for air quality within an area along the Applicant's preferred route and route alternatives where air quality could be affected by construction and operation. Next, the section evaluates the potential impacts of construction and operation on the existing conditions and compares these impacts for the five route options (i.e., the Applicant's preferred route, RA-03AM, RA-06, RA-07, and RA-08).

Chapter 10 addresses the impacts on air quality resulting from a crude oil release.

6.3.7.1 Regulatory Context and Methodology

6.3.7.1.1 Regulatory Context

Air Quality Standards

Criteria pollutants and federal air quality standards are defined in Section 5.2.7.1 and Table 5.2.7-1. Minnesota has adopted ambient air quality standards that are the same as or more stringent than the National Ambient Air Quality Standards (NAAQS); these are referred to as "Minnesota Ambient Air Quality Standards" (MAAQS). Minnesota also has established state standards for hydrogen sulfide and particulate matter (PM) (EPA 2016a; Minnesota PCA 2000).

Attainment of Air Quality Standards

Neither the Applicant's preferred route nor any route alternative would pass through an air quality maintenance or nonattainment area within Minnesota (EPA 2016b). Refer to Section 5.2.7.2 for general information on air quality attainment status.

Air Quality Control Regions

Air quality control regions are categorized as Class I, Class II, or Class III. Class I areas (commonly called "pristine areas") were established primarily as national parks and wilderness areas above a certain size and receive special protections under the Clean Air Act to help maintain pristine air quality. Minnesota contains two Class I areas: Voyageurs National Park (in Koochiching and St. Louis counties) and the Boundary Waters Canoe Area (in St. Louis, Lake, and Cook counties). The closest distances to Class I and pending Class I areas are listed in Table 6.3.7-1. Neither the Applicant's preferred route nor any route alternative would pass through a Class I area within Minnesota; however, route alternatives RA-06, RA-07, and RA-08 would pass through the Fond du Lac Reservation.

Table 6.3.7-1. Closest Distance to Class I Areas in Minnesota for the Applicant's Preferred Route and Route Alternatives (miles)

Route	Distance to Boundary Waters Canoe Area Wilderness Area	Distance to Voyageurs National Park	Distance to Fond du Lac Reservation (pending re-designation)
Applicant's preferred route	87.6	110.8	2.0
Route alternative RA-03AM	87.6	112.9	2.0
Route alternative RA-06	38.6	47.4	0.0
Route alternative RA-07	69.1	82.4	0.0
Route alternative RA-08	69.5	82.6	0.0

Source: Minnesota PCA 2016a.

Air Quality Permitting Requirements

Air permits may be required for a project, depending on the quantity of specific project emissions. In general, federal permits are required for larger emitters and are implemented nationwide under a consistently applied permitting program. Minnesota has been delegated authority to implement the federal permits program. State permits are those air permits required by state rule and statutes. In Minnesota, these permits are the result of state-specific strategies approved by the federal government to regulate minor sources of air emissions and to attain compliance with broader air quality federal laws and regulations (e.g., registration permits, capped emission permits).

Generally, no significant air emissions are associated with operation of a pipeline itself. While there may be what are termed "fugitive emissions" from a pipeline, such emissions are generally very minor and typically are not subject to the requirement to obtain a permit. The pipeline-associated facilities that most commonly trigger the requirement to obtain a permit for operations are storage tanks at terminals and pump stations that use internal combustion engines to power pipeline pumps. All the pump stations proposed for the Applicant's preferred route and route alternatives use electric-drive motors and do not emit air pollutants. However, they do create air emissions indirectly from the additional electricity generation required to operate them. Note that, although pipeline construction causes air pollution through emissions from non-road engines and mobile sources, these emissions do not count toward permitting triggers and therefore do not require air permits. The additional storage tank withdrawal losses due to increased throughput at the Clearbrook terminal will require an air permit. At Clearbrook terminal, the Applicant would obtain a synthetic-minor individual state permit in order to limit VOC emissions and retain status as a minor source (Enbridge 2016a).

6.3.7.1.2 Methodology

Construction and operation of the Applicant's preferred route and route alternatives would result in emissions that may affect local air quality. The ROI consisted of the designated airsheds (geographical regions that share the same air supply and are subject to the same air pollutants) through which the pipeline routes pass. Because of the large regional nature of airsheds, the Applicant's preferred route and the route alternatives generally would occur within the same airsheds.

Potential impacts on air quality within the ROI from construction and operation of the Applicant's preferred route and route alternatives were assessed as follows:

- Direct construction emissions data were obtained from the Applicant for one pipeline construction spread. Each construction emission source group from the Applicant's data was divided by an average of 54.8 miles per spread to obtain emissions per mile. Emissions per mile then were multiplied by the corresponding pipeline segment length to determine the emissions for each source group for each route segment. This allowed a comparable assessment of the construction emissions from the Clearbrook-to-Carlton segment for the Applicant's preferred route and route alternatives.
- Direct operations emissions data were obtained from the Applicant for the Applicant's preferred route and route alternatives based on the number of electric pump stations and MLV sites. Operational emissions for the Applicant's preferred route and route alternatives were presented for the entire routes within Minnesota, not just the Clearbrook-to-Carlton segment.
- Indirect GHG emissions for the Applicant's preferred route and route alternatives from generation of electricity by the existing local utilities for electric pump station operations were calculated using pump station electricity consumption data supplied by the Applicant and GHG emission factors from EPA's Emissions and Generation Resource Integrated Database (eGRID).
- The amounts of carbon that potentially would be released back into the atmosphere during tree removal within the construction work areas were estimated using the average carbon density of trees within the Northern Lake States developed by USFS.
- The loss of carbon sequestration for areas along the permanent right-of-way that would remain cleared was estimated using the average annual carbon accumulation associated with trees within the Northern Lake States developed by the Chicago Climate Exchange.

No single one of theses data sources provides a complete indication of all relevant impacts to air quality, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, the estimates of direct emissions of GHG emissions from construction do not account for the GHG emission implications of clearing in the ROW, but together with carbon stock loss calculations they provide a reasonable estimate of the overall GHG impacts of construction.

Furthermore, the quantitative information provided by these data sources should be coupled with the qualitative descriptions of impacts that are contained in the text. Tables in this section provide estimates, for example, of GHG emissions and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that result from the emission of greenhouse gases is contained in the text of this section and in Section 12.6.

6.3.7.2 Existing Conditions

6.3.7.2.1 Applicant's Preferred Route and Route Alternatives

Climate/Meteorology

Air quality is substantially influenced by climate and meteorological conditions. Minnesota has a continental climate with cold, often frigid winters and hot summers. Refer to Table 5.2.7-3 for representative climate data.

Existing Air Quality

To characterize the background air quality for northern Minnesota when no site-specific monitoring data were available, data were obtained from air quality monitoring stations located within the counties that would be crossed by the Applicant's preferred route and route alternatives. To obtain representative background air quality for nitrogen dioxide (NO_2) and sulfur dioxide (SO_2), data from a monitoring station in Anoka County were used. This monitoring station is the closest station to counties in the ROI that monitors for NO_2 and SO_2 emissions. A summary of the available background air quality concentrations for 2015 is presented in Table 6.3.7-2. The table shows that ambient air quality for all criteria pollutants are below the NAAQS for all areas that would be crossed by the Applicant's preferred route and route alternatives. Furthermore, ambient air quality for all criteria pollutants are also below MAAQS.

EPA developed the Air Quality Index to provide a simple, uniform way to report daily air quality conditions taking into account all of the criteria air pollutants measured within a geographic area. Minnesota reports the Air Quality Index in 10 reporting areas across the state. According to the Air Quality Index report for 2015, all of the routes are in areas that are in-attainment for air quality standards, and none are located near any of the areas noted for unhealthy air quality (Minnesota PCA 2016b).

Greenhouse Gases

GHGs occur in the atmosphere both naturally and as a result of human activities, such as burning fossil fuels. Based on overwhelming scientific evidence, EPA found that GHGs constitute a threat to public health and welfare (Center for Climate and Energy Solutions 2016). Refer to Section 5.2.7.2.1 for a general discussion of federal actions designed to reduce overall GHG emissions in 2025 by 26 to 28 percent over 2005 emission levels.

Minnesota has implemented various programs and legislation to reduce GHG emissions. Since the 1990s, the state has provided tax exemptions for renewable and alternative energy sources (Minn. Stat. § 272.02 and 297A.68). The Next Generation Energy Act of 2007 established state GHG reduction goals of 15 percent by 2015, 30 percent by 2025, and 80 percent by 2050. Recent data indicate that Minnesota missed the 2015 target and is not on track to meet the other goals (MNDOT 2017; MPR News 2016).

Table 6.3.7-2. Representative Background Air Quality Data in the Vicinity of the Applicant's Preferred Route and Route Alternatives in Minnesota (2015)

Pollutant (Averaging Time)	Monitoring Station Location				
	Beltrami County	Carlton County	Crow Wing County	St. Louis County	Anoka County[a]
PM-10 (24-hour, 2nd max)	--	--	--	67 µg/m^3 (45% of NAAQS)	--
PM-2.5 (Annual, mean)	5.0 µg/m^3 (42% of NAAQS)	6.8[b] µg/m^3 (57% of NAAQS)	6.2 µg/m^3 (52% of NAAQS)	5.6 µg/m^3 (47% of NAAQS)	6.6 µg/m^3 (55% of NAAQS)
PM-2.5 (24-hour, 98%)	14 µg/m^3 (40% of NAAQS)	23 µg/m^3 (66% of NAAQS)	16 µg/m^3 (46% of NAAQS)	16 µg/m^3 (46% of NAAQS)	15 µg/m^3 (43% of NAAQS)
SO_2 (1-hour, 99%)	--	--	--	--	4 ppb (5% of NAAQS)
NO_2 (Annual, mean)	--	--	--	--	6.55 ppb (12% of NAAQS)
NO_2 (1-hour, 98%)	--	--	--	--	44 ppb (44% of NAAQS)
Ozone (8-hour, 4th max)	--	0.06 ppm (86% of NAAQS)	0.06 ppm (86% of NAAQS)	0.056 ppm (80% of NAAQS)	0.064 ppm (91% of NAAQS)
CO (8-hour, 2nd max)	--	--	--	--	0.9 ppm (10% of NAAQS)
CO (1-hour, 2nd max)	--	--	--	--	1.2 ppm (4% of MAAQS)
Lead (Max 3-month average)	--	--	--	0 µg/m^3 (0% of NAAQS)	0.01 µg/m^3 (7% of NAAQS)

Source: EPA 2016c.

[a] Although the region of interest (ROI) is not within Anoka County, this monitoring station is the closest station to counties in the ROI that monitors for NO_2 and SO_2 emissions.

[b] The mean value does not satisfy minimum data completeness criteria.

Notes:

Table results depict the data from the monitoring site within the county with the highest pollutant level, including exceptional events data.

Air pollution levels measured at a particular monitoring site are not necessarily representative of the air quality for an entire county or urban area.

Air quality standards for some pollutants (PM-2.5, lead) allow for combining data from multiple monitors into a site-level summary statistic that can be compared to the standards. In those cases, the site-level statistics may differ from the monitor–level statistics.

CO = carbon monoxide, MAAQS = Minnesota Ambient Air Quality Standards, NAAQS = National Ambient Air Quality Standards, NO_2 = nitrogen dioxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, ppb = parts per billion, ppm = parts per million, SO_2 = sulfur dioxide, µg/m^3 = micrograms per cubic meter

"--" = no available data

Total GHG emissions in Minnesota in 2012 were approximately 154 million tons of carbon dioxide equivalents (CO_2e). Between 2005 and 2012, GHG emissions from Minnesota declined by 11 million tons of CO_2e, or about 7 percent, with the most significant reductions coming from electric power utilities and transportation energy use. In 2012, about 31 percent of the GHG emissions were from consumption of electricity, and about 25 percent of emissions were from transportation, as identified in Table 6.3.7-3 (Minnesota PCA 2015).

Table 6.3.7-3. Minnesota Greenhouse Gases by Sector (2012)

Economic Sector	Percent of 2012 Total	Sector Description
Electric utility	31%	Combustion of fuel for generation of electricity; all emissions from electricity consumption in Minnesota, including electricity imported from other states
Transportation	25%	Fuel combustion, air conditioning leakage, and natural gas pipelines
Agriculture	19%	Ruminant digestion, animal feedlots and manure management, fertilizer use, crop cultivation, and fuel combustion
Industrial	14%	Fuel combustion; taconite processing; petroleum refining; magnesium casting; lead recycling; and manufacturing steel, glass, insulating foam, and semiconductors
Residential	6%	Fuel combustion (space and water heating, dryers), fertilizer and product use, housing material carbon sequestration, and air conditioner and refrigerator leakage
Commercial	4%	Fuel combustion, solvent use, medical N_2O; includes institutional sources
Waste	1%	Waste processing and incineration, methane from landfill gas and wastewater, and carbon sequestered in demolition landfills

Source: Minnesota PCA 2015.

6.3.7.3 Impact Assessment

This section of the analysis assesses the temporary air quality effects associated with construction of the pipeline and associated facilities, and the permanent air quality effects resulting from facility operations for the Applicant's preferred route and each of the route alternatives. See Section 5.2.7.3 for a general discussion of potential air quality effects related to pipeline construction and operation.

6.3.7.3.1 Applicant's Preferred Route (in Minnesota)

Construction Impacts

The total estimated construction emissions for the Applicant's preferred route in Minnesota are shown in Table 6.3.7-4. Because the pipeline would be constructed in seven spreads (seven separate sections), total emissions would not be concentrated in any one location but would occur incrementally along the pipeline route. Further, each spread of pipeline activity moves along the route daily during construction; therefore, emissions would be minimal at any specific location, and typical meteorological conditions likely would cause rapid dispersal. The Applicant would minimize dust generated from construction activities by wetting soils on the right-of-way and limiting working hours in residential areas as needed (Enbridge 2016a), and/or taking additional measures as appropriate based on site specific conditions. Gasoline and diesel engines must comply with the EPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 89 for non-road engines. These regulations are designed to minimize emissions and require a maximum sulfur content in diesel fuel of 15 parts per million.

Open burning of cleared materials from construction activities has the potential to affect air quality, particularly the large volume of trees that would be removed from the right-of-way. Consequently, the burning of mature trees would not be allowed. Only small and dry brush piles will be allowed to burn.

As a result, air emissions from construction would result in only localized minor, intermittent and temporary impacts. Because air permitting is not triggered by temporary construction phase emissions, dispersion modeling to ensure compliance with ambient air quality standards would not be required.

Table 6.3.7-4. Estimated Construction Emissions for the Applicant's Preferred Route in Minnesota

Emission Source Description	Direct Emissions (tons)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
North Dakota Border to Clearbrook								
On- and off-road diesel equipment combustion emissions	17.1	245.8	241.0	0.4	10.6	9.9	47,162.5	1.1
On- and off-road gasoline equipment combustion emissions	2.2	4.7	30.4	2.4	0.5	0.4	4,190.7	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	117.7	28.9	0.0	0.0
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	16.7	1.7	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	542.9	0.0	52.9	52.9	280.7	0.0
Subtotal	***19.3***	***250.4***	***814.2***	***2.8***	***198.3***	***93.7***	***51,633.9***	***1.1***
Clearbrook to Carlton								
On- and off-road diesel equipment combustion emissions	34.5	497.6	487.8	0.9	21.4	20.0	95,473.4	2.1
On- and off-road gasoline equipment combustion emissions	4.4	9.4	61.5	4.8	0.9	0.9	8,483.5	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	238.3	58.5	0.0	0.0
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	33.8	3.4	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	1,099.0	0.0	107.0	107.0	568.3	0.0
Blasting emissions[a]	0.0	0.2	0.3	0.003	0.0005	0.00003	0.0	0.0
Subtotal	***39.0***	***507.1***	***1,648.6***	***5.6***	***401.5***	***189.8***	***104,525.1***	***2.1***
Carlton to Wisconsin Border								
On- and off-road diesel equipment combustion emissions	1.5	21.6	21.2	0.04	0.9	0.9	4.2	0.1
On- and off-road gasoline equipment combustion emissions	0.2	0.4	2.7	0.2	0.04	0.04	369.0	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	10.4	2.6	0.0	0.0

Table 6.3.7-4. Estimated Construction Emissions for the Applicant's Preferred Route in Minnesota

Emission Source Description	Direct Emissions (tons)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	1.5	0.2	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	47.8	0.0	4.7	4.7	24.7	0.0
Subtotal	***1.7***	***22.1***	***71.7***	***0.2***	***17.5***	***8.3***	***4,546.9***	***0.1***
TOTAL MINNESOTA EMISSIONS	**59.9**	**779.6**	**2,534.6**	**8.7**	**617.3**	**291.8**	**160,705.8**	**3.3**

Source: Enbridge 2017.

[a] Blasting would be required only for one 1,500-foot section in Spread 7.

Notes:

Calculations are based on the emissions per spread presented in Table 5.2.7-6 (absent blasting), and an average of 54.8 miles per spread was used to determine emissions per mile. Emissions per mile then were multiplied by the corresponding pipeline length to determine the emissions for each source group for each route segment.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

Stored Carbon Releases

Construction along the Applicant's preferred route could require removal of trees from up to 1,543 acres of forested land within the construction work area in Minnesota (i.e., 1,447 acres between Clearbrook and Carlton). Of this, 673 acres are to remain permanently without trees, while the forest would be allowed to regrow on the other 871 acres. When a tree is harvested and converted into forest products, the carbon dioxide (CO_2) it has stored or sequestered over a lifetime is retained within its cellular structure. When trees die and decompose or are burned, some of the sequestered carbon remains as forest litter and soils, but much of the rest is released back into the atmosphere as CO_2. Within the Northern Lake States, USFS estimated the carbon density of forested lands for six forest types: aspen-birch, elm-ash-cottonwood, maple-beech-birch, oak-hickory, spruce-fir, and white-red-jack pine (Smith et al. 2006). The average for the six forest types is 30.2 metric-tons of carbon per acre. Consequently, the amount of carbon that potentially would be released back into the atmosphere as a result of tree removal over 1,543 acres is estimated at 188,523 tons of CO_2e, with approximately 176,710 tons of CO_2e occurring between Clearbrook and Carlton. Regrowth of the forest on the 871 acres outside of the pipeline right-of-way eventually would more than halve this loss, in the long run, after forest regrowth, bringing net CO_2 emissions from forest clearance to a level of about 82,095 tons. Note that the annual loss of carbon sequestration is quantified below as an operations impact.

Operations Impacts

Total annual emissions during operations are shown in Table 6.3.7-5. These emissions would result from eight pipeline pump stations operated with electric motors and 27 MLV sites (Enbridge 2017). Indirect GHG emissions resulting from power generation to supply electrical energy to the pump stations is considered in the following section.

Table 6.3.7-5. Estimated Operations Emissions for the Applicant's Preferred Route in Minnesota

Emission Source Description	Direct Emissions (tons per year)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
Pump station fugitive emissions from pumps, piping components, sump tanks, and pig traps	2.9	0.0	0.0	0.0	0.0	0.0	0.04	0.09
Mainline valve fugitive emissions from piping components	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.004
Clearbrook terminal fugitive emissions from pumps, piping components, sump tanks, and pig traps	0.5	0.0	0.0	0.0	0.0	0.0	0.006	0.02
Additional Clearbrook terminal storage tank withdrawal losses from pipeline throughput[a]	17.5	0.0	0.0	0.0	0.0	0.0	372.2	1.2
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	0.1	0.01	0.0	0.0
Vehicle combustion emissions	0.002	0.004	0.03	0.002	0.0004	0.0004	4.1	0.0
TOTAL MINNESOTA EMISSIONS	**21.0**	**0.004**	**0.03**	**0.002**	**0.1**	**0.01**	**375.9**	**1.3**

Source: Enbridge 2017.

[a] Only those emissions associated with the proposed increase in throughput of the Clearbrook terminal are included as part of the Project's operations emissions (i.e., existing operations emissions are equivalent to the existing environment).

Note:

Operations emissions are based on 8 pump stations and 27 mainline valve sites.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

As discussed in Section 5.2.7.3, the external floating roof storage tanks at the existing Clearbrook terminal are subject to New Source Performance Standards (NSPS) in 40 CFR 60 Subpart Kb, "Standards of Performance for Volatile Organic Liquid Storage Vessels." Subpart Kb regulates VOC emissions and establishes controls based on the vapor pressure of the stored liquid. The Clearbrook terminal currently operates under a minor source Option A Registration Permit, which is a State of Minnesota permit, solely because an NSPS applies and no federal or state permitting thresholds are exceeded (i.e., applicability to NSPS Subpart Kb requires a state air permit under Minnesota Administrative Rules Part 7007.0250). The increased throughput associated with the Applicant's preferred route would cause potential emissions of VOCs at the Clearbrook terminal that exceed the 100 tons-per-year major source threshold, triggering a Title V operating permit. The Applicant would obtain a synthetic-minor individual state permit to limit VOC emissions in order to retain status as a minor source (Enbridge 2016a).

Overall, operations would be expected to result in permanent, minor, localized air quality impacts; and GHG emissions could contribute to global climate change. Dispersion modeling to ensure compliance with ambient air quality standards has not been completed and would likely not be triggered by the synthetic-minor individual state permit. Furthermore, operations emissions would consist primarily of VOCs, which are a precursor to the criteria pollutant ozone.

Indirect Greenhouse Gases

In addition to the direct operations emissions presented in Table 6.3.7-5 (376 tons of CO_2e per year), the pump stations would be powered by electricity from existing local electric utilities, which would produce indirect air emissions (i.e., emissions not from the Project itself but from power plant emissions that generate the electricity used by the Project). The projected power consumption from operations of all pump stations is 533,249 megawatt-hours (MWh) per year (Enbridge 2016b). This estimate includes the power consumption for the existing Line 3 pump stations.

GHG emissions for electricity use for the power control area for each of the proposed pump stations were calculated using EPA's eGRID emission factors:

- 1,894 pounds of CO_2e per MWh for the Otter Tail Power Company for the Donaldson, Viking, Plummer, and Clearbrook terminal pump stations; and
- 1,836 pounds of CO_2e per MWh for the Great River Energy for the Two Inlets, Backus, Palisade, and Cromwell pump stations.

Based on these data, the maximum indirect GHG emissions from pump station operations would be 497,112 tons of CO_2e per year (EPA 2015). The maximum indirect GHG emissions from pump station operations associated only with the increased throughput would be 452,497 tons of CO_2e per year, after removing 44,615 tons of CO_2e per year that is associated with existing Line 3 and considered part of the existing environment (Enbridge 2017). The criteria pollutant emissions associated with the electric generating facilities would be authorized by applicable air quality operating permits that ensure compliance with ambient air quality standards.

Loss of Carbon Sequestration

Following construction, 871 acres of previously cleared forested land could be reforested to provide a carbon sequestration (storage) reservoir. The remaining 673 acres along the permanent right-of-way within Minnesota would remain cleared (i.e., 631 acres between Clearbrook and Carlton). The nature of the proposed tree removal is to permanently convert forested land within the permanent right-of-way and aboveground facility sites to a non-forested land use, which would result in a permanent loss of carbon sequestration. The mechanism for carbon sequestration is discussed in Section 5.2.7.3.

Within the Northern Lake States, the Chicago Climate Exchange (2009) estimated the annual carbon accumulation on forested lands for six forest types: aspen-birch, elm-ash-cottonwood, maple-beech-birch, oak-hickory, spruce-fir, and white-red-jack pine. For these forest types, 1.6 metric tons of CO_2 is annually sequestered in the non-soil components of the forest. Thus, the carbon sequestration foregone annually on the 631 acres that are permanently deforested would be 1,210 tons. Between Clearbrook and Carlton, 631 acres would sequester approximately 1,135 tons of CO_2e per year.

6.3.7.3.2 Route Alternatives (from Clearbrook to Carlton)

In general, the air quality impacts associated with construction and operation of the route alternatives would be similar to those described above for the Applicant's preferred route.

Route Alternative RA-03AM

Construction Impacts

Table 6.3.7-6 shows the estimated construction emissions for RA-03AM between Clearbrook and Carlton. The Applicant-proposed measures to minimize air impacts for the Applicant's preferred route also would be implemented for the route alternative; consequently, the air quality impacts during construction would be minor and temporary.

Table 6.3.7-6. Estimated Construction Emissions for Route Alternative RA-03AM between Clearbrook and Carlton

Emission Source Description	Direct Emissions (tons)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
On- and off-road diesel equipment combustion emissions	43.0	619.5	607.4	1.1	26.6	24.9	118,873.2	2.7
On- and off-road gasoline equipment combustion emissions	5.5	11.7	76.6	5.9	1.2	1.1	10,562.6	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	296.8	72.9	0.0	0.0
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	42.1	4.2	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	1,368.4	0.0	133.2	133.2	707.5	0.0
Blasting emissions[a]	--	--	--	--	--	--	--	--
TOTAL EMISSIONS	**48.5**	**631.2**	**2,052.3**	**7.0**	**499.9**	**236.3**	**130,143.3**	**2.7**

Source: Enbridge 2017.

[a] Blasting emissions have not been quantified.

Notes:

Calculations are based on the emissions per spread presented in Table 5.2.7-6 (absent blasting), and an average of 54.8 miles per spread was used to determine emissions per mile. Emissions per mile then were multiplied by the corresponding pipeline length to determine the emissions for each emission source group for the route alternative.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Stored Carbon Releases

During construction, RA-03AM could require removal of trees from the construction work area between Clearbrook and Carlton that, when removed, would release GHGs. Using the same emissions factor of 30.2 metric-tons of carbon per acre as noted for the Applicant's preferred route, the amount of carbon that potentially would be released back into the atmosphere during construction tree removal of 1,138 acres is estimated at 138,986 tons of CO_2e. Regrowth of the forest on the 667 acres outside of the pipeline right-of-way eventually would more than halve this loss, in the long run, after forest regrowth, bringing net CO_2 emissions from forest clearance to a level of about 57,455 tons.

Operations Impacts

Table 6.3.7-7 shows the estimated operations emissions for RA-03AM in Minnesota based on 9 pump stations and 29 MLV sites (Enbridge 2017). The table includes indirect GHG emissions from the purchase of electricity for pump station operations determined as a function of the pipeline length. Although the route alternative varies only in the Clearbrook-to-Carlton segment, the operations emissions presented in the table are for the entire pipeline route within Minnesota. Similar to the Applicant's preferred route, operations of RA-03AM would result in minor permanent impacts on air quality, and GHG emissions could contribute to global climate change. Note that emissions from vehicle combustion and unpaved roads have not been quantified.

Loss of Carbon Sequestration

Following construction of RA-03AM, 667 acres of previously cleared forested land could be reforested to provide a carbon sequestration (storage) reservoir. The remaining 471 acres along the permanent right-of-way between Clearbrook and Carlton would remain cleared and would not provide any future carbon sequestration. Using the same emission factor of 1.6 metric-tons of CO_2 per acre per year as noted for the Applicant's preferred route, the amount of carbon that would have been sequestered by 471 acres is estimated at 846 tons of CO_2e per year.

Route Alternative RA-06

Construction Impacts

Table 6.3.7-8 shows the estimated construction emissions for RA-06 between Clearbrook and Carlton. The Applicant-proposed measures to minimize air impacts for the Applicant's preferred route also would be implemented for the route alternative; consequently, air quality impacts during construction would be minor and temporary.

Table 6.3.7-7. Estimated Operations Emissions for Route Alternative RA-03AM in Minnesota

Emission Source Description	Direct Emissions (tons per year)[a]								Indirect Emissions (tons per year)[b]
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs	GHGs
Pump station fugitive emissions from pumps, piping components, sump tanks, and pig traps	3.7	0.0	0.0	0.0	0.0	0.0	0.05	0.1	N/A
Mainline valve fugitive emissions from piping components	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.004	N/A
Clearbrook terminal fugitive emissions from pumps, piping components, sump tanks, and pig traps	0.5	0.0	0.0	0.0	0.0	0.0	0.006	0.02	N/A
Additional Clearbrook terminal storage tank withdrawal losses from pipeline throughput	17.5	0.0	0.0	0.0	0.0	0.0	372.2	1.2	N/A
Unpaved roads fugitive emissions[c]	--	--	--	--	--	--	--	--	N/A
Vehicle combustion emissions[c]	--	--	--	--	--	--	--	--	N/A
Pump stations indirect emissions from being powered by electricity from existing local electric utilities	--	--	--	--	--	--	--	--	518,668.3
TOTAL EMISSIONS	**21.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**372.2**	**1.3**	**518,668.3**

Source: Enbridge 2017.

[a] Only those emissions associated with the proposed increase in throughput of the Clearbrook terminal are included as part of the operations emissions (i.e., existing operations emissions are equivalent to the existing environment).

[b] Because the projected power consumption from the pump stations is unknown, indirect GHG emissions for the route alternatives were calculated based on 452,497 tons of CO_2e per year for the Applicant's preferred route over 380 total miles (i.e., 1,191 tons of CO_2e per year per mile).

[c] Air emissions from vehicles and unpaved roads have not been quantified for operations for RA-03AM.

Note:

Operations emissions are based on 9 pump stations and 29 mainline valve sites.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, N/A = not applicable, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Table 6.3.7-8. Estimated Construction Emissions for Route Alternative RA-06 between Clearbrook and Carlton

Emission Source Description	Direct Emissions (tons)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
On- and off-road diesel equipment combustion emissions	30.8	443.1	434.5	0.8	19.1	17.8	85,031.4	1.9
On- and off-road gasoline equipment combustion emissions	3.9	8.4	54.8	4.2	0.8	0.8	7,555.6	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	212.3	52.1	0.0	0.0
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	30.1	3.0	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	978.8	0.0	95.3	95.3	506.1	0.0
Blasting emissions[a]	--	--	--	--	--	--	--	--
TOTAL EMISSIONS	**34.7**	**451.5**	**1,468.0**	**5.0**	**357.6**	**169.0**	**93,093.0**	**1.9**

Source: Enbridge 2017.

[a] Blasting emissions have not been quantified.

Notes:

Calculations are based on the emissions per spread presented in Table 5.2.7-6 (absent blasting), and an average of 54.8 miles per spread was used to determine emissions per mile. Emissions per mile then were multiplied by the corresponding pipeline length to determine the emissions for each emission source group for the route alternative.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Stored Carbon Releases

During construction, RA-06 could require removal of trees from the construction work area between Clearbrook and Carlton that, when removed, would release GHGs. Using the same emission factor of 30.2 metric-tons of carbon per acre as noted for the Applicant's preferred route, the amount of carbon that potentially would be released back into the atmosphere during construction tree removal of 1,107 acres is estimated at 135,272 tons of CO_2e. Regrowth on the forest on the 646 acres outside of the pipeline right-of-way eventually would more than halve this loss, in the long run, after forest regrowth, bringing net CO_2 emissions from forest clearance to a level of about 56,245 tons.

Operations Impacts

Table 6.3.7-9 shows the estimated operations emissions for RA-06 in Minnesota based on 7 pump stations and 24 MLV sites (Enbridge 2017). The table includes indirect GHG emissions from the purchase of electricity for pump station operations determined as a function of the pipeline length. Although the route alternative varies only in the Clearbrook-to-Carlton segment, the operations emissions presented in the table are for the entire pipeline route within Minnesota. Similar to the Applicant's preferred route, operations of RA-06 would result in minor permanent impacts on air quality, and GHG emissions could contribute to global climate change. Note that emissions from vehicle combustion and unpaved roads have not been quantified.

Table 6.3.7-9. Estimated Operations Emissions for Route Alternative RA-06 in Minnesota

Emission Source Description	Direct Emissions (tons per year)[a]								Indirect Emissions (tons per year)[b]
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs	GHGs
Pump station fugitive emissions from pumps, piping components, sump tanks, and pig traps	2.9	0.0	0.0	0.0	0.0	0.0	0.04	0.09	N/A
Mainline valve fugitive emissions from piping components	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.003	N/A
Clearbrook terminal fugitive emissions from pumps, piping components, sump tanks, and pig traps	0.5	0.0	0.0	0.0	0.0	0.0	0.006	0.02	N/A
Additional Clearbrook terminal storage tank withdrawal losses from pipeline throughput	17.5	0.0	0.0	0.0	0.0	0.0	372.2	1.2	N/A
Unpaved roads fugitive emissions[c]	--	--	--	--	--	--	--	--	N/A
Vehicle combustion emissions[c]	--	--	--	--	--	--	--	--	N/A
Pump stations indirect emissions from being powered by electricity from existing local electric utilities	--	--	--	--	--	--	--	--	425,442.1
TOTAL EMISSIONS	**21.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**372.2**	**1.3**	**425,442.1**

Source: Enbridge 2017.

[a] Only those emissions associated with the proposed increase in throughput of the Clearbrook terminal are included as part of the operations emissions (i.e., existing operations emissions are equivalent to the existing environment).

[b] Because the projected power consumption from the pump stations are unknown, indirect GHG emissions for the route alternatives were calculated based on 452,497 tons of CO_2e per year for the Applicant's preferred route over 380 total miles (i.e., 1,308 tons of CO_2e per year per mile).

[c] Air emissions from vehicles and unpaved roads have not been quantified for operations for RA-06.

Notes:

Operations emissions are based on 7 pump stations and 24 mainline valve sites.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, N/A = not applicable, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Loss of Carbon Sequestration

Following construction of RA-06, 646 acres of previously forested land could be reforested to provide a carbon sequestration (storage) reservoir. The remaining 461 acres along the permanent right-of-way between Clearbrook and Carlton would remain cleared and would not provide any future carbon sequestration. Using the same emission factor of 1.6 metric-tons of CO_2 per acre per year as noted for the Applicant's preferred route, the amount of carbon that would have been sequestered for 461 acres is estimated at 829 tons of CO_2e per year.

Route Alternative RA-07

Construction Impacts

Table 6.3.7-10 shows the estimated construction emissions for RA-07 between Clearbrook and Carlton. The Applicant-proposed measures to minimize air impacts for the Applicant's preferred route also would be implemented for the route alternative; consequently, air quality impacts during construction would be minor and temporary.

Table 6.3.7-10. Estimated Construction Emissions for Route Alternative RA-07 between Clearbrook and Carlton

Emission Source Description	Direct Emissions (tons)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
On- and off-road diesel equipment combustion emissions	26.2	377.8	370.4	0.7	16.2	15.2	72,487.5	1.6
On- and off-road gasoline equipment combustion emissions	3.4	7.2	46.7	3.6	0.7	0.6	6,441.0	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	181.0	44.4	0.0	0.0
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	25.7	2.6	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	834.4	0.0	81.2	81.2	431.4	0.0
Blasting emissions[a]	--	--	--	--	--	--	--	--
TOTAL EMISSIONS	**29.6**	**384.9**	**1,251.5**	**4.3**	**304.8**	**144.1**	**79,359.9**	**1.6**

Source: Enbridge 2017.

[a] Blasting emissions have not been quantified.

Notes:

Calculations are based on the emissions per spread presented in Table 5.2.7-6 (absent blasting), and an average of 54.8 miles per spread was used to determine emissions per mile. Emissions per mile then were multiplied by the corresponding pipeline length to determine the emissions for each emission source group for the route alternative.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Stored Carbon Releases

During construction, RA-07 could require removal of trees from the construction work area between Clearbrook and Carlton that, when removed, would release GHGs. Using the same emission factor of 30.2 metric-tons of carbon per acre as noted for the Applicant's preferred route, the amount of carbon that would potentially be released back into the atmosphere during construction tree removal of 1,146 acres is estimated at 140,048 tons of CO_2e. Regrowth of the forest on the 904 acres outside of the pipeline right-of-way eventually would more than halve this loss, in the long run, after forest regrowth, bringing net CO_2 emissions from forest clearance to a level of about 29,520 tons.

Operations Impacts

Table 6.3.7-11 shows the estimated operations emissions for RA-07 in Minnesota based on 7 pump stations and 22 MLV sites for RA-07 (Enbridge 2017). The table includes indirect GHG emissions from the purchase of electricity for pump station operations determined as a function of the pipeline length. Although the route alternative varies only in the Clearbrook-to-Carlton segment, the operations emissions presented in the table are for the entire pipeline route within Minnesota. Similar to the Applicant's preferred route, operations of RA-07 would result in minor permanent impacts on air quality, and GHG emissions could contribute to global climate change. Note that emissions from vehicle combustion and unpaved roads have not been quantified.

Loss of Carbon Sequestration

Following construction of RA-07, 904 acres of previously forested land could be reforested to provide a carbon sequestration (storage) reservoir. The remaining 242 acres along the permanent right-of-way between Clearbrook and Carlton would remain cleared and would not provide any future carbon sequestration. Using the same emission factor of 1.6 metric-tons of CO_2 per acre per year as used for the Applicant's preferred route, the amount of carbon that would have been sequestered for 242 acres is estimated at 435 tons of CO_2e per year.

Table 6.3.7-11. Estimated Operations Emissions for Route Alternative RA-07 in Minnesota

Emission Source Description	Direct Emissions (tons per year)[a]								Indirect Emissions (tons per year)[b]
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs	GHGs
Pump station fugitive emissions from pumps, piping components, sump tanks, and pig traps	2.9	0.0	0.0	0.0	0.0	0.0	0.04	0.09	N/A
Mainline valve fugitive emissions from piping components	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.003	N/A
Clearbrook terminal fugitive emissions from pumps, piping components, sump tanks, and pig traps	0.5	0.0	0.0	0.0	0.0	0.0	0.006	0.02	N/A
Additional Clearbrook terminal storage tank withdrawal losses from pipeline throughput	17.5	0.0	0.0	0.0	0.0	0.0	372.2	1.2	N/A
Unpaved roads fugitive emissions[c]	--	--	--	--	--	--	--	--	N/A
Vehicle combustion emissions[c]	--	--	--	--	--	--	--	--	N/A
Pump stations indirect emissions from being powered by electricity from existing local electric utilities	--	--	--	--	--	--	--	--	390,873.7
TOTAL EMISSIONS	**21.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**372.2**	**1.3**	**390,873.7**

Source: Enbridge 2017.

[a] Only those emissions associated with the proposed increase in throughput of the Clearbrook terminal are included as part of the operations emissions (i.e., existing operations emissions are equivalent to the existing environment).

[b] Because the projected power consumption from the pump stations are unknown, indirect GHG emissions for the route alternatives were calculated based on 452,497 tons of CO_2e per year for the Applicant's preferred route over 380 total miles (i.e., 1,308 tons of CO_2e per year per mile).

[c] Air emissions from vehicles and unpaved roads have not been quantified for operations for RA-07.

Notes:

Operations emissions are based on 7 pump stations and 22 mainline valve sites.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, N/A = not applicable, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Route Alternative RA-08

Construction Impacts

Table 6.3.7-12 shows the estimated construction emissions for RA-08 between Clearbrook and Carlton. The Applicant-proposed measures to minimize air impacts for the Applicant's preferred route also would be implemented for the route alternative; consequently, air quality impacts during construction would be minor and temporary.

Table 6.3.7-12. Estimated Construction Emissions for Route Alternative RA-08 between Clearbrook and Carlton

Emission Source Description	Direct Emissions (tons)							
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs
On- and off-road diesel equipment combustion emissions	25.8	371.3	364.0	0.7	16.0	14.9	71,238.6	1.9
On- and off-road gasoline equipment combustion emissions	3.3	7.0	45.9	3.5	0.7	0.6	6,330.0	0.0
Paved roads fugitive emissions	0.0	0.0	0.0	0.0	177.8	43.7	0.0	0.0
Unpaved roads fugitive emissions	0.0	0.0	0.0	0.0	25.2	2.5	0.0	0.0
Open burning of wood debris emissions	0.0	0.0	820.0	0.0	79.8	79.8	424.0	0.0
Blasting emissions[a]	--	--	--	--	--	--	--	--
TOTAL EMISSIONS	**29.1**	**378.3**	**1,229.9**	**4.2**	**299.6**	**141.6**	**77,992.0**	**1.6**

Source: Enbridge 2017.

[a] Blasting emissions have not been quantified.

Notes:

Calculations are based on the emissions per spread presented in Table 5.2.7-6 (absent blasting), and an average of 54.8 miles per spread was used to determine emissions per mile. Emissions per mile then were multiplied by the corresponding pipeline length to determine the emissions for each emission source group for the route alternative.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

Stored Carbon Releases

During construction, RA-08 could require removal of trees from the construction work area between Clearbrook and Carlton that, when removed, would release GHGs. Using the same emission factor of 30.2 metric-tons of carbon per acre as used for the Applicant's preferred route, the amount of carbon that would potentially be released back into the atmosphere during construction tree removal of 773 acres is estimated at 944,408 tons of CO_2e. Regrowth of the forest on the 453 acres outside of the pipeline right-of-way eventually would more than halve this loss, in the long run, after forest regrowth, bringing net CO_2 emissions from forest clearance to a level of about 39,035 tons.

Operations Impacts

Table 6.3.7-13 shows the estimated operations emissions for RA-08 in Minnesota based on 6 pump stations and 22 MLV sites (Enbridge 2017). The table includes indirect GHG emissions from the purchase of electricity for pump station operations determined as a function of the pipeline length. Although the route alternative varies only in the Clearbrook-to-Carlton segment, the operations emissions presented in the table are for the entire pipeline route within Minnesota. Similar to the Applicant's preferred route, operations of RA-08 would result in minor permanent impacts on air quality, and GHG emissions could contribute to global climate change. Note that emissions from vehicle combustion and unpaved roads have not been quantified.

Loss of Carbon Sequestration

Following construction of RA-08, 453 acres of previously forested land could be reforested to provide a carbon sequestration (storage) reservoir. The remaining 320 acres along the permanent right-of-way between Clearbrook and Carlton would remain cleared and would not provide any future carbon sequestration. Using the same emission factor of 1.6 metric-tons of CO_2 per acre per year as used for the Applicant's preferred route, the amount of carbon that would have been sequestered for 320 acres is estimated at 575 tons of CO_2e per year.

Table 6.3.7-13. Estimated Operations Emissions for Route Alternative RA-08 in Minnesota

Emission Source Description	Direct Emissions (tons per year)[a]								Indirect Emissions (tons per year)[b]
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	HAPs	GHGs
Pump station fugitive emissions from pumps, piping components, sump tanks, and pig traps	2.5	0.0	0.0	0.0	0.0	0.0	0.03	0.08	N/A
Mainline valve fugitive emissions from piping components	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.003	N/A
Clearbrook terminal fugitive emissions from pumps, piping components, sump tanks, and pig traps	0.5	0.0	0.0	0.0	0.0	0.0	0.006	0.02	N/A
Additional Clearbrook terminal storage tank withdrawal losses from pipeline throughput	17.5	0.0	0.0	0.0	0.0	0.0	372.2	1.2	N/A
Unpaved roads fugitive emissions[c]	--	--	--	--	--	--	--	--	N/A
Vehicle combustion emissions[c]	--	--	--	--	--	--	--	--	N/A
Pump stations indirect emissions from being powered by electricity from existing local electric utilities	--	--	--	--	--	--	--	--	387,450.4
TOTAL EMISSIONS	**20.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**372.2**	**1.3**	**387,450.4**

Source: Enbridge 2017.

[a] Only those emissions associated with the proposed increase in throughput of the Clearbrook terminal are included as part of the operations emissions (i.e., existing operations emissions are equivalent to the existing environment).

[b] Because the projected power consumption from the pump stations are unknown, indirect GHG emissions for the route alternatives were calculated based on 452,497 tons of CO_2e per year for the Applicant's preferred route over 380 total miles (i.e., 1,308 tons of CO_2e per year per mile).

[c] Air emissions from vehicles and unpaved roads have not been quantified for operations for RA-08.

Notes:

Operations emissions are based on 6 pump stations and 22 mainline valve sites.

CO = carbon monoxide, GHGs = greenhouse gases, HAPs = hazardous air pollutants, N/A = not applicable, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

"--" = Emissions not estimated.

6.3.7.4 Summary and Mitigation

6.3.7.4.1 Summary

Overall, construction impacts on air quality would be minor, localized, and intermittent and temporary along the construction work areas for the Applicant's preferred route and each of the route alternatives. This is primarily due to the nature of pipeline construction, where the construction activity moves along the pipeline route, thus limiting the exposure of residents and resources in any one area.

Air quality impacts during operations for any of the route options would be minor but permanent. Because the Applicant plans to use electric power pumps for pipeline operation, no significant new point source emissions would be created. Instead, generation of electrical power to operate the pumps would be spread through the state's existing electrical generation system. Other emissions during operations would be limited to small, limited sources. No effects on achievement of either NAAQS or MAAQS would be expected to occur from construction or operation of any of the route options, although air dispersion modeling has not been completed. GHG emissions from construction, operations, and changes in the carbon sequestration of forested lands would occur for all the route options. These GHG emissions could contribute to climate change.

The estimated construction emissions for the Applicant's preferred route and route alternatives between Clearbrook and Carlton are shown in Table 6.3.7-14. Comparing the route options, RA-03AM would have the highest emissions, followed by the Applicant's preferred route, and then RA-06, RA-07, and RA-08, in that order. The length of each alternative between Clearbrook and Carlton determines this ranking, as the longer the route distance, the higher the total construction-related emissions.

Table 6.3.7-14. Estimated Total Construction Emissions for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton

Route	Direct Emissions (tons)						
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs
Applicant's preferred route	39.0	507.0	1,648.3	5.6	401.5	189.8	104,525.1
Route alternative RA-03AM	48.5	631.2	2,052.3	7.0	499.9	236.3	130,143.3
Route alternative RA-06	34.7	451.5	1,468.0	5.0	357.6	169.0	93,093.0
Route alternative RA-07	29.6	384.9	1,251.5	4.3	304.8	144.1	79,359.9
Route alternative RA-08	29.1	378.3	1,229.9	4.2	299.6	141.6	77,992.0

Notes:

The estimates for GHGs do not include emissions from forest clearance.

Blasting emissions have not been quantified for the route alternatives.

CO = carbon monoxide, GHGs = greenhouse gases, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

During construction, all of the route options would require tree removal from construction work areas between Clearbrook and Carlton; when removed, the trees would release GHGs. The Applicant's preferred route would affect more forested lands than the route alternatives, and thus would release more GHGs. The RA-08 route would affect less forested lands than the other route options and thus would release less GHGs.

Table 6.3.7-15 presents the operations emissions (for those that can be quantified) for the Applicant's preferred route and route alternatives in Minnesota. Although the route alternatives vary only in the Clearbrook-to-Carlton segment, the operations emissions presented in the table are for the entire pipeline route within Minnesota. The table includes indirect GHG emissions from electricity purchased for operation of the pump stations. Similar to construction impacts, because the Applicant's preferred route has a shorter pipeline length than the RA-03AM route, the resulting air emissions and associated impacts from operations would be lower. Conversely, because the Applicant's preferred route has a longer pipeline length than the RA-06, RA-07, and RA-08 routes, the resulting air emissions and associated impacts from operations would be greater.

During operations, all route options would require that previously forested land within the permanent rights-of-way between Clearbrook and Carlton remain cleared. If not removed, the trees would sequester GHGs. The Applicant's preferred route would affect more forested lands than the route alternatives and thus would remove more sequestration potential. The RA-07 route would affect less forested lands than the other route options and thus would remove less sequestration potential.

Table 6.3.7-15. Estimated Operations Emissions for the Applicant's Preferred Route and Route Alternatives in Minnesota

Route	Direct Emissions (tons per year)							Indirect Emissions (tons per year)
	VOCs	NOx	CO	SO_2	PM-10	PM-2.5	GHGs	GHGs
Applicant's preferred route	21.0	0.004	0.03	0.002	0.1	0.01	375.9	452,497.6
Route alternative RA-03AM	21.8	0.0	0.0	0.0	0.0	0.0	372.2	518,668.3
Route alternative RA-06	21.0	0.0	0.0	0.0	0.0	0.0	372.2	425,442.1
Route alternative RA-07	21.0	0.0	0.0	0.0	0.0	0.0	372.2	390,873.7
Route alternative RA-08	20.6	0.0	0.0	0.0	0.0	0.0	372.2	387,420.4

Notes:

The estimates for GHGs do not include emissions for lost sequestration potential.

Air emissions from vehicles and unpaved roads have not been quantified for the route alternatives.

CO = carbon monoxide, GHGs = greenhouse gases, NOx = nitrogen oxide, PM-10 = suspended particulate matter less than or equal to 10 microns in diameter, PM-2.5 = fine PM less than or equal to 2.5 microns in diameter, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

In summary, construction- and operations-related impacts on air quality would be expected to be minor for all routes, as detailed in Table 6.3.7-16. Construction and operation of the Applicant's preferred route and route alternatives would directly contribute to global GHG emissions and associated climate change, which collectively could lead to a threat to public health and welfare. For further information about the impacts of climate change, refer to Chapter 12.

6.3.7.4.2 Mitigation

Beyond the Applicant-proposed measures described above for the Applicant's preferred route, air impacts could be reduced further by:

- Burning small and dry brush piles only;
- Operating construction equipment as far as possible from sensitive receptors (e.g., residences, schools, and hospitals);
- Limiting construction equipment idling to the extent practical when not in use; and
- Following equipment manufacturer-recommended operations and good combustion practices, including not tampering with engines to increase horsepower and using ultra-low sulfur diesel.

Further mitigation for GHG emissions could include compensatory measures such as:

- Investment in new terrestrial carbon storage programs (forest establishment, other types of vegetation restoration);
- Purchase of GHG offset credits;
- Investment in renewable energy development; and
- Contributing resources to regional and local climate adaptation programs.

Table 6.3.7-16. Summary of Potential Impacts on Air Quality for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Direct and indirect emissions	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts	Temporary/minor impacts
Greenhouse gases (GHG)	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change
Operations Impacts					
Direct and indirect emissions	Permanent/minor impacts	Permanent/minor impacts	Permanent/minor impacts	Permanent/minor impacts	Permanent/minor impacts
Greenhouse gases (GHG)	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change	GHG emissions contribute to overall global climate change

[a] **The individual rows in this table should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on on the factors represented by the individual rows is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Information in this table should be coupled with an understanding of the quanitative estimates and qualitative descriptions of impacts that are contained in the text in this section on pages 6-641 to 6-656. This table, for example, provides a general assessment of the duration and magnitude of impacts from construction emissions of criteria pollutants, however a more complete discussion of the quantitative and qualitative impacts that could occur as a result of construction emissions of criteria pollutants is contained in the impacts discussion in the text (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-641 to 6-645. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-646 to 6-647. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-647 to 6-651. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.3.7-16. Summary of Potential Impacts on Air Quality for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-651 to 6-653. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-654 to 6-656. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.3.7.5 References

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6.4 CULTURAL RESOURCES

Cultural resources include the locations of human activity, occupation, or usage that contain materials, structures, or landscapes that were used, built, or modified by people. They also include the institutions that form and maintain communities and link them to their surroundings. Cultural resources consist of archaeological resources (e.g., sites and isolated finds), historic resources (e.g., objects, buildings, structures, or districts), and sacred places (including traditional cultural properties (TCPs) and landscapes). Cultural resources also include tribal, usufructuary rights resources both within reservation boundaries and ceded lands by treaty (e.g., traditional hunting and fishing areas) and treaty areas, which are discussed in detail in Chapter 9. For the purposes of this discussion, these resources are referred to collectively as cultural resources.

The discussion of existing conditions and the evaluation of potential impacts on cultural resources, addressed in this section, are limited to archaeological and historic resources that are recorded as part of resource investigations (e.g., Phase I and Phase II archaeological surveys) and that are recorded in databases maintained by individual state historic preservation offices (SHPOs). Special attention also is made to historic properties (i.e., those listed or eligible for listing on the National Register of Historic Places [NRHP]). In this manner, cultural resources important to American Indian tribes may not be captured in their entirety. Additional discussion of resources important to American Indian tribes, as well as the confluence of cultural and natural resources are discussed in Chapter 9.

This section first describes the existing conditions for the cultural resources within an area along the Applicant's preferred route and each of the route alternatives where cultural resources could be affected by construction and operation of the Project. Potential impacts on cultural resources are discussed and compared for the Applicant's preferred route and route alternatives (RA-03AM, RA-06, RA-07, and RA-08). None of the impacts or mitigation measures described in this chapter reflect how American Indians describe impacts on the landscape and tribal resources within reservation boundaries and ceded lands (see Chapter 9). Potential impacts on cultural resources from an accidental release of crude oil are discussed in Chapter 10.

6.4.1 Regulatory Context and Methodology

6.4.1.1 Regulatory Context

Minnesota Field Archaeology Act of 1963

The Minnesota Field Archaeology Act of 1963 (Minn. Stat. 138.31-42) allows the State of Minnesota to reserve the exclusive right of field archaeology on state sites in order to protect and preserve archaeological sites on state lands. It prohibits unlicensed field archaeology on state sites and discourages unlicensed field archaeology on privately owned lands. Based on the Field Archaeology Act, it is a gross misdemeanor for a person to willfully conduct unlicensed archaeology on state sites; willfully deface, injure, destroy, displace, or remove any object or data belonging to the State; or willfully interfere with evidence or work on any state site or other site for which a license has been issued. Persons having knowledge of the location of archaeological sites are encouraged to communicate such information to the State Archaeologist.

The Field Archaeology Act also outlines the duties of the Office of the State Archaeologist (Minnesota OSA), which include consultation with the Minnesota Indian Affairs Council (MIAC). The MIAC shares legal responsibility for monitoring and enforcing laws that protect Indian human remains and associated burial items. The MIAC reviews archaeological license applications to conduct fieldwork to determine if a burial or cemetery are within the project area. The authority for the MIAC is contained in Minnesota Statutes § 138.31.

Under the Field Archaeology Act, the Minnesota OSA shares some duties with the Minnesota Historical Society (MHS), but the Minnesota OSA is not affiliated with the MHS or the State Historic Preservation Officer (SHPO). The Minnesota OSA and the MHS/SHPO operate independently but cooperatively with regard to their shared duties.

Minnesota DNR, MNDOT, and all other state agencies whose activities affect cultural resources are required to cooperate with MHS and the State Archaeologist to carry out the provisions of the Field Archaeology Act. Under the Field Archaeology Act, state agencies (i.e., the agency controlling the public lands or waters) must supply MHS and the State Archaeologist with a development plan for review and comment when known or suspected sites (i.e., when significant archaeological sites exist, or are predicted to exist) on public lands or water under their jurisdiction may be affected by implementation of the plan. The Minnesota Environmental Quality Board submits copies of EAWs to the MHS/SHPO for comment on potential effects of privately funded developments, such as the Project, on cultural resources in Minnesota (Minnesota SHPO 2005). As part of the worksheet, consideration is made for historic designations (e.g., NHRP), known artifact areas, and architectural features.

Minnesota Historic Sites Act

The Minnesota Historic Sites Act (Minn. Stat. § 138.661–669) established the Minnesota Historic Sites Network. The sites are significant state resources that MHS is preserving, developing, interpreting, and maintaining for public use, benefit, and access.

The Minnesota Historic Sites Act also created the State Register of Historic Places (SRHP), which is an inventory of outstanding properties possessing historical, architectural, archaeological, and aesthetic values that are of paramount importance in the development of the state. These historic properties represent and reflect elements of the state’s cultural, social, economic, religious, political, architectural, and aesthetic heritage. These properties are separate from the Minnesota Historic Sites Network and are not operated by MHS for historical interpretive or public use and access purposes.

Historic properties are selected for inclusion in the SRHP based on any of the following criteria:

1. The quality of significance in American history, architecture, archaeology, engineering, and culture that is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association;
2. Association with events that have made a significant contribution to the broad patterns of our history;
3. Association with the lives of persons significant in our past;
4. Embodiment of the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
5. The yielding or likelihood of yielding information pertinent in prehistory or history.

The Minnesota Historic Sites Act outlines the responsibility of the State in protecting the physical features and historic character of properties designated in the Minnesota Historic Sites Network, SRHP, or NRHP. Before carrying out any undertaking that would affect designated or listed properties, or funding or licensing an undertaking by other parties, the state department or agency must consult with the MHS to determine appropriate treatments and to seek ways to avoid and mitigate any adverse effects on designated or listed properties.

Minnesota Private Cemeteries Act

Minnesota's "Private Cemeteries Act" (Minn. Stat. § 307.08) protects all human remains and burials older than 50 years, and located outside of platted, recorded or identified cemeteries, protection from unauthorized disturbance; whether on either public or private lands or waters. In the event that a burial is either known or suspected to be associated with American Indian peoples, Minnesota OSA works together with the MIAC to ensure the integrity of these sites. The Minnesota OSA maintains a database of identified burial sites in the state.

Minnesota State Historic Preservation Office

The Minnesota SHPO is a department of MHS. While the SHPO's principal responsibilities are defined in the National Historic Preservation Act (NHPA) Section 110, the SHPO also has historic preservation duties under Minnesota state law. The SHPO acts for MHS in the review of state agency projects that may affect state archaeological sites.

The SHPO is responsible for maintaining an inventory of historic properties; identifying and nominating properties to the NRHP; implementing a statewide historic preservation plan; administering a federal grants program; assisting federal, state, and local governments with historic preservation duties; and working with state and federal agencies to ensure that historic properties (i.e., those eligible for listing or listed on the NRHP) are considered by planning and development.

As defined in 36 CFR 800, the SHPO plays a central role in the Section 106 process and "advises and assists federal agencies in carrying out their 106 responsibilities." The SHPO ensures that agencies make "a reasonable and good faith effort" to consider the effects of their undertakings on historic properties. "Historic properties" for the purposes of Section 106 are defined as sites, districts, buildings, structures, or objects that are included in or are eligible for listing in the NRHP.

Minnesota archaeological laws do not set standards for site significance and do not discuss integrity, but the SHPO evaluates affected sites using NRHP criteria and suggests treatments of significant state sites that are consistent with Section 106.

Minnesota Governor's Executive Order 13-10

The Minnesota Governor's Executive Order 13-10 directs state government agencies to implement new re consultation policies aimed at improving relationships and collaboration with Minnesota's 11 tribal governments. It provides for consultation, coordination, and cooperation between the State and the 11 Indian tribes.

Tribal Historic Preservation Offices and Tribal Policies/Ordinances

American Indian tribes also have adopted policies and/or ordinances governing cultural resources, including archaeological and historic resources. These policies often define what cultural resources are and how they will be protected for future generations.

As an example of these policies, the Mille Lacs Band of Ojibwe define archaeological resources as remains of past human life or activities, which are of archaeological or historical interest. These resources must be at least fifty years in age. This definition is part of their Cultural Resources Code (1072-MLB-23), which was enacted prior to the establishment of the Tribal Historic Preservation Officer (THPO) (see Appendix P). In addition, the Fond du Lac Band of Lake Superior Chippewa have adopted Ordinance #03/14, which established a cultural resources preservation zone to help protect and preserve cultural sensitive areas.

In addition to these policies and/or ordinances, the THPOs have assumed Section 106 responsibilities for archaeological sites and TCPs, as well as other duties. Among the THPOs in MN are the Bois Forte Band of Chippewa Indians, the Fond du Lac Band of Lake Superior Chippewas, the Grand Portage Band of Lake Superior Chippewa, the LLBO, Lower Sioux Indian Community, Mille Lacs Band of Ojibwe Indians, Prairie Island Indian Community, Upper Sioux Community, and the White Earth Band of Minnesota Chippewa.

6.4.1.2 Methodology

The ROI for this impact analysis encompasses the areas in the estimated footprints of the Applicant's preferred route and route alternatives where archaeological or historic resources could be directly or indirectly disturbed during Project-related construction or operations. The ROI for the Applicant's preferred route includes the construction work area, permanent right-of-way, ATWS, access roads, and aboveground facilities, including 0.5 mile on either side of the pipeline centerline for archaeological resources, and 1 mile on either side of the pipeline centerline for historic resources. The ROI also includes 0.5 mile on either side of the pipeline centerline for archaeological resources and 1 mile on either side of the pipeline centerline for historic resources for the route alternatives. For route alternatives, no locations for ATWS, access roads or aboveground facilities have been identified; however, the ROI would generally encompass the likely extent of the features.

Existing data were obtained from MHS on November 16, 2017, for archaeological and historic resources within the ROI for Minnesota. Cultural resource data from the MHS includes information on the following: properties that are listed in the NRHP or SRHP; resources that have been determined eligible for listing in the NRHP through previous federal or state review; and resources that have been identified through reconnaissance surveys, but which have not been evaluated for NRHP eligibility or are not recommended for listing. Sensitive locational information, however, is not provided within the context of this EIS. This type of information, however, was considered in evaluating the potential impacts on cultural resources. For the route alternatives, data reviewed includes only that provided as part of the SHPO database, whereas for the Applicant's preferred route, information also is available for archaeological surveys conducted within Minnesota.

Cemetery data also was reviewed based on available GIS data. Available cemetery data included information for Minnesota. This data is not intended to represent a full list and may exclude small, family owned cemeteries and those without names. Cemetery information is included in the discussion of historic resources and is treated as a historic resource within the impacts discussion, unless noted as an archaeological resource within a SHPO database.

The data collected included site number, site/property type, site location, date of recordation, historic context, and associated reports. The types of cultural resources were input into GIS and overlaid with the Applicant's preferred route and route alternatives. Potential impacts on archaeological and historic resources for the Applicant's preferred route and route alternatives were considered where construction or operation of the routes could cause disturbance, loss, or modification of the resource.

National Register data was reviewed using data from the NPS (2014). This data provides information on those properties listed within the NRHP as of April 28, 2014. The file reviewed consists of properties listed within the Midwest.

Additionally, surveys were completed for archaeological resources by the Applicant for the Applicant's preferred route in Minnesota; the information from these surveys is included in this analysis. DOC-EERA's consultation with SHPO is ongoing, and the results of the consultation concerning determinations of eligibility, Project effects, and any necessary treatment for impacts are not currently available.

Information concerning sacred places or resources with importance to American Indian tribes is not available through SHPO databases, but may be available through consultation with affected American Indian tribes. Where information is known on resources of this type or TCPs, information is provided within this chapter. Details on ongoing tribal consultation and coordination can be found in Chapter 9 and Appendix P. **In its December 14, 2017, order finding the Line 3 Project EIS inadequate, the Commission specified that the traditional cultural properties survey must be completed before the start of any construction pursuant to any permit granted in the Line 3 Project proceeding.**[20]

As noted in previous sections, no one dataset for cultural resources provides a complete indication of all relevant impacts to them. However, taken together these datasets provide a reasonably comprehensive indication of the potential impacts. For instance, the number of resources alone do not account for the size or significance of a particular site or structure. However, data from the National Register dataset (and where available, survey information) in combination can aid the reader in understanding the number of resources along the route already known to be significant and how they may be impacted by the proposed route or the alternatives. Known resources also hint as to the types of resources that may be present.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. The summary table at the end of the cultural resources section provides counts of resources and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to these resources is contained within the text of this section.

[20] **Minnesota Public Utilities Commission (December 14, 2017) Order Finding Environmental Impact Statement Inadequate, e-dockets No. 201712-138168-01**

6.4.2 Existing Conditions

6.4.2.1 Applicant's Preferred Route

6.4.2.1.1 Archaeological Resources

For the Applicant's preferred route in Minnesota, the Applicant conducted 11 archaeological surveys (Phase I) and site evaluations (Phase II) between May 2013 and August 2016 (Table 6.4.2-1). As part of the Applicant's surveys, over 80 archaeological resources were identified and re-visited (i.e., those that were previously documented). According to a 2017 summary report of the investigations, 59 of the resources are located within the Applicant's preferred route (Mueller 2017). The survey corridor for the Applicant's preferred route comprised an area of 23,874 ac (9,661 ha); a total of 23,513 ac (9,515 ha) of the corridor have been surveyed by the Applicant for archaeological resources through April 2017 (Mueller 2017).

Based on data obtained from MHS on November 17, 2016, 53 previously recorded archaeological resources are located within the archaeological resources ROI for the Applicant's preferred route in Minnesota (Table 6.4.2-2). Of these 53 archaeological resources in the ROI, 9 would be located within the construction work area, 4 of which are in the permanent right-of-way (Table 6.4.2-2). Additionally, three archaeological resources would be located within the ATWS for the Applicant's preferred route.

Based on a review of NPS data (2014) and MHS data (for MN portions only), no NRHP listed historic properties (that are archaeological in nature) are located within the construction workspaces, the permanent right-of-way, or ROI for the Applicant's preferred route.

Table 6.4.2-1. Archaeological Investigations Conducted by the Applicant in the Region of Interest for the Applicant's Preferred Route in Minnesota

Survey Date	Survey Type	Reference	Archaeological Resources Identified/ Revisited[a]	Period	NRHP Status Recommendations	Counties	Miles Surveyed	Acres Surveyed
May – November 2013	Phase I	Mueller et al. April 2014	48	35 - Pre-Contact Sites 12 - Post-Contact Sites 1 Pre and Post Contact Site	35 – Not eligible 2 – Recommended as eligible 2 – Recommended for additional testing 9 - Not evaluated * 1 cemetery protected by other regulations (not included in total count)	Aitkin, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Polk, and Red Lake	358	16,756
April – October 2014	Phase I and Phase II	Watson et al. 2014 Addendum	9	8 – Pre-Contact Sites 1 – Post-Contact Site	6 - Not eligible 2 - Not evaluated 1 - Recommended for additional testing	Polk, Crow Wing, Clearwater, Red Lake, Cass, Hubbard, Wadena, Aitkin, and Carlton	Unknown	3,800
May – November 2014	Phase I	Mueller and Terry March 2015	18	12 - Pre-Contact Sites 5 - Post-Contact Sites 1 Pre and Post Contact Site	17 – Not eligible 1 – Not evaluated	Kittson, Marshall, Pennington, Red Lake, Polk, and Clearwater	119	8,263
July 2014	Phase II	Mueller and Terry	1	1 – Pre and Post-Contact Site	1 – Not eligible	Hubbard	Unknown	Unknown
June – August 2015	Phase I	Mueller and Terry October 2015	2	1 - Pre-Contact Site 1 - Post-Contact Site	2 – Not eligible	Aitkin, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Polk, and Red Lake	Unknown	1,617

Table 6.4.2-1. Archaeological Investigations Conducted by the Applicant in the Region of Interest for the Applicant's Preferred Route in Minnesota

Survey Date	Survey Type	Reference	Archaeological Resources Identified/ Revisited[a]	Period	NRHP Status Recommendations	Counties	Miles Surveyed	Acres Surveyed
August – November 2015	Phase I	Mueller et al. 2016 Addendum	4	4 – Pre-Contact Sites	4 – Not eligible	Aitkin, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Polk, and Red Lake	Unknown	1,347
June – July 2015	Phase II	Watson et al. September 2015	5	5 – Pre-Contact Sites	4 – Not eligible 1 – Recommended eligible	Polk, Clearwater, Hubbard, and Carlton	N/A	N/A
June – August 2015	Phase I	Mueller and Terry October 2015	2	2 – Post-Contact Sites	2 –Not eligible	Kittson, Marshall, Pennington, Red Lake, Polk, and Clearwater	119	8,409
August – November 2015	Phase I	Mueller et al. February 2016 Addendum	1	1 – Post –Contact Site	1 – Not eligible	Polk	Unknown	69
June – August 2016	Phase 1	Mueller September 2016	3	3 - Post-Contact Sites	3 – Not eligible	Aitkin, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Polk, and Red Lake	Unknown	781 mainline/ 139 access roads
June – August 2016	Phase 1	Mueller September 2016	0	Not applicable	Not applicable	Kittson, Marshall, Pennington, Red Lake, Polk, and Clearwater	Unknown	61 mainline/ 1 access roads

[a] Please note – the total number of sites may be overrepresented as some were subject to Phase II testing, and they, therefore, may be double-counted.

Table 6.4.2-2. Previously Recorded Archaeological Resources in the Region of Interest for the Applicant's Preferred Route

Route Segment	Number of Archaeological Resources in Region of Interest	Number of Archaeological Resources in Construction Work Area	Number of Archaeological Resources in Permanent Right-of-Way	Number of NRHP Historic Properties (Archaeological) within the ROI[a]
North Dakota border to Clearbrook	27	1	0	0
Clearbrook to Carlton	24	8	4	0
Carlton to Wisconsin border	2	0	0	0

Source: MHS 2016.

[a] The ROI for the Applicant's preferred route consists of 0.5 mile to either side of the centerline for archaeological resources.

6.4.2.1.2 Historic Resources

Based on data obtained from MHS on November 17, 2016, 80 previously recorded historic resources are located within the ROI for the Applicant's preferred route (Table 6.4.2-3). These historic resources include structures, buildings, and bridges. None of these would be located within the construction work area or the permanent right-of-way of the Applicant's preferred route.

Table 6.4.2-3. Previously Recorded Historic Resources in the Region of Interest for the Applicant's Preferred Route

Route Segment	Number of Historic Resources in Region of Interest (ROI)	Number of Historic Resources in Construction Work Area	Number of Historic Resources in Permanent Right-of-Way	Number of NRHP Historic Properties (Above-Ground) within the ROI[a]
North Dakota border to Clearbrook	34	0	0	0
Clearbrook to Carlton	40	0	0	1
Carlton to Wisconsin border	6	0	0	0

Source: MHS 2016.

[a] The ROI for the Applicant's preferred route consists of 1.0 miles to either side of the centerline for historic resources.

Based on a review of NPS data (2014) and MHS data (for MN portions only), no NRHP listed historic properties (that are above-ground) are located within the construction workspaces or the permanent right-of-way for the Applicant's preferred route. However, the Itasca State Park, a NRHP listed property, is within the ROI. This resource also is referred to as the Itasca State Park CCC/WPA/Rustic Style historic resources. It contains multiple contributing resources (NPS 2014).

Within Minnesota, 31 cemeteries are located within the ROI of the Applicant's preferred route. Among these, 17 are within 0.5 miles, and 14 are within 1 mile. Among these, 16 are located between Clearbrook and Carlton. None are located within an American Indian reservation.

6.4.2.1.3 Traditional Cultural Properties

As noted in Section 5.4.1.1.6, TCPs are places of traditional religious and cultural importance. They often are associated with American Indian tribes and nations, but they can be attributed to other cultural groups. A TCP can be eligible for or listed on the NRHP. For this reason, they are considered herein.

To date, no specific studies of TCPs have been completed within the ROI, and as such, no specific locations and/or details are known at this time. However, information gathered from the consultation with American Indian tribes with an interest within the ROI have indicated that TCPs are present (see Appendix P). For instance, the Ojibwe consider wild rice waters to be TCPs (Hoppe 2017).

6.4.2.2 Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to archaeological and historic resources for the route alternatives between Clearbrook and Carlton are described below. No Project-specific surveys were conducted for archaeological or historic resources; the following summary is based on available data obtained from MHS on November 17, 2016 and where applicable, a review of NPS data for listed NRHP resources.

6.4.2.2.1 Route Alternative RA-03AM

Archaeological Resources

Based on data obtained from MHS, 47 previously recorded archaeological resources are located within the ROI between Clearbrook and Carlton for RA-03AM. Of these, six would be in the construction work area, one of which would also be in the permanent right-of-way.

Based on a review of NPS data (2014) and MHS data (for MN portions only), no NRHP listed historic properties (that are archaeological in nature) are located within the construction workspaces, the permanent right-of-way, or ROI for RA-03AM.

Historic Resources

Based on data obtained from MHS, 141 previously recorded historic resources are located in the ROI between Clearbrook and Carlton for RA-03AM; seven of these would be within the construction work area, and two would be in the permanent right-of-way.

Seven NRHP listed properties would be located within the ROI within Minnesota. These include the John A. Oldenburg House (Minnesota 18, Finlayson, Pine County), the Ogilvie Watertower (Anderson Street, Ogilvie, Kanabec County), the Milaca Municipal Hall (145 Central Avenue, South, Milaca, Mille Lacs County), the Mille Lacs County Courthouse (635 2nd Street, Southeast, Milaca, Mille Lacs County), the Northern Pacific Depot (Front Street, Finlayson, Pine County), the Itasca Park State (21 mi. N of Park Rapids off U.S. 71, Park Rapids, Clearwater County), and the Our Lady of the Angels Academy (18801 Riverwood Drive, Little Falls, Morrison County) (NPS 2014).

Within Minnesota, 43 cemeteries are located within the ROI. Among these, 20 are within 0.5 miles, and 23 are within 1 mile. Twenty-seven of the cemeteries are located between Clearbrook and Carlton. None are located within an American Indian reservation.

Traditional Cultural Properties

To date, no specific studies of TCPs have been completed within the ROI, and as such, no specific locations and/or details are known at this time. However, information gathered from the consultation with American Indian tribes with an interest within the ROI have indicated that TCPs are present (see Appendix P). For instance, the Ojibwe consider wild rice waters to be TCPs (Hoppe 2017).

6.4.2.2.2 Route Alternative RA-06

Archaeological Resources

Based on data obtained from MHS, eight previously recorded archaeological resources were identified within the ROI between Clearbrook and Carlton for RA-06, none of which would be in the construction work area or in the permanent right-of-way.

Based on a review of NPS data (2014) and MHS data (for MN portions only), no NRHP listed historic properties (that are archaeological in nature) are located within the construction workspaces, the permanent right-of-way, or ROI.

Historic Resources

Based on data obtained from MHS, 27 previously recorded historic resources are located in the ROI between Clearbrook and Carlton for RA-06, one of which would be in the construction work area (none would be in the permanent right-of-way).

One NRHP listed property is located within the ROI within Minnesota. It includes the District No. 132 School, which is located along County Road 500 in Pinewood, Beltrami County (NPS 2014).

Within Minnesota, 19 cemeteries are located within the ROI. Among these, 11 are within 0.5 miles, and eight are within 1 mile. Three of these cemeteries are located between Clearbrook and Carlton. None are located within an American Indian reservation.

Traditional Cultural Properties

To date, no specific studies of TCPs have been completed within the ROI for RA-06, and as such, no specific locations and/or details are known at this time. However, information gathered from the consultation with American Indian tribes with an interest within the ROI have indicated that TCPs are present (see Appendix P). For instance, the Ojibwe consider wild rice waters to be TCPs (Hoppe 2017).

6.4.2.2.3 Route Alternative RA-07

Archaeological Resources

Based on data obtained from MHS, 107 previously recorded archaeological sites were identified within the ROI between Clearbrook and Carlton for RA-07. Of these, seven would be in the construction work area, five of which would be in the permanent right-of-way.

Based on a review of NPS data (2014) and MHS data (for MN portions only), no NRHP listed historic properties (that are archaeological in nature) are located within the construction workspaces, the permanent right-of-way, or ROI.

Historic Resources

Based on data obtained from MHS, 166 previously recorded historic resources are located in the ROI between Clearbrook and Carlton for RA-07; three of these would be in the construction work area, and one would be in the permanent right-of-way.

Three NRHP listed properties are located within the ROI within Minnesota. These include the Itasca Lumber Company Superintendent's House (506 5^{th} Street in Deer River, Itasca County), the Supervisor's Office Headquarters (Ash Avenue in Cass Lake, Cass County), and the Winnibigoshish Resort (on U.S. Route 2 in Bena, Cass County) (NPS 2014).

Within Minnesota, 31 cemeteries are located within the ROI. Among these, 18 are within 0.5 miles, and 13 are within 1 mile. Fifteen are located between Clearbrook and Carlton. Four are located within an American Indian reservation; they include the Mary Donald Cemetery, the Pine Grove Cemetery, the Saint Joseph Cemetery, and the Thompson Cemetery. These are all within the boundaries of the Leech Lake Reservation.

Traditional Cultural Properties

To date, no specific studies of TCPs have been completed within the ROI. Information gathered from the consultation with American Indian tribes with an interest within the ROI have indicated that TCPs are present (see Appendix P). The Ojibwe consider wild rice waters to be TCPs. Among these TCPs is Deadfish Lake; the lake itself is approximately 0.6 miles from the centerline of RA-07 (Hoppe 2017). Additional information concerning this TCP was not available at the time of this assessment.

6.4.2.2.4 Route Alternative RA-08

Archaeological Resources

Based on data obtained from MHS, 119 previously recorded archaeological resources were identified within the ROI between Clearbrook and Carlton for RA-08. Of these, 12 would be in the construction work area, and 10 would be in the permanent right-of-way.

Based on a review of NPS data (2014) and MHS data (for MN portions only), no NRHP listed historic properties (that are archaeological in nature) are located within the construction workspaces, the permanent right-of-way, or ROI.

Historic Resources

Based on data obtained from MHS, 74 previously recorded historic resources are located in the ROI between Clearbrook and Carlton for RA-08; three of these would be in the construction work area, one of which would also be in the permanent right-of-way.

One NRHP listed property, the Itasca Lumber Company Superintendent's House, is located within the ROI within Minnesota. This property is located at 506 5^{th} Street in Deer River, Itasca County (NPS 2014).

Within Minnesota, 28 cemeteries are located within the ROI. Among these, 15 are within 0.5 miles, and 13 are within 1 mile. Twelve are located between Clearbrook and Carlton. Three are located within an American Indian reservation; they include the Mary Donald Cemetery, the Rabbits Cemetery, and the Saint Joseph Cemetery. These are all within the boundaries of the Leech Lake Reservation.

Traditional Cultural Properties

To date, no specific studies of TCPs have been completed within the ROI. Information gathered from the consultation with American Indian tribes with an interest within the ROI have indicated that TCPs are present (see Appendix P). The Ojibwe consider wild rice waters to be TCPs. Among these TCPs is Deadfish Lake; the lake itself is approximately 0.6 miles from the centerline of RA-08 (Hoppe 2017). Additional information concerning this TCP was not available at the time of this assessment.

6.4.3 Impact Assessment

The Project would cause potential direct and indirect impacts on archaeological and historic resources during construction and operations. Where information was available, consideration also was made for TCPs, which may consist of sites or landscapes important to American Indian tribes and are listed or eligible for listing on the NRHP (Parker and King 1998).

Direct and/or indirect impacts are those that may affect the ability of a cultural resource to convey its significance. These types of impacts may result in changes to a resource's integrity, visibility, accessibility, and/or research potential. The duration of impact could range from temporary to permanent, depending on the type of impact and type of cultural resource. The magnitude of impact could range from negligible to major, depending on the type of cultural resource that would be affected and its location relative to the construction work area or permanent right-of-way. Additional information on general direct and indirect impacts on cultural resources is described in Section 5.4.2.

The level of impact on archaeological resource would depend on the type of resource and its eligibility for listing in the SRHP, the State Historic Site Network, or the NRHP, as well as its significance to affected American Indian tribes (e.g., a sacred place).

A resource that is eligible for listing in the SRHP generally would have a higher magnitude of impacts than a site that is not eligible for the same register based on the site's importance to the affiliated culture or the State of Minnesota. A similar type of impact would be anticipated if the resources is listed or eligible for the NRHP. Single artifacts and surface sites may have a low potential to yield information important to prehistory or history as they may lack context. If an archaeological site is physically affected, the impact likely would be permanent and would range in magnitude from minor to major.

The level of impact would also vary depending on the location of the construction-related activity and the type of soil, bedrock, and vegetation. For example, vegetation removal may cause damage to surface sites more than deeply buried sites. Compaction may affect shallow sites and not affect deeply buried sites.

Unknown archaeological resources may be located within the construction work area could be discovered during ground-disturbing activities. To reduce impacts on currently unknown archaeological resources, an Unanticipated Discovery Plan would be implemented during construction (Appendix O). Impacts on inadvertently discovered archaeological resources would be similar to those described for previously recorded resources.

Contamination of archaeological resources could occur from small spills or leaks of lubricants, gasoline, oil, other fuels, coolants, transmission fluid, or other hazardous chemicals during construction activities for the Applicant's preferred route or route alternatives. These spills would be managed according to pending SPCC plans. Direct impacts on archaeological resources due to contamination and disturbance from cleanup activities would be permanent, depending on the type and location of resource and would range in magnitude from minor to major. Direct impacts on historic resources would range from temporary to permanent and negligible to major, depending on the type and location of resource.

Since only the Applicant's preferred route was surveyed for archaeological resources, the analyses for the remaining alternatives are based on the archival review of existing site data. Additionally, no surveys were conducted for historic resources; thus, only archival data were used in these analyses. As such, a greater number of cultural resources may be present within the ROI, construction work area, and permanent right-of-way for the route alternatives. In addition, even where known resources exist, the significance of these resources may have not been evaluated.

6.4.3.1 Applicant's Preferred Route (in Minnesota)

For the Applicant's preferred route, no listed NRHP archaeological resources are present within the construction workspaces or the permanent right-of-way (based on a review of NPS (2014) data and MHS data for the MN portions of the project). In this manner, no direct or indirect impacts would be anticipated to occur to these types of resources. However, other archaeological resources are present within the construction workspaces, permanent right-of-way, and within the ROI; direct and indirect impacts may occur to these resources.

6.4.3.1.1 Construction Impacts

Archaeological Resources

Construction-related activities would directly impact the nine previously recorded archaeological resources within the construction work area (see Table 6.4.2-2). Construction-related activities such as excavation, grading, rutting, compaction, and removing vegetation would directly impact these archaeological resources. Damage to an archaeological resource could occur from clearing and grading of the pipeline alignment, construction work area, ATWS, access roads, pump stations, and materials staging areas. An increased risk due to erosion, vandalism and looting (if significant), and compaction of archaeological resources could occur from movement of heavy machinery and transport of pipe sections, which may alter site stratigraphy. In addition, impacts could be associated with minor Project-related spills or leaks, such as contamination or disturbance during cleanup activities, or encountering existing contamination.

Direct impacts on archaeological resources during construction would be permanent and minor to major depending on the type of resource. Some impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

Indirect impacts during construction would be temporary, localized, and negligible to minor. These impacts include vibration, changes in noise and air quality, dust, and visual intrusions.

Historic Resources

No previously recorded historic resources would be within the construction work area (Table 6.4.2-3). As such, construction-related direct impacts on historic resources are unlikely to occur. However, indirect impacts may occur on the 80 historic resources within the ROI during construction. These indirect impacts include dust, vibration, and intrusion related to construction equipment, as well as construction-related noise. These impacts would be temporary and negligible to minor. Spill response activities and personnel would also cause temporary negligible to minor indirect impacts. Indirect visual intrusions due to vegetation clearing would be long-term and negligible to minor. Indirect impacts from the construction of aboveground facilities would be permanent and negligible to major. Most of the viewshed along the Applicant's preferred route contains existing pipelines and transmission lines and the changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

6.4.3.1.2 Operations Impacts

Archaeological Resources

Disturbed areas would be restored and stabilized to the extent practicable after pipeline installation. Such restoration is unlikely to cause damage to archaeological resources beyond what may occur during construction. Inspection, monitoring, and maintenance activities are unlikely to affect the four archaeological resources within the permanent right-of-way. The archaeological resources present within the permanent right-of-way would have been directly affected during construction, and as such, additional impacts from these activities would not be expected. Direct impacts associated with Project-related spills or encountering existing contamination could occur; however, no additional impacts would be expected as the archaeological resources would have already been disturbed during construction.

If operations-related activities result in direct impacts on archaeological resources that were not previously disturbed during construction (i.e., avoided) or to those resources that are adjacent to the construction work area, then the impacts would be permanent and minor to major. Some impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

If new ground disturbance occurs during the lifespan of the project, it would occur within the already disturbed permanent right-of-way or construction work area. As such, direct impacts on archaeological resources would have already occurred during construction; thus, any new ground disturbance is unlikely to cause additional impacts on these resources. However, if archaeological resources had been avoided during construction, or if they are adjacent to the construction work area, new ground disturbance may cause new impacts on these resources, which would be permanent and minor to major.

Indirect impacts of new ground disturbance during operations would be temporary, localized, and negligible to minor. Temporary impacts would include vibration, changes in noise and air quality, and visual intrusions.

Historic Resources

Operations impacts are unlikely to directly impact historic resources, as no known historic resources are located within the permanent right-of-way. Indirect temporary impacts may occur on historic resources within the ROI during pipeline operations. These indirect impacts would primarily consist of the presence of MLVs, pump stations, and maintenance crews and equipment, resulting in dust, vibration, and visual and auditory intrusions. These indirect impacts would be temporary to permanent and negligible to minor. Spill response activities and personnel would also cause temporary negligible to minor indirect impacts.

Indirect visual intrusions from the new pipeline would be permanent and negligible to minor, as almost all of the viewshed contains existing pipelines and transmission lines and the changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

6.4.3.1.3 Traditional Cultural Properties

Without specific knowledge of the particulars of a TCP, the assessment of potential impacts is difficult to accomplish. A TCP may be important for a variety of reasons, may incorporate a small or large geographic area, and may have unique qualities that make it eligible for listing on the NRHP. In this manner, impacts would vary greatly depending on the location of the TCP in relation to a Project component.

6.4.3.2 Route Alternatives (from Clearbrook to Carlton)

Archaeological and historic resources information along the route alternatives is limited to archival information along the pipeline corridor. No field surveys have been completed for the route alternatives. Archaeological and historic resource types are similar between the route alternatives and the Applicant’s preferred route. Archaeological resources include historic scatters, pre-contact artifacts, pre-contact surface features, railroads, and agricultural developments. Historic resources include bridges, farmhouses and associated outbuildings, and other buildings and structures.

For the route alternatives, no listed-NRHP archaeological resources are present within the construction workspaces or the permanent right-of-way (based on a review of NPS (2014) data and MHS data). In this manner, no direct or indirect impacts would be anticipated to occur to these types of resources. However, other archaeological resources are present within the construction workspaces, permanent right-of-way, and within the ROI; direct and indirect impacts may occur to these resources.

In addition, while NRHP listed properties that are above-ground are located within the ROI, it is assumed that if one of these alternatives were to be constructed, these types of resources would not be directly affected. Direct and indirect impacts, however, may occur to other historic resources located within construction workspaces, the permanent right-of-way, and the ROI.

6.4.3.2.1 Route Alternative RA-03AM

Construction Impacts

<u>Archaeological Resources</u>

Based on MHS data, six previously recorded archaeological resources would be within the construction work area. Construction-related impacts would be similar to those described in Section 6.4.3.1 for the Applicant’s preferred route. Direct impacts could result from ground excavation with machinery and hand tools, grading, vegetation removal, leak containment, and any inadvertent exposure of contaminated sediments. Construction activity may expose archaeological resources (if significant) to looting and vandalism. Archaeological resources within the RA-03AM construction work area primarily include artifact scatters, which would be permanently affected by ground disturbance related to construction if not avoided. Direct impacts would be permanent and minor to major, depending on the types of affected sites and their significance. In addition, impacts could be associated with minor Project-related spills and leaks such as contamination or disturbance during cleanup activities, or encountering existing contamination. These direct impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

Indirect impacts during construction would be temporary, localized, and negligible to minor. These impacts include vibration, changes in noise and air quality, dust, and visual intrusions.

Historic Resources

Based on MHS data, seven previously recorded historic resources would be within the construction work area, including railroads, structural ruins, and farm buildings. Construction along RA-03AM would directly affect more known historic resources than the other route alternatives. Construction-related direct impacts on historic resources may include physical destruction, alteration, or damage caused by equipment and excavation, which would cause permanent minor to major impacts.

Indirect impacts may occur on the 141 historic resources within the ROI during construction. These indirect impacts include dust, vibration, and intrusion related to construction equipment, as well as construction-related noise. These impacts would be temporary and negligible to minor. Indirect visual intrusions due to vegetation clearing would be long-term and negligible to minor. Indirect impacts from the construction of aboveground facilities would be permanent and negligible to major. Almost all of the viewshed contains existing pipelines and transmission lines and the changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

Minor spills have the potential to directly and indirectly affect historic resources through contamination, changes in access and setting, and response activities. These impacts would be temporary to permanent and negligible to major.

Operations Impacts

Archaeological Resources

Based on MHS data, one previously recorded archaeological resource would be within the permanent right-of-way. Disturbed areas would be restored and stabilized to the extent practicable after pipeline installation. Such restoration is unlikely to cause damage to archaeological resources beyond what may occur during construction. Inspection, monitoring, and maintenance activities are unlikely to affect the one archaeological resources within the permanent right-of-way because these activities would be undertaken using established access routes. The archaeological resources present within the permanent right-of-way would have been directly affected during construction, and as such, additional impacts from these activities would not be expected. Direct impacts associated with Project-related spills or encountering existing contamination could occur; however, no additional impacts would be expected as the archaeological resources would have already been disturbed during construction.

If operations-related activities result in direct impacts on archaeological resources that were not previously disturbed during construction (i.e., avoided) or to those resources that are adjacent to the construction work area, then the impacts would be permanent and minor to major. Some impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

If new ground disturbance occurs during the lifespan of the project, it would occur within the already disturbed permanent right-of-way or construction work area. As such, direct impacts on archaeological resources would have already occurred during construction; thus, any new ground disturbance is unlikely to cause additional impacts on these resources. However, if archaeological resources had been avoided during construction, or if they are adjacent to the construction work area, new ground disturbance may cause new impacts on these resources, which would be permanent and minor to major.

Indirect impacts of new ground disturbance during operations would be temporary, localized, and negligible to minor. Temporary impacts would include vibration, changes in noise and air quality, and visual intrusions.

Historic Resources

Based on MHS data, two previously recorded historic resources are within the permanent right-of-way for RA-03AM, including a historic farmstead. No ground disturbance would occur during operations; therefore, direct impacts are not anticipated beyond those that occurred during construction. Inspection, monitoring, and maintenance activities are unlikely to affect historic resources because they would be undertaken using established access routes. Impacts could be associated with Project-related spills or encountering existing contamination, which may cause temporary to permanent and negligible to major impacts.

Indirect impacts may occur on the 141 historic resources within the ROI during pipeline operations. These indirect impacts would primarily consist of the presence of MLVs, pump stations, and maintenance crews and equipment, resulting in dust, vibration, and visual and auditory intrusion. These indirect impacts would be temporary to permanent and negligible to minor. Spill response activities and personnel would also cause temporary negligible to minor indirect impacts. Indirect visual intrusions from the new pipeline would be permanent and negligible to minor as almost all of the viewshed contains existing pipelines and transmission lines. The changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

Traditional Cultural Properties

The discussion of potential impacts on TCPs would be the same as provided in Section 6.4.3.1.3.

6.4.3.2.2 Route Alternative RA-06

Construction Impacts

Archaeological Resources

Based on MHS data, no previously recorded archaeological resources would be within the construction work area. As such, this route alternative would not directly or indirectly impact known archaeological sites. It is possible that currently unknown archaeological resources are located within the construction work area that could be discovered and affected during ground-disturbing activities. To reduce impacts on currently unknown cultural resources, an Unanticipated Discovery Plan would be implemented during construction (Appendix O).

Historic Resources

Based on MHS data, one previously recorded historic resource would be within the construction work area. RA-06 would affect fewer known historic resources than the other route alternatives. Construction-related direct impacts on historic resources may include physical destruction, alteration, or damage caused by equipment and excavation, which would cause permanent minor to major impacts.

Indirect impacts may occur on the 27 historic resources within the ROI during construction. These indirect impacts include dust, vibration, and intrusion related to construction equipment, as well as construction-related noise. These impacts would be temporary and negligible to minor. Indirect visual intrusions due to vegetation clearing would be long-term and negligible to minor. The changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way. Indirect impacts from the construction of aboveground facilities would be permanent and negligible to major given that relatively little of the viewshed contains existing pipelines, transmission lines, and associated facilities.

Minor spills have the potential to directly and indirectly affect historic resources through contamination, changes in access and setting, and response activities. These impacts would be temporary to permanent and negligible to major.

Operations Impacts

<u>Archaeological Resources</u>

Based on MHS data, no previously recorded archaeological resources would be within the permanent right-of-way. Therefore, no direct or indirect impacts on known archaeological resources are expected during operation of RA-06.

<u>Historic Resources</u>

Based on MHS data, no previously recorded historic resources would be within the permanent right-of-way. Therefore, no direct impacts on historic resources are expected during operation of RA-06. Inspection, monitoring, and maintenance activities are unlikely to affect historic resources because there are no historic resources in the permanent right-of-way. Similarly, no impacts caused by Project-related spills or encountering existing contamination are expected as no historic resources are within the permanent right-of-way.

Indirect impacts may occur on the 27 historic resources within the ROI during pipeline operations. These indirect impacts would primarily consist of the presence of MLVs, pump stations, and maintenance crews and equipment, resulting in dust, vibration, and visual and auditory intrusion. These indirect impacts would be temporary to permanent and negligible to minor. Spill response activities and personnel would also cause temporary negligible to minor indirect impacts. Indirect visual intrusions from the new pipeline would be permanent and negligible to major as relatively little of the viewshed contains existing pipelines and transmission lines. The changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

Traditional Cultural Properties

The discussion of potential impacts on TCPs would be the same as provided in Section 6.4.3.1.3.

6.4.3.2.3 Route Alternative RA-07

Construction Impacts

<u>Archaeological Resources</u>

Based on MHS data, seven previously recorded archaeological resources would be within the construction work area. The types of construction-related impacts would be similar to those described in Section

6.4.3.1 for the Applicant's preferred route; however, the extent would differ as the construction work area would be larger (205 feet wide), and the activities would be more intensive and last longer to allow removal and replacement of the pipeline. Direct impacts could result from ground excavation with machinery and hand tools, grading, vegetation management, leak containment, and any inadvertent exposure of contaminated sediments. Construction activity may expose archaeological resources to looting and vandalism. Archaeological resources within the RA-07 construction work area primarily include artifact scatters, which would be permanently affected by ground disturbance related to construction, if not avoided. Direct impacts would be permanent and minor to major, depending on the types of affected sites and their significance. In addition, impacts could be associated with Project-related spills including contamination or disturbance during cleanup activities, or encountering existing contamination. These direct impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

Indirect impacts during construction would be temporary, localized, and negligible to minor. These impacts include vibration, changes in noise and air quality, dust, and visual intrusions.

Historic Resources

Based on MHS data, three previously recorded historic resources would be within the construction work area for RA-07. Construction-related direct impacts on historic resources may include physical destruction, alteration, or damage caused by equipment and excavation, which would cause permanent minor to major impacts.

Indirect impacts on the 166 historic resources in the ROI. These indirect impacts include dust, vibration, and intrusion related to construction equipment, as well as construction-related noise. These impacts would be temporary and negligible to minor. Indirect visual intrusions due to vegetation clearing would be long-term and negligible to minor. Indirect impacts from the construction of aboveground facilities would be permanent and negligible to major. The entire viewshed contains existing pipelines and transmission lines along the Mainline corridor and the changes in viewshed would decrease over time from revegetation of temporary construction work areas.

Minor spills have the potential to directly and indirectly affect historic resources through contamination, changes in access and setting, and response activities. These impacts would be temporary to permanent and negligible to major.

Operations Impacts

Archaeological Resources

Based on MHS data, five previously recorded archaeological resources would be within the permanent right-of-way. Disturbed areas would be restored and stabilized to the extent practicable after pipeline installation. Such restoration is unlikely to cause damage to archaeological resources beyond what may occur during construction. Inspection, monitoring, and maintenance activities are unlikely to affect the five archaeological resources within the permanent right-of-way because these activities would be undertaken using established access routes. The archaeological resources present within the permanent right-of-way would have been directly affected during construction, and as such, additional impacts from these activities would not be expected. Direct impacts associated with Project-related spills or encountering existing contamination could occur; however, no additional impacts would be expected as the archaeological resources would have already been disturbed during construction.

If operations-related activities result in direct impacts on archaeological resources that were not previously disturbed during construction (i.e., avoided) or to those resources that are adjacent to the construction work area, then the impacts would be permanent and minor to major. Some impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

If new ground disturbance occurs during the lifespan of the project, it would occur within the already disturbed permanent right-of-way or construction work area. As such, direct impacts on archaeological resources would have already occurred during construction; thus, any new ground disturbance is unlikely to cause additional impacts on these resources. However, if archaeological resources had been avoided during construction, or if they are adjacent to the construction work area, new ground disturbance may cause new impacts on these resources, which would be permanent and minor to major.

Indirect impacts of new ground disturbance during operations would be temporary, localized, and negligible to minor. Temporary impacts would include vibration, changes in noise and air quality, and visual intrusions.

<u>Historic Resources</u>

Based on MHS data, one previously recorded historic resource would be within the permanent right-of-way. No ground disturbance would occur during operations; therefore, direct impacts are not anticipated during operations beyond those that occurred during construction. Inspection, monitoring, and maintenance activities are unlikely to affect historic resources because they would be undertaken using established access routes. Impacts could be associated with minor Project-related spills and leaks or encountering existing contamination, which may cause temporary to permanent and negligible to major impacts.

Indirect impacts may occur on the 166 historic resources within the ROI during pipeline operations. These indirect impacts would primarily consist of the presence of MLVs, pump stations, and maintenance crews and equipment, resulting in dust, vibration, and visual and auditory intrusion. These indirect impacts would be temporary to permanent and negligible to minor. Spill response activities and personnel would also cause temporary negligible to minor indirect impacts. Indirect visual intrusions from the new pipeline would be permanent and negligible to minor as the viewshed along the Mainline corridor contains existing pipelines and transmission lines. The changes in viewshed would decrease over time from revegetation of temporary construction work areas.

Traditional Cultural Properties

The discussion of potential impacts on TCPs would be the same as provided in Section 6.4.3.1.3.

6.4.3.2.4 Route Alternative RA-08

Construction Impacts

<u>Archaeological Resources</u>

Based on MHS data, 12 previously recorded archaeological resources would be within the construction work area. Construction related impacts would be similar to those described in Section 6.4.3.1 for the Applicant's preferred route. Direct impacts could result from ground excavation with machinery and hand tools, grading, vegetation management, leak containment, and any inadvertent exposure of contaminated sediments. Construction activity may expose archaeological resources (if significant) to looting and vandalism. Archaeological resources within the RA-08 construction work area primarily include artifact scatters, which would be permanently affected by ground disturbance related to construction, if not avoided. Direct impacts would be permanent and minor to major, depending on the types of affected sites and their significance. In addition, impacts could be associated with Project-related spills including contamination or disturbance during cleanup activities, or encountering existing contamination. These direct impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

Indirect impacts during construction would be temporary, localized, and negligible to minor. These impacts include vibration, changes in noise and air quality, dust, and visual intrusions.

Historic Resources

Based on MHS data, three previously recorded historic resources would be located within the construction work area (Table 6.4.2-3). Construction-related direct impacts on historic resources may include physical destruction or damage caused by equipment, which would cause long-term to permanent minor to major impacts.

Indirect impacts on the 74 historic resources within the ROI during construction. These indirect impacts include dust, vibration, and intrusion related to construction equipment, as well as construction-related noise. These impacts would be temporary and negligible to minor. Indirect visual intrusions due to vegetation clearing would be long-term and negligible to minor. Indirect impacts from the construction of aboveground facilities would be permanent and negligible to major. The entire viewshed contains existing pipelines and transmission lines, and the changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

Minor spills have the potential to directly and indirectly affect historic resources through contamination, changes in access and setting, and response activities. These impacts would be temporary to permanent and negligible to major.

Operations Impacts

Archaeological Resources

Based on MHS data, 10 previously recorded archaeological resources would be within the permanent right-of-way. Disturbed areas would be restored and stabilized to the extent practicable after pipeline installation. Such restoration is unlikely to cause damage to archaeological resources beyond what may occur during construction. Inspection, monitoring, and maintenance activities are unlikely to affect the four archaeological resources within the permanent right-of-way, because these activities would be undertaken using established access routes. The archaeological resources present within the permanent right-of-way would have been directly affected during construction; as such, additional impacts from these activities would not be expected. Direct impacts associated with Project-related spills or encountering existing contamination could occur; however, no additional impacts would be expected as the archaeological resources would have already been disturbed during construction.

If operations-related activities result in direct impacts on archaeological resources that were not previously disturbed during construction (i.e., avoided) or to those resources that are adjacent to the construction work area, then the impacts would be permanent and minor to major. Some impacts may require mitigation that would be determined in consultation with the SHPO, affected American Indian tribes, and the public (see Section 6.4.4).

If new ground disturbance occurs during the lifespan of the project, it would occur within the already disturbed permanent right-of-way or construction work area. As such, direct impacts on archaeological resources would have already occurred during construction; thus, any new ground disturbance is unlikely to cause additional impacts on these resources. However, if archaeological resources had been avoided during construction, or if they are adjacent to the construction work area, new ground disturbance may cause new impacts on these resources, which would be permanent and minor to major.

Indirect impacts of new ground disturbance during operations would be temporary, localized, and negligible to minor. Temporary impacts would include vibration, changes in noise and air quality, and visual intrusions.

Historic Resources

Based on MHS data, one previously recorded historic resource would be located within the permanent right-of-way. No new ground disturbance would be expected to occur during operations; therefore, direct impacts are not anticipated during operations beyond those that occurred during construction. Inspection, monitoring, and maintenance activities are unlikely to affect historic resources because they would be undertaken using established access routes. Impacts could be associated with minor Project-related spills and leaks or encountering existing contamination, which may cause temporary to permanent and negligible to major impacts.

Indirect impacts may occur on the 74 historic resources within the ROI during pipeline operations. These indirect impacts would primarily consist of the presence of MLVs, pump stations, and maintenance crews and equipment, resulting in dust, vibration, and visual and auditory intrusion. These indirect impacts would be temporary to permanent and negligible to minor. Spill response activities and personnel would also cause temporary negligible to minor indirect impacts. Indirect visual intrusions from the new pipeline would be permanent and negligible to minor, as the entire viewshed contains existing pipelines and transmission lines. The changes in viewshed would decrease over time from revegetation of temporary construction work areas and to a lesser degree the permanent right-of-way.

Traditional Cultural Properties

The discussion of potential impacts on TCPs would be the same as provided in Section 6.4.3.1.3.

6.4.4 Summary and Mitigation

6.4.4.1 Summary

Construction and operation of the Applicant’s preferred route and route alternatives could impact archaeological and historic resources. Based on the current information, impacts on archaeological and historic resources could range from negligible to major during construction and operations (Table 6.4.4-1). DOC-EERA’s consultation with the SHPO is ongoing, and the results of the consultation concerning recommendations of eligibility, Project effects, and any necessary treatment for impacts, are not yet available.

During construction, direct impacts on archaeological resources would be permanent and could range from minor to major for the Applicant's preferred route and each route alternative. The types of archaeological resources across the ROI for the Applicant's preferred route and route alternatives primarily consist of individual lithic artifacts or lithic scatter.

As a result, the primary difference in potential impacts on archaeological resources among route options is associated with the number of resources present in the ROI and construction footprint between Clearbrook and Carlton. The number of previously recorded archaeological resources that could be directly affected ranges from none for RA-06 up to 12 resources for RA-08 (Table 6.4.4-1). Direct impacts on historic resources would be permanent and minor to major if physical disturbance of these resources during construction or operation were to occur. Historic resources within the construction footprints of the route options ranges from none for the Applicant's preferred route to seven historic resources for RA-03AM. Indirect impacts on historic resources within the ROI for a route option could occur (e.g., dust, noise, visibility of new features) during construction and operation. Most construction impacts would be temporary and negligible to minor. However, construction of new features on the landscape could result in permanent and minor to major impacts. Historic resources along the ROI for the route options range from 27 historic resources for RA-06 to up to 166 resources for RA-07 (Table 6.4.4-1).

During operations, direct and indirect impacts on archaeological resources could continue with the operational footprint of the Project. The number of archaeological resources within the permanent right-of-way would range from no resources for RA-07 to up to 10 resources for RA-08 (Table 6.4.4-1). As potential impacts on historic structures across the ROI during construction could be permanent, the same number of historic structures within the ROI for each route option could continue to be affected during operations, if no minimization measures were implemented.

6.4.4.2 Mitigation

Known archaeological resources may be avoided in the construction work area through the use of fencing around the site boundaries or designated buffers and incorporation of an archaeological monitor during ground-disturbing activities. To reduce impacts on currently unknown archaeological resources, an Unanticipated Discovery Plan would be implemented during construction (Appendix O). Archaeological and/or tribal monitoring could be implemented in sensitive areas during construction to further minimize impacts.

The need for minimization and mitigation measures for impacts on cultural resources would be discussed with MHS, the SHPO, State Archaeologist, and affected American Indian tribes through continuing consultation efforts. Additional survey also may be needed to account for areas not already investigated or surveyed (i.e., if a route permit is issued for a route alternative other than the Applicant's preferred route, or if variations were to be incorporated into the route). Minimization measures may include avoidance, site staking, and archaeological and tribal monitoring during construction. Mitigation measures may include data recovery excavations of significance archaeological sites, intensive recordation of historic resources, ethnographic studies, and guaranteed access, among others.

Table 6.4.4-1. Summary of Potential Impacts on Archaeological and Historic Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Previously recorded archaeological resources	Direct: Permanent/minor to major impacts • 8 resources Indirect: Temporary/ negligible to minor impacts • 8 resources	Direct: Permanent/minor to major impacts • 6 resources Indirect: Temporary/negligible to minor impacts • 6 resources	Direct: No impact • 0 resources Indirect: No impact • 0 resources	Direct: Permanent/minor to major impacts • 7 resources Indirect: Temporary/negligible to minor impacts • 7 resources	Direct: Permanent/minor to major impacts • 12 resources Indirect: Temporary/negligible to minor impacts • 12 resources
Previously recorded historic resources	Direct: No impacts • 0 resources Indirect: Temporary to permanent/ negligible to major impacts • 40 resources	Direct: Permanent/minor to major impacts • 7 resources Indirect: Temporary to permanent/ negligible to major impacts • 141 resources	Direct: Permanent/minor to major impacts • 1 resource Indirect: Temporary to permanent/ negligible to major impacts • 27 resources	Direct: Permanent/minor to major impacts • 3 resources Indirect: Temporary to permanent/ negligible to major impacts • 166 resources	Direct: Permanent/minor to major impacts • 3 resources Indirect: Temporary to permanent/ negligible to major impacts • 74 resources
Operations Impacts					
Previously recorded archaeological resources	Direct: Permanent/minor to major impacts • 4 resources Indirect: Temporary/ negligible to minor impacts • 4 resources	Direct: Permanent/minor to major impacts • 1 resources Indirect: Temporary/negligible to minor impacts • 1 resources	Direct: No impact • 0 resources Indirect: No impact • 0 resources	Direct: Permanent/minor to major impacts • 5 resources Indirect: Temporary/negligible to minor impacts • 5 resources	Direct: Permanent/minor to major impacts • 10 resources Indirect: Temporary/negligible to minor impacts • 10 resources

Table 6.4.4-1. Summary of Potential Impacts on Archaeological and Historic Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Previously recorded historic resources	Direct: No impacts • 0 resources Indirect: Temporary to permanent/ negligible to minor impacts • 40 resources	Direct: Temporary to permanent/negligible to major impacts • 2 resources Indirect: Temporary to permanent/ negligible to minor impacts • 141 resources	Direct: No impact • 0 resources Indirect: Temporary to permanent/ negligible to minor impacts • 27 resources	Direct: Temporary to permanent/negligible to major impacts • 1 resource Indirect: Temporary to permanent/ negligible to minor impacts • 166 resources	Direct: Temporary to permanent/ negligible to major impacts • 1 resource Indirect: Temporary to permanent/ negligible to minor impacts • 74 resources

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to cultural resources. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, the number of resources alone do not account for the size or significance of a particular resource. However, data from the National Register dataset (and where available, survey information) in combination can aid the reader in understanding the number of resources along the route already known to be significant and how they may be impacted by the proposed route or the alternatives. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-676 to 6-686. The table above, for example, includes counts of cultural resources within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-677 to 6-679. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-679 to 6-681. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-681 to 6-682. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.4.4-1. Summary of Potential Impacts on Archaeological and Historic Resources for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-682 to 6-684. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-684 to 6-686. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.4.5 References

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6.5 SOCIOECONOMICS

The 20 counties in Minnesota that could be crossed by the Applicant's preferred route and route alternatives contribute to regional and statewide economies through the production of a variety of goods and services. Project actions have the potential to affect these economies (both positively and negatively). This section discusses the existing conditions and assesses potential Project-related impacts with respect to commodity production; recreation and tourism; and employment, income, and tax revenues.

6.5.1 Commodity Production

The primary commodities produced along the Applicant's preferred route and the route alternatives that would be affected by construction or operations of the Project include agricultural commodities, forestry products, and mining production. Construction of Project facilities and permanent maintenance of a cleared right-of-way during operations may displace some capacity for production of these commodities. The analysis of impacts on commodity production during construction and operations for the Applicant's preferred route and route alternatives considered the following issues:

- Disturbance and loss of agricultural land, including for the production of wild rice, and potential for and magnitude of lost yields,
- Disturbance and loss of forested land and timber resources, and
- Disturbance and loss of land used for mining.

This section first describes the existing conditions within an area along the Applicant's preferred route and each of the route alternatives where commodity production could be affected by construction and operation of the Project. The potential impacts on commodity production of Project-related construction and operation in these areas are considered next. Potential impacts for each route alternative (RA-03AM, RA-06, RA-07, and RA-08) also are assessed and then compared to each other and to the Applicant's preferred route between Clearbrook and Carlton. A summary and comparison of the impacts for all route options are included at the end of the section. Chapter 10 addresses the impacts on commodity production resulting from an unanticipated crude oil release.

6.5.1.1 Regulatory Context and Methodology

6.5.1.1.1 Regulatory Context

Several Minnesota statutes provide for the protection and management of land used to produce commodities. Minnesota Statutes § 17.80 – 17.84 set the state policy on agricultural land preservation and conservation. One of the main goals is "[…] to minimize the disruption of agricultural production in accordance with local social, economic and environmental considerations of the agricultural community." Minnesota Statutes § 89.002 establishes the policies for managing forest resources of state forest lands, providing for the responsible and sustainable use of forest products. The provision for leasing state-owned lands and mineral rights for nonferrous metallic minerals and other minerals, other than iron ore, is found in Minnesota Statutes § 93.25. Furthermore, state-owned lands and mineral rights administered by the Commissioner of Natural Resources may be leased for peat, sand, gravel, stone, clay, and rock under Minnesota Statutes § 92.50.

6.5.1.1.2 Methodology

The ROI for the analysis of impacts on commodities consists of all land currently used in the production of agricultural, timber, or mineral products—or land with the potential to be used for these purposes—that could be disturbed or removed from production along the Applicant's preferred route or the route alternatives. This includes the permanent right-of-way and the broader construction work area. Impacts on commodity production were evaluated by:

- Using GIS data resources to identify and inventory all land in the ROI currently being used, or with the potential to be used, in the production of agricultural, timber, or mineral production in the counties crossed by the Applicant's preferred route and route alternatives.
- Overlaying the construction and operations footprints for the Applicant's preferred route and the route alternatives on these areas. The footprint for the Applicant's preferred route is based on specific geo-referenced information provided by Enbridge; the construction footprint for the route alternatives is based on a standard 120-foot-wide construction footprint (except for RA-07, which would have a 205-foot-wide construction footprint; see Chapter 4) and a 50-foot-wide permanent right-of-way.
- Determining the geographic extent of impacts on all land currently being used for commodity production or land that could be used for commodity production from the construction work area, the permanent right-of-way, and the associated aboveground facilities.
- Providing a range of estimates of lost yield and market value of the affected commodities (where applicable).
- Providing a qualitative statement of the duration and magnitude of impacts on the productivity of commodity lands.

Various state and federal database layers were obtained for agricultural land, forested land, and mineral resources. Acreages of agricultural and forested lands were obtained using the NLCD 2011 Classification System (Homer et al. 2015). Acreages of farmland soils were obtained using the NRCS database to identify prime farmland and farmlands of statewide importance (NRCS 2011). For mining, acreages of active lease land and acreages of land with potential sand and gravel deposits were obtained from Minnesota DNR and USGS. Based on the geographic extent of impacts on the land used in the production of each commodity, a qualitative assessment is provided of the relative magnitude (i.e., negligible, minor, or major) and duration (i.e., temporary, short-term, long-term, or permanent) of the impacts in terms of lost production, access, and disruption.

No single dataset provides a complete indication of all relevant impacts to commodity production, but together the various datasets used in this section provide a reasonably comprehensive indication of the potential impacts. For example, NRCS data was used to assess acreage of farmland soil impacted. While this dataset provides an indication of potential impacts to land with current and future agricultural value, it does not provide an indication of the type and extent of actual cultivation underway and must be considered in conjunction with crop production data to determine the specific impacts to agricultural commodity production.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, of miles and acres of land used for

commodities production crossed; however, a more complete discussion of the qualitative nature of impacts that could occur to different types of commodities is contained in the text of this section.

6.5.1.2 Existing Conditions

Existing conditions are described for the entire length of the Applicant's preferred route in Minnesota. Route alternatives RA-03AM, RA-06, RA-07, and RA-08 represent alternative routes to the Applicant's preferred route between Clearbrook and Carlton. A subset of data for the segment from Clearbrook to Carlton is included in the description of existing conditions for the Applicant's preferred route to enable direct comparison of the route alternatives to the Applicant's preferred route.

The following discussion of existing conditions describes agricultural land, forested land, and mineral resource lands. These land types are defined as follows:

- Agricultural lands – Cultivated cropland and grassland that includes activities such as crop harvesting, livestock grazing, dairy production, and organic farming. It also includes land with areas of soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops (i.e., prime farmland); or areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods (i.e., farmland of statewide importance). Collectively, these soils are referred to as "farmland soils." Farmland soils can include agricultural land as defined above or land that is not currently being used for agricultural production but has high potential for future productivity.
- Forested lands – Commercially productive land that is actively managed for the sustainable harvest of timber and includes the following land cover types: deciduous, evergreen, and mixed forest. This land currently is being used in the production of timber or has timber resources that could be harvested in the future. The timber industry is an important part of Minnesota's economy.
- Mineral resource lands – lands where non-metallic (e.g., sand, gravel, and crushed stone) and metallic (e.g., iron ore, nickel, and titanium) minerals are produced.

6.5.1.2.1 Applicant's Preferred Route

Agricultural Lands

Table 6.5.1-1 presents the agricultural land located within the ROI for the Applicant's preferred route. Within the construction work area 1,913 acres are classified as agricultural land; 562 of these acres occur in the segment between Clearbrook and Carlton. The construction work area includes 1,907 acres of farmland soils (classified as prime farmland or farmland of statewide importance). Of this total, approximately 1,278 acres are located between Clearbrook and Carlton.

An additional approximately 487 acres of farmland soils and 554 acres of agricultural land are within the footprint of ATWS, access roads, valve sites, and pump stations. Some of the farmland soils may be in active production, while some may not be actively farmed as the designation is based on soil characteristics, not land use. In total, approximately 2,394 acres of farmland soils and 2,467 acres of agricultural land are located within the ROI for the Applicant's preferred route (Table 5.3.1-1).

The market value of crops (as reported by the U.S. Department of Agriculture in 2016) within the area disturbed by the Applicant's preferred route for construction and operation is shown in Table 6.5.1-2 (i.e., the average yield per acre multiplied by the acres crossed) by crop type. In total, the market value of the crops grown on lands crossed by the Applicant's preferred route is approximately $817,000 within the construction work area and approximately $333,000 within the permanent right-of-way.

Table 6.5.1-1. Agricultural Land and Farmland Soils Crossed by the Applicant's Preferred Route (acres)

Agricultural Land Type	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Construction Work Area Subtotal		ATWS	Temp Access Roads	Perm Access Roads	Pump Stations	Valves[a]	Total[b]	
	Con	Op	Con	Op	Con	Op	Con	Op						Con	Op
Agricultural Land															
Cultivated crops	1,154	495	173	76	8	4	1,336	575	327	2	20	21	2	1,707	617
Grass/pastureland	131	58	388	175	58	25	577	259	121	1	45	16	2	760	320
Agricultural land subtotal	***1,285***	***553***	***562***	***252***	***66***	***29***	***1,913***	***832***	***448***	***3***	***65***	***36***	***3***	***2,467***	***937***
Farmland															
Prime farmland	337	146	514	227	11	4	862	371	182	8	60	4	1	1,116	444
Farmland of statewide importance	206	90	763	332	76	33	1,046	459	134	12	67	17	3	1,278	542
Farmland soils subtotal	***541***	***236***	***1,278***	***559***	***84***	***38***	***1,907***	***833***	***315***	***19***	***127***	***21***	***5***	***2,394***	***986***

Sources: Homer et al. 2015 for agricultural lands; NRCS 2011 for prime farmland and farmland of statewide importance.

[a] Includes valve sites and valve driveways. Since valve sites are within the permanent right-of-way, total project impacts may be slightly overestimated due to double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations.

Notes:

Values in the table may not sum to subtotals and totals due to rounding.

Enbridge-provided footprints: Con = construction work area, Op = operations permanent right-of-way.

Table 6.5.1-2. Market Value of Crops Crossed by the Applicant's Preferred Route ($2016 thousands)

Crop Type	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Construction Work Area Subtotal		ATWS	Temp Access Roads	Perm Access Roads	Pump Station	Valves[a]	Total[b]	
	Con	Op	Con	Op	Con	Op	Con	Op						Con	Op
Alfalfa	$21.7	$9.7	$25.3	$11.3	$2.1	$0.9	$49.1	$21.9	$6.3	$0.1	$2.7	$2.6	$0.3	$61.1	$27.5
Barley	$6.6	$2.7	$0.0	$0.0	$0.0	$0.0	$6.7	$2.7	$1.5	$0.0	$0.0	$1.6	$0.2	$10.0	$4.5
Buckwheat	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Corn	$44.3	$18.7	$13.3	$5.6	$2.1	$1.0	$59.7	$25.3	$10.9	$0.1	$0.6	$0.2	$3.0	$74.5	$29.1
Dry beans	$8.9	$4.1	$24.7	$10.1	$0.0	$0.0	$33.6	$14.3	$2.9	$0.2	$2.0	$0.2	$1.2	$40.1	$17.7
Oats	$0.7	$0.3	$0.9	$0.4	$0.0	$0.0	$1.6	$0.7	$0.1	$0.0	$0.2	$0.2	$0.1	$2.2	$1.1
Other hay/ non alfalfa	$1.2	$0.6	$5.6	$2.5	$0.4	$0.2	$7.3	$3.2	$0.7	$0.0	$0.4	$0.1	$2.3	$10.8	$6.0
Potatoes	$0.0	$0.0	$31.0	$11.5	$0.0	$0.0	$31.0	$11.5	$7.7	$0.0	$1.2	$0.0	$0.0	$39.9	$12.7
Rye	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Soybeans	$246.0	$105.0	$7.8	$3.7	$0.0	$0.0	$253.8	$108.7	$37.3	$0.0	$3.2	$2.4	$32.8	$329.5	$147.0
Spring wheat	$93.9	$40.0	$2.8	$1.1	$0.0	$0.0	$96.6	$41.1	$20.9	$0.0	$1.1	$0.4	$1.2	$120.3	$43.9
Sugarbeets	$92.6	$37.3	$0.0	$0.0	$0.0	$0.0	$92.6	$37.3	$22.3	$0.0	$0.2	$0.3	$0.6	$116.0	$38.3
Sunflower	$4.7	$1.9	$0.0	$0.0	$0.0	$0.0	$4.7	$1.9	$1.1	$0.0	$0.0	$0.0	$0.1	$6.0	$2.1
Winter wheat	$6.2	$2.7	$0.0	$0.0	$0.0	$0.0	$6.3	$2.8	$0.8	$0.0	$0.1	$0.0	$0.0	$7.2	$2.9
TOTAL	**$526.9**	**$223.0**	**$111.4**	**$46.3**	**$4.6**	**$2.1**	**$642.9**	**$271.4**	**$112.6**	**$0.5**	**$11.6**	**$8.1**	**$41.7**	**$817.4**	**$332.7**

Source: U.S. Department of Agriculture, National Agricultural Statistical Service 2016.

[a] Includes valve sites and valve driveways. Since valve sites are within the permanent right-of-way, total Project impacts may be slightly overestimated due to double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations.

Notes:

Values in the table may not sum to subtotals and totals due to rounding.

Enbridge-provided footprints: Con = construction work area, Op = operations permanent right-of-way.

Wild Rice

As discussed within Section 6.3, the Applicant's preferred route would cross waterbodies known to be used for the harvesting of wild rice. The construction work area of the Applicant's preferred route would cross approximately 4.9 acres in a total of five waterbodies, while the permanent right-of-way for operations of the Applicant's preferred route would cross approximately 3.2 acres in a total of five waterbodies.

The market value of wild rice is variable and dependent on source and means of cultivation and harvesting (e.g., traditional hand-harvested versus use of a combine). Limited information pertaining to commodity values of Minnesota wild rice, both generally and traditionally hand-harvested, is available. According to a report on wild rice prepared by the Minnesota DNR, the price paid for unprocessed rice from the LLBO reservation between 1990 and 2007 was between $1.00 and $1.50 (Minnesota DNR 2008). Based on the 2015 Annual Report of the LLBO, the LLBO Department/Division of Resource Management purchased over 89,000 pounds of wild rice from LLBO Band members, resulting in $178,000 injected into the local economy (LLBO 2015). However, it should be noted that the Applicant's preferred route would not cross any American Indian reservations.

Using the resulting rudimentary assumption that the average price for traditionally harvested unprocessed wild rice is $2.00 per pound (LLBO 2015), a reasonable assumption given the previously noted 1990-2007 price range, and a yield assumption of approximately 300 pounds per acre (), the approximate market values of unprocessed wild rice within the construction work area and permanent right-of-way of the Applicant's preferred route are $3,000 and $2,000, respectively. These estimates assume that the entire waterbody acreage contains harvestable wild rice. The estimates do not consider the economic value of other activities, such as finishing/processing for consumption.

Forested Land

Forested land in the State of Minnesota represents 17.4 million acres of land (all ownerships). Of this total area, 15.7 million acres is considered to be commercially productive. This is forested land that is actively managed for sustainable harvest of timber and includes the following land cover types: deciduous, evergreen, and mixed forest. This land currently is being used for production of timber or has timber resources that could be harvested in the future.

Table 6.5.1-3 presents the total acres of forested land that would be crossed by the Applicant's preferred route. In total, approximately 1,790 acres of forested land is present within the ROI for the Applicant's preferred route (including footprints for the ATWS, pump stations, valve sites, and temporary access roads). The majority of forested land that would be crossed by the proposed pipeline is within the Clearbrook-to-Carlton segment (approximately 1,447 acres) and currently is owned by private landowners. These lands are used primarily as residential property, as recreational property, or for harvesting wood products.

Table 6.5.1-4 presents the current market value of the timber within the ROI for the Applicant's preferred route, which is approximately $337,000, based on the assumption that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40 (USFS 2008).

Mineral Lands

In Minnesota, mineral resource commodity areas host occurrences, deposits, or mine operations, or are sites of active or recurrent exploration.

Table 6.5.1-5 presents the total acres of active mineral exploration areas that would be crossed by the Applicant's preferred route and the route alternatives. The Applicant's preferred route crosses approximately 0.5 acre of land within active county metallic areas for a temporary access road in Carlton County.

Table 6.5.1-6 presents the acres of land within the ROI for the Applicant's preferred route that contain undeveloped sand, gravel, and mineral resources. These include glacial lake sediments with potential commercially important deposits of sand and gravel. Glacial deposits in the area of the proposed pipeline range from 5 to 450 feet in depth. In total, including the ATWS and access roads (Table 6.5.1-6), the construction work area of the Applicant's preferred route would cross approximately 513 acres of land with glacial deposits containing potentially valuable sand and gravel resources. MLVs and permanent access roads would permanently convert approximately 8 acres of land with potential sand and gravel resources, whereas 191 acres would remain within the permanent right-of-way.

Table 6.5.1-3. Forested Land Crossed by the Applicant's Preferred Route (acres)

Forested Land Type	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Construction Work Area Subtotal[a]		ATWS	Temp Access Roads	Perm Access Roads	Pump Stations	Valves[a]	Total[b]	
	Con	Op	Con	Op	Con	Op	Con	Op						Con	Op
Deciduous forest	56	26	1,256	554.0	38	14	1,349	594	97	31	73	2	2	1,554	671
Evergreen forest	1	1	173	70	1	1	176	71	18	4	15	1	1	214	86
Mixed forest	-	-	18	7	1	0	18	8	1	0	2	0	0	22	10
TOTAL	**57**	**27**	**1,446**	**631**	**40**	**15**	**1,543**	**673**	**116**	**35**	**90**	**3**	**3**	**1,790**	**767**

Source: Homer et al. 2015.

[a] Includes valve sites and valve driveways. Since valve sites are within the permanent right-of-way, total Project impacts may be slightly overestimated due to double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations.

Notes:

Enbridge-provided footprints: Con = construction work area; Op = operations permanent right-of-way.

Table 6.5.1-4. Estimated Market Value of Forested Land Crossed by the Applicant's Preferred Route ($2016 thousands)

Forested Land Type	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Construction Work Area Subtotal		ATWS	Temp Access Roads	Perm Access Roads	Pump Stations	Valves[a]	Total[b]	
	Con	Op	Con	Op	Con	Op	Con	Op						Con	Op
Deciduous forest	$10.6	$5.0	$239.3	$105.6	$7.2	$2.7	$257.2	$113.2	$18.4	$5.9	$13.8	$0.5	$0.4	$296.2	$127.9
Evergreen forest	$0.2	$0.1	$33.0	$13.3	$0.2	$0.1	$33.5	$13.5	$3.5	$0.7	$2.8	$0.1	$0.1	$40.7	$16.5
Mixed forest	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$3.5	$1.5	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
TOTAL	**$10.9**	**$5.1**	**$272.3**	**$118.9**	**$7.4**	**$2.8**	**$294.2**	**$128.2**	**$21.9**	**$6.7**	**$16.6**	**$0.6**	**$0.5**	**$336.9**	**$144.4**

Source: USFS 2008.

[a] Includes valve sites and valve driveways. Since valve sites are within the permanent right-of-way, total Project impacts may be slightly overestimated due to double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations.

Notes:

Values in the table may not sum to subtotals and totals due to rounding.

Enbridge-provided footprints: Con = construction work area, Op = operations permanent right-of-way.

Assumes that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40.

Table 6.5.1-5. Active Mineral Areas Crossed by the Applicant's Preferred Route and Route Alternatives (acres)

Project Phase	North Dakota Border to Clearbrook[a]	Clearbrook to Carlton					Carlton to Wisconsin Border[a]
		Applicant's Preferred Route[b]	Route Alternative RA-03AM[a]	Route Alternative RA-06[a]	Route Alternative RA-07[c]	Route Alternative RA-08[a]	
Construction	0.0	0.51	0.0	2.7	0.0	0.0	0.0
Operations	0.0	<0.1	0.0	1.1	0.0	0.0	0.0

Source: Minnesota DNR 2016.

[a] Con = estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way; Op = estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

[b] Enbridge-provided footprints: Con = construction work area, Op = operations permanent right-of-way.

[c] Con = estimated construction impact area in acres based on 205-foot-wide construction area, 10 feet wide on the north side of the existing Line 3 and 195 feet wide on the south side of the existing Line 3; Op = estimated operations impact area in acres based on 50-foot-wide operations permanent right-of-way centered on the route.

Table 6.5.1-6. Land with Potential Sand and Gravel Resources Crossed by the Applicant's Preferred Route (acres)

Resource	North Dakota Border to Clearbrook		Clearbrook to Carlton		Carlton to Wisconsin Border		Applicant's Preferred Route Total		ATWS	Temp Access Roads	Perm Access Roads	Pump Stations	Valves[a]	Total[b]	
	Con	Op	Con	Op	Con	Op	Con	Op						Con	Op
Land with glacial deposits	395.2	170.9	14.1	6.8	32.1	13.5	441.4	191.2	62.7	0.0	7.1	0.0	1.2	513.2	199.5

Source: USGS 2006.

[a] Includes valve sites and valve driveways. Since valve sites are within the permanent right-of-way, total Project impacts may be slightly overestimated due to double counting.

[b] Con = sum of pipeline construction work area, additional temporary workspaces (ATWS), pump stations, valves, and temporary and permanent access roads; Op = sum of pipeline permanent right-of-way, permanent access roads, valves, and pump stations.

Notes:

Enbridge-provided footprints: Con = construction work area, Op = operations permanent right-of-way.

6.5.1.2.2 Route Alternatives

As previously noted, the only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to commodity production for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Agricultural Land

Table 6.5.1-7 presents the agricultural commodity land located within the ROI for RA-03AM. In total, the construction work area of the route would include approximately 1,681 acres of agricultural land between Clearbrook and Carlton. It also would cross approximately 1,608 acres of farmland soils that may or may not currently be in active production. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified.

Table 6.5.1-7. Agricultural Commodity Land Crossed by Route Alternative RA-03AM (acres)

Agricultural Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Agricultural Land		
Cultivated crops	585	246
Grass/pastureland	1,096	460
Agricultural land subtotal	***1,681***	***706***
Farmland		
Prime farmland	493	206
Farmland of statewide importance	1,115	465
Farmland soils subtotal	***1,608***	***671***

Sources: Homer et al. 2015 for agricultural lands; NRCS 2011 for prime farmland and farmland of statewide importance.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

To illustrate the impact in terms of market value, Table 6.5.1-8 presents the total dollar value of the yield (i.e., the average yield per acre multiplied by the acres crossed) by crop type. In total, the market value of the crops grown on lands crossed by RA-03AM is approximately $482,000 within the construction work area and approximately $201,000 within the permanent right-of-way.

Table 6.5.1-8. Market Value of Crops for Route Alternative RA-03AM[a] ($2016)

Crop Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Alfalfa	$78,401	$33,058
Barley	$224	$81
Corn	$155,598	$64,904
Dry beans	$38,175	$16,020
Oats	$3,173	$1,369
Other hay/non alfalfa	$9,289	$3,735
Potatoes	$147,638	$61,571
Soybeans	$46,114	$18,954
Spring wheat	$2,735	$1,095
Sugarbeets	$134	$27
Sunflower	$167	$78
Winter wheat	$39	$23
TOTAL	**$481,687**	**$200,914**

Source: U.S. Department of Agriculture, National Agricultural Statistical Service 2016.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Wild Rice

As discussed within Section 6.3, the RA-03AM route would cross waterbodies known to be used for the harvesting of wild rice. The construction work area of RA-03AM would cross approximately 7.5 acres in a total of seven waterbodies, while the permanent right-of-way for operations of the Applicant's preferred route would cross approximately 3.1 acres in a total of seven waterbodies.

The market value of wild rice is variable and dependent on source and means of cultivation and harvesting (e.g., traditional hand-harvested versus use of a combine). Limited information pertaining to commodity values of Minnesota wild rice, both generally and traditionally hand-harvested, is available. According to a report on wild rice prepared by the Minnesota DNR, the price paid for unprocessed rice from the LLBO reservation between 1990 and 2007 was between $1.00 and $1.50 (Minnesota DNR 2008). Based on the 2015 Annual Report of the LLBO, the LLBO Department/Division of Resource Management purchased over 89,000 pounds of wild rice from LLBO Band members, resulting in $178,000 injected into the local economy (LLBO 2015). However, it should be noted that RA-03AM would not cross any American Indian reservations.

Using the resulting rudimentary assumption that the average price for traditionally harvested unprocessed wild rice is $2.00 per pound, and a yield assumption of approximately 300 pounds per acre (UMN 1982), the approximate market values of unprocessed wild rice within the construction work area and permanent right-of-way of the Applicant's preferred route are $4,500 and $2,000, respectively. These estimates assume that the entire waterbody acreage contains harvestable wild rice. The estimates do not consider the economic value of other activities, such as finishing/processing for consumption.

Forested Land

Table 6.5.1-9 presents the total acres of forested land that would be crossed by RA-03AM during construction and operation of the pipeline. In total, the construction work area of the route would include approximately 1,175 acres of forested land between Clearbrook and Carlton; and the permanent right-of-way would include 486 acres of forested land. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified. Table 6.5.1-10 presents the current market value of timber within the ROI for RA-03AM, which is $193,000 within the construction work area and approximately $80,000 within the permanent right-of-way for operation. This is based on the assumption that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40 (USFS 2008).

Table 6.5.1-9. Forested Land Crossed by Route Alternative RA-03AM (acres)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	1,013	419
Evergreen forest	147	61
Mixed forest	15	6
TOTAL	**1,175**	**486**

Source: Homer et al. 2015.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Table 6.5.1-10. Market Value of Forested Land Crossed by Route Alternative RA-03 AM ($2016 thousands)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	$193.0	$79.8
Evergreen forest	$27.9	$11.6
Mixed forest	$2.8	$1.2
TOTAL	**$193.0**	**$79.8**

Sources: Minnesota DNR 2016; U.S. Forest Service 2008.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Notes:

Assumes that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40.

Mineral Lands

No active mineral mining areas would be crossed by RA-03AM during construction or operations. Glacial lake sediments have potential commercially important deposits of sand and gravel. The construction work area would cross approximately 442 acres of land with potential sand and gravel resources, and the permanent right-of-way would cross approximately 184 acres.

Route Alternative RA-06

Agricultural Land

Table 6.5.1-11 presents the agricultural commodity land located within the ROI for RA-06. In total, the construction work area would include approximately 326 acres of agricultural land between Clearbrook and Carlton. The route also would cross approximately 1,241 acres of farmland soils that may or may not currently be in active production. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified.

Table 6.5.1-11. Agricultural Commodity Land Crossed by Route Alternative RA-06 (acres)

Agricultural Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Agricultural Land		
Cultivated crops	51	22
Grass/pastureland	275	115
Agricultural land subtotal	***326***	***137***
Farmland		
Prime farmland	770	321
Farmland of statewide importance	471	197
Farmland soils subtotal	***1,241***	***518***

Sources: Homer et al. 2015 for agricultural lands; NRCS 2011 for prime farmland and farmland of statewide importance.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Table 6.5.1-12 presents the total dollar value of the yield (i.e., the average yield per acre multiplied by the acres crossed) by crop type. In total, the recent market value of the crops grown on lands crossed by RA-06 is approximately $52,000 within the construction work area and approximately $22,000 within the permanent right-of-way.

Table 6.5.1-12. Market Value of Crops for Route Alternative RA-06 ($2016)

Crop Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Alfalfa	$27,538	$11,613
Corn	$12,071	$5,210
Oats	$1,737	$713
Other hay/non alfalfa	$1,763	$706
Soybeans	$8,214	$3,392
Spring wheat	$932	$393
TOTAL	**$52,255**	**$22,026**

Source: U.S. Department of Agriculture, National Agricultural Statistical Service 2016.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Wild Rice

As discussed within Section 6.3, RA-06 would cross waterbodies known to be used for the harvesting of wild rice. The construction work area of RA-06 would cross approximately 10.6 acres in a total of five waterbodies, while the permanent right-of-way for operations of RA-06 would cross approximately 4.4 acres in a total of five waterbodies.

The market value of wild rice is variable and dependent on source and means of cultivation and harvesting (e.g., traditional hand-harvested versus use of a combine). Limited information pertaining to commodity values of Minnesota wild rice, both generally and traditionally hand-harvested, is available. According to a report on wild rice prepared by the Minnesota DNR, the per-pound price paid for unprocessed rice from the LLBO reservation between 1990 and 2007 was between $1.00 and $1.50 (Minnesota DNR 2008). Based on the 2015 Annual Report of the LLBO, the LLBO Department/Division of Resource Management purchased over 89,000 pounds of wild rice from LLBO Band members, resulting in $178,000 injected into the local economy (LLBO 2015). RA-06 would cross the Fond du Lac Reservation.

Using the resulting rudimentary assumption that the average price for traditionally harvested unprocessed wild rice is $2.00 per pound, and a yield assumption of approximately 300 pounds per acre, the approximate market values of unprocessed wild rice within the construction work area and permanent right-of-way of the Applicant's preferred route are $7,000 and $3,000, respectively. These estimates assume that the entire waterbody acreage contains harvestable wild rice. The estimates do not consider the economic value of other related activities, such as wages paid for harvesting, finishing/processing for consumption, etc.

Forested Land

Table 6.5.1-13 presents the total acres of forested land that would be crossed by RA-06 during construction and operation of the pipeline. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified. Table 6.5.1-14 presents the current market value of timber within the ROI for RA-06, which is approximately $165,000 within the construction work area and approximately $69,000 within the permanent right-of-way. This is based on the assumption that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40 (USFS 2008).

Table 6.5.1-13. Forested Land Crossed by Route Alternative RA-06 (acres)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	865	360
Evergreen forest	105	44
Mixed forest	174	72
TOTAL	**1,143**	**476**

Sources: Homer et al. 2015.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Table 6.5.1-14. Market Value of Forested Land for Route Alternative RA-06 ($2016 thousands)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	$164.8	$68.6
Evergreen forest	$20.0	$8.3
Mixed forest	$33.1	$13.8
TOTAL	**$164.8**	**$68.6**

Sources: USFS 2008.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Note:

Assumes that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40.

Mineral Lands

The 120-foot construction footprint for RA-06 would cross the highest amount of land with active county metallic areas (approximately 3 acres), and approximately 1 acre would be crossed during operations (Table 6.5.1-15). Glacial lake sediments have potential commercially important deposits of sand and gravel. The construction work area would cross approximately 571 acres of land with potential sand and gravel resources, and the permanent right-of-way would cross approximately 238 acres.

Table 6.5.1-15. Mining Areas Crossed by Route Alternative RA-06 (acres)

Project Phase	Active Mineral Areas	Land with Potential Sand and Gravel Resources
Construction[a]	2.7	570.7
Operations[b]	1.1	237.8

Source: Minnesota DNR 2016.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Route Alternative RA-07

Agricultural Land

Table 6.5.1-16 presents the agricultural commodity land located within the ROI for RA-07. In total, the construction work area for the route would include approximately 402 acres of agricultural land between Clearbrook and Carlton. It also would cross approximately 1,082 acres of farmland soils that may or may not currently be in active production. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified.

Table 6.5.1-16. Agricultural Commodity Land Crossed by Route Alternative RA-07 (acres)

Agricultural Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Agricultural Land		
Cultivated crops	76	57
Grass/pastureland	326	114
Agricultural land subtotal	***402***	***170***
Farmland		
Prime farmland	422	113
Farmland of statewide importance	660	189
Farmland soils subtotal	***1,082***	***302***

Sources: Homer et al. 2015 for agricultural lands; NRCS 2011 for prime farmland and farmland of statewide importance.

[a] Estimated construction impact area in acres based on 205-foot-wide construction work area, 10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3.

[b] Estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on route.

To illustrate the impact in terms of market value, Table 6.5.1-17 presents the total dollar value of the yield (i.e., the. average yield per acre multiplied by the acres crossed) by crop type. In total, the market value of the crops grown on lands crossed by RA-07 is approximately $39,000 within the construction work area and approximately $15,000 within the permanent right-of-way.

Table 6.5.1-17. Market Value of Crops for Route Alternative RA-07 ($2016)

Crop Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Alfalfa	$18,717	$7,918
Corn	$4,433	$1,936
Oats	$207	$90
Other hay/non alfalfa	$2,522	$1,035
Soybeans	$5,300	$2,293
Spring wheat	$3,040	$1,276
Sunflower	$36	$16
TOTAL	**$39,153**	**$14,564**

Sources: U.S. Department of Agriculture, National Agricultural Statistical Service 2016.

[a] Estimated construction impact area in acres based on 205-foot-wide construction work area, 10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3.

[b] Estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on route.

Wild Rice

As discussed within Section 6.3, RA-07 would cross waterbodies known to be used for the harvesting of wild rice. The construction work area of RA-07 would cross approximately 6.1 acres in a total of one waterbody, while the permanent right-of-way for operations of RA-07 would cross approximately 2.5 acres in a total of one waterbody.

The market value of wild rice is variable and dependent on source and means of cultivation and harvesting (e.g. traditional hand-harvested versus use of a combine). Limited information pertaining to commodity values of Minnesota wild rice, both generally and traditionally hand-harvested, is available. According to a report on wild rice prepared by the Minnesota DNR, the per-pound price paid for unprocessed rice from the LLBO reservation between 1990 and 2007 was between $1.00 and $1.50 (Minnesota DNR 2008). Based on the 2015 Annual Report of the LLBO, the LLBO Department/Division of Resource Management purchased over 89,000 pounds of wild rice from LLBO Band members, resulting in $178,000 injected into the local economy (LLBO 2015). RA-07 would cross the Fond du Lac and LLBO reservations.

Using the resulting rudimentary assumption that the average price for traditionally harvested unprocessed wild rice is $2.00 per pound, and a yield assumption of approximately 300 pounds per acre, the approximate market values of unprocessed wild rice within the construction work area and permanent right-of-way of the Applicant's preferred route are $4,000 and $2,000, respectively. These estimates assume that the entire waterbody acreage contains harvestable wild rice. The estimates do not consider the economic value of other related activities, such as wages paid for harvesting, finishing/processing for consumption, etc.

Forested Land

Table 6.5.1-18 presents a conservative estimate of the total acres of forested land that would be crossed by RA-07 during construction and operation of the pipeline. RA-07 involves removing the existing Line 3 and placing the new Line 3 in the same trench. RA-07 would be centered in the existing Enbridge Mainline, which is largely cleared of trees. However, the resolution of the GIS land cover data does not provide accurate representation of land cover/land use at the scale of the Mainline corridor right-of-way. This limitation in the data creates some uncertainty about the accuracy of the land cover data within the anticipated construction work area. The numbers shown should be considered a very conservative estimate of impacts on forested land; the actual numbers are likely to be much lower.

Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified. Table 6.5.1-19 presents the current market value of timber within the ROI for RA-07, which is approximately $147,000 within the construction work area and approximately $36,000 within the permanent right-of-way. This is based on the assumption that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40 (USFS 2008).

Table 6.5.1-18. Forested Land Crossed by Route Alternative RA-07 (acres)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	773	192
Evergreen forest	235	38
Mixed forest	139	28
TOTAL	**1,147**	**258**

Sources: Homer et al. 2015.

[a] Estimated construction impact area in acres based on 205-foot-wide construction work area, 10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3.

[b] Estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on route.

Table 6.5.1-19. Market Value of Forested Land for Route Alternative RA-07 ($2016 thousands)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	$147.3	$36.4
Evergreen forest	$44.7	$7.1
Mixed forest	$26.6	$5.4
TOTAL	**$147.3**	**$36.4**

Sources: USFS 2008.

Notes:

Assumes that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40.

[a] Estimated construction impact area in acres based on 205-foot-wide construction work area, 10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3.

[b] Estimated operations impact area in acres based on 50-foot-wide permanent right-of-way centered on route.

Mineral Lands

No active mineral areas would be crossed by RA-07 during construction or operations. Glacial lake sediments have potential commercially important deposits of sand and gravel. The construction work area would cross approximately 562 acres of land with potential sand and gravel resources, and the permanent right-of-way would cross approximately 234 acres.

Route Alternative RA-08

<u>Agricultural Land</u>

Table 6.5.1-20 presents the agricultural commodity land located within the ROI for RA-08. In total, the construction work area for the route would include approximately 405 acres of agricultural land between Clearbrook and Carlton. It also would cross approximately 944 acres of farmland soils that may or may not currently be in active production. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified.

To illustrate the impact in terms of market value, Table 6.5.1-21 presents the total dollar value of the yield (i.e., the average yield per acre multiplied by the acres crossed) by crop type. In total, the market value of the crops grown on lands crossed by RA-08 is approximately $41,000 within the construction work area and approximately $17,000 within the permanent right-of-way.

Table 6.5.1-20. Agricultural Commodity Land Crossed by Route Alternative RA-08 (acres)

Agricultural Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Agricultural Land		
Cultivated crops	41	17
Grass/pastureland	364	153
Agricultural land subtotal	***405***	***170***
Farmland		
Prime farmland	387	162
Farmland of statewide importance	556	232
Farmland soils subtotal	***944***	***394***

Sources: Homer et al. 2015 for agricultural lands; NRCS 2011 for prime farmland and farmland of statewide importance.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Table 6.5.1-21. Market Value of Crops for Route Alternative RA-08 ($2016)

Crop Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Alfalfa	$22,604	$9,596
Corn	$8,678	$3,690
Oats	$690	$293
Other hay/non alfalfa	$1,381	$560
Soybeans	$6,918	$2,957
Spring wheat	$373	$146
TOTAL	**$40,645**	**$17,242**

Sources: U.S. Department of Agriculture, National Agricultural Statistical Service 2016.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Wild Rice

As discussed within Section 6.3, RA-08 would cross waterbodies known to be used for the harvesting of wild rice. The construction work area of RA-08 would cross approximately 9.8 acres in a total of two waterbodies, while the permanent right-of-way for operations of RA-08 would cross approximately 4.1 acres in a total of two waterbodies.

The market value of wild rice is variable and dependent on source and means of cultivation and harvesting (e.g., traditional hand-harvested versus use of a combine). Limited information pertaining to commodity values of Minnesota wild rice, both generally and traditionally hand-harvested, is available. According to a report on wild rice prepared by the Minnesota DNR, the per-pound price paid for unprocessed rice from the LLBO reservation between 1990 and 2007 was between $1.00 and $1.50 (Minnesota DNR 2008). Based on the 2015 Annual Report of the LLBO, the LLBO Department/Division of Resource Management purchased over 89,000 pounds of wild rice from LLBO Band members, resulting in $178,000 injected into the local economy (LLBO 2015). RA-08 would cross the Fond du Lac and LLBO reservations.

Using the resulting rudimentary assumption that the average price for traditionally harvested unprocessed wild rice is $2.00 per pound, and a yield assumption of approximately 300 pounds per acre, the approximate market values of unprocessed wild rice within the construction work area and permanent right-of-way of the Applicant's preferred route are $6,000 and $3,000, respectively. These estimates assume that the entire waterbody acreage contains harvestable wild rice. The estimates do not consider the economic value of other related activities, such as wages paid for harvesting, finishing/processing for consumption, etc.

Forested Land

Table 6.5.1-22 presents the total acres of forested land that would be crossed by RA-08 during construction and operation of the pipeline. Temporary and permanent access roads, pump stations, and valve sites have not been determined for the route alternatives; therefore, the additional affected acreage from these footprints cannot be quantified. Table 6.5.1-23 presents the current market value of the timber within the ROI for RA-08, which is approximately $119,000 within the construction work area and approximately $50,000 within the permanent right-of-way easement. This is based on the assumption that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40 (USFS 2008).

Table 6.5.1-22. Forested Land Crossed by Route Alternative RA-08 (acres)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	626	260
Evergreen forest	108	44
Mixed forest	76	31
TOTAL	**810**	**335**

Sources: Homer et al. 2015.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Table 6.5.1-23. Market Value of Forested Land for Route Alternative RA-08 ($2016 thousands)

Forest Land Type	Construction Work Area[a]	Permanent Right-of-Way[b]
Deciduous forest	$119.3	$49.5
Evergreen forest	$20.5	$8.4
Mixed forest	$14.4	$5.9
TOTAL	**$119.3**	**$49.5**

Sources: USFS 2008.

[a] Estimated construction impact area in acres based on a 120-foot-wide construction work area centered on the route, including the 50-foot-wide permanent right-of-way.

[b] Estimated operations impact area in acres based on a 50-foot-wide permanent right-of-way centered on the route.

Note:

Assumes that an acre of forested land produces 7.8 cords of wood and the average value per cord across all species is $24.40.

Mineral Lands

No active mineral areas would be crossed by RA-08 during construction or operations. Glacial lake sediments have potential commercially important deposits of sand and gravel. The construction work area would cross approximately 555 acres of land with glacial deposits, and the permanent right-of-way would cross approximately 231 acres.

6.5.1.3 Impact Assessment

Potential impacts on land used in the production of commodities from construction and operation of the Applicant's preferred route and route alternatives include impacts on agricultural productivity and commercial forestry through the loss of both current and future productivity from removal of crops, disruption of farmland soils, and clearing of trees. This also could affect the corresponding economies, depending on the total market value of the commodities lost and the overall size of the relevant commodity market in the counties crossed. Land that is currently being mined for mineral resources could temporarily be disrupted during construction, and land containing undeveloped potential mineral resources would not be accessible within the permanent right-of-way. The extent and magnitude of these impacts are influenced by the overall geographic scope of the impact and whether the land would recover or be available for future production.

The duration of potential Project impacts on commodity production along the pipeline right-of-way could range from temporary during active construction to permanent (e.g., aboveground facilities, a new corridor through forested areas). During construction, the greatest impacts on commodity production would be caused by clearing of vegetation. Operations impacts would be limited to the addition of aboveground facilities and reduced production from the permanent removal of trees on cleared forested land. In general, agricultural areas would return to their preconstruction condition relatively quickly, whereas forested lands would not be permitted to regrow within the permanent right-of-way.

6.5.1.3.1 Applicant’s Preferred Route (in Minnesota)

Construction Impacts

<u>Disturbance and Loss of Agricultural Land and Lost Yields</u>

Construction activities would affect agricultural land (i.e., cropland and hay/pastures). Impacts could include soil erosion, interference with and damage to agricultural surface and subsurface drainage and irrigation systems, mixing or loss of fertile topsoil and subsoil, and soil compaction. During construction, the production of crops on agricultural land typically would need to be deferred for one growing season, resulting in short-term minor impacts on land currently in production. The Applicant would compensate all landowners for lost crops and any documented damage that may be caused by construction activities.

To prevent soil compaction, drainage alteration, and damage to crops, operation of equipment on agricultural lands would be limited to the access routes to the construction footprint agreed upon with landowners. The Applicant would implement measures to avoid or minimize potential impacts on soil productivity in accordance with their Agricultural Protection Plan (Appendix F). These measures include erosion control, topsoil segregation, rock removal, and measures to avoid compaction or loosen compacted soils. In temporary construction work areas and along the permanent right-of-way, agricultural activity typically would be prevented for one growing season, resulting in short-term minor losses to agricultural productivity.

The Agricultural Protection Plan provides additional measures that would be applied specifically to organic agricultural lands, such as organic-certified farms or farms that are in active transition to organic-certified status, in order to address the unique management and certification requirements of these operations. The Applicant has identified two organic farms that would be crossed by the Applicant’s preferred route. Both organic farms are located east of Clearbrook, and both landowners have signed easement agreements (Enbridge 2016). The Applicant would continue to work with affected landowners to identify organic farms that have not been identified to date and would implement measures in the Agricultural Protection Plan accordingly. As part of this plan, The Applicant has developed specific measures, outlined in an appendix to the plan, to minimize impacts on organic farms.

Construction activities also could affect farmland soils. Impacts on prime farmland and farmland of statewide importance from construction of the Applicant’s preferred route could include interference with agricultural drainage (if present), mixing of topsoil and subsoil, and compaction and rutting of soil. These impacts could result from clearing, trench excavation and backfilling, and vehicular traffic within the construction work area. Potential impacts include temporary and short-term minor soil erosion, short-term minor soil compaction, permanent increases in the proportion of large rocks in the topsoil, and short-term to long-term minor soil contamination. Overall, these impacts could result in short-term to long-term minor impacts on the current and future productivity of the soil in terms of agricultural production.

The current market value of crops within the construction work area is approximately $643,000 and the total value is approximately $817,000 including the value of crops within the footprint of ATWS, access roads, valve sites and pump stations (Table 6.5.1-2). Within the Clearbrook-to-Carlton segment, this amount is approximately $111,000. This amount represents less than one-half of a percent of the total market value of agricultural products in the counties that would be crossed by the Applicant's preferred route; therefore, it is likely that construction of the Project would result in a temporary negligible impact on the local agricultural economy.

Disturbance and Loss of Wild Rice

Five wild rice waterbodies would be crossed by the Applicant's preferred route, with about 5 acres of the delineated waterbody basins within the construction work area. Construction would occur across the edge of the basins within the existing pipeline corridor but not through the wild rice stands on Mud Lake, Peterson Lake, and Portage Lake (Appendix A). In addition, some or all of the wild rice areas occur along the margins of larger waterbodies where the Applicant would use site-specific waterbody crossing techniques, including HDD. HDD would be used to cross the unnamed wild rice waterbody at Hay Creek and the Shell River within the existing pipeline corridor. At this location and at other sites where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs.

Where HDD is not used, the wild rice waterbodies would be crossed using applicable wetland crossing methods for the water saturation conditions at the crossing (see Section 2.7.2 for a description of waterbody and wetland construction methods). Trenched crossing could remove the rice plants and disturb sediments, and could increase sedimentation within the remainder of the waterbody. Although the Applicant would restore the hydrology and soils of the affected wild rice waterbodies after construction, rice yield would be reduced in the portion of the waterbody directly affected by the repair or replacement activities for the first growing season after construction. To minimize impacts of construction through wild rice waterbodies, the Applicant would implement applicable measures identified in the Stream and River Crossing Requirements and Construction Methods in the Environmental Protection Plan (Appendix E). These plans contain measures to reduce or avoid impacts on wild rice during construction. Avoidance measures include use of a narrower construction work area, reseeding, monitoring, and use of timber mats, and incorporate any additional measures proposed by local and state agencies to reflect existing regional policies and procedures to protect wild rice. Two stands also would be monitored for overall condition, function, and vegetative regrowth after construction until the permit conditions are met.

Although not anticipated, construction-related impacts on wild rice waterbodies could include longer than expected recovery time for native wild rice stands (i.e., impacts could affect rice waterbodies beyond the first growing season after construction), introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions—all of which could be detrimental to wild rice germination and production. These potential impacts would be reduced through Project-specific SPCC plans, invasive species management plans, and post-construction monitoring of vegetation for a period of time until permit conditions are met, as described in the Applicant's Environmental Protection Plan (Appendix E). With implementation of these measures, impacts on wild rice waterbodies are expected to be short-term and minor. However, if HDD frac-out, introduction of contaminants, introduction of invasive aquatic plants and non-native strains of wild rice, and altered lakebed conditions occur as a result of construction, impacts could be major.

Based on the conservative assumption that the entire 4.9 acres within the Clearbrook-Carlton segment construction work area includes viable stands of wild rice (not likely to be the case based on the discussion above), the approximate annual commodity value economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $3,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that construction of the Project would result in a temporary negligible to minor impact on the local agricultural economy.

Disturbance and Loss of Forested Lands and Timber Resources

During construction, trees from forested areas would be cleared within the construction work area, which would result in loss of timber production. However, the Applicant would compensate Minnesota DNR for any merchantable timber loss on state-managed forested lands, and compensation on private lands would be agreed upon by the Applicant and the landowner during easement acquisition. For any merchantable timber on state lands, disposal/sale must be handled with the division of forestry. Any merchantable timber within the ROI belongs to the State and must follow its procedures. For forested land in WMAs, any revenue for merchantable timber that is harvested would be deposited into the WMA revenue account.

Following construction activities, trees would be allowed to regenerate naturally within the construction work areas, temporary access roads, and ATWS; however, the area within the construction work area could take up to 50 years to regenerate harvestable timber. Construction activities likely would result in long-term to permanent, minor impacts on land used for timber production. Based on the value of the annual lost growth, the present value of the future growth foregone is approximately $2.3 million, with the majority of the impact occurring in Minnesota. When compared to the present value of the timber harvest market over the same time period (50 years, $662 million), the impact of construction is likely to cause a long-term to permanent, minor impact on the associated local timber industry.

Disturbance and Loss of Land Used for Mining

Because the pipeline for Applicant's preferred route would be installed mainly within and adjacent to an existing right-of-way, no additional restrictions on the current use of land for mining mineral resources would be expected from construction. Approximately 0.5 acre of land in active mineral areas would be crossed by the route for a temporary access road; however, impacts on productivity are expected to be temporary and negligible. Given the temporary nature of construction coupled with the relatively undeveloped state of the resources and the average depth of their location below the surface (from 5 to 450 feet), impacts from construction on future exploration or mining of lands with potential sand and gravel resources are likely to be temporary and negligible. If future discovery of metallic mineral resources occurs where the pipeline crosses state lands, realignment of the pipeline would be handled under standard licensing clauses.

Operations Impacts

Disturbance and Loss of Agricultural Land and Lost Yields

Impacts on agricultural lands during operation would be minimal, as most of these areas would recover following construction and typically would not require maintenance mowing. During operation, the easement for the permanent right-of-way would include 833 acres of agricultural land (cropland and grass/pastureland), the majority of which would be located along the existing pipeline corridor. Following final restoration, agricultural activities would be able to resume across the construction work area and the permanent right-of-way, resulting in no additional impacts during continued operation of the pipeline. Operation of the pipeline would not affect land currently being used for agricultural production, except for land within the permanent footprint of pump stations, MLVs, and permanent access roads that would be converted to industrial/developed land uses. Approximately 104 acres of agricultural land in the Clearbrook-to-Carlton segment would be converted to industrial/developed land associated with aboveground facilities and associated access. As with construction of the pipeline, the Applicant would compensate all landowners for lost crops and any documented damage that may be caused by maintenance activities.

The current market value of crops on agricultural land that would be converted to other land uses is approximately $61,400 (value of the land converted to pump stations, valve sites, and permanent access roads from Table 6.5.1-2). The value of this annual loss into perpetuity would equal approximately $2.1 million. The annual loss of commodities from agricultural land removed from agricultural use relative to the overall value of agricultural products sold in the affected counties would be small; therefore, the impact on the local agricultural economy would be permanent and negligible.

The easement for the Applicant's preferred route also would include farmland soils (i.e., 378 acres of prime farmland and 455 acres of farmland of statewide importance). Following final restoration, agricultural activities would be able to resume across this land, resulting in no additional impacts during the continued operation of the pipeline. Impacts on farmland soils from operation of the pipeline therefore would be short term and minor. The exception would be about 153 acres that would be permanently converted to industrial use for the pump stations, permanent access roads, and MLVs, and would no longer be available for future production. Conversion of this land would result in a permanent negligible impact.

Disturbance and Loss of Wild Rice

The wild rice waterbodies crossed by HDD at Hay Creek and Shell River would not be affected during operations. Wild rice waterbodies crossed by other methods would not be affected by normal pipeline operation unless it is necessary to repair or replace a section of pipe within the waterbody as a part of the Applicant's Integrity Management Program. In that event, the impacts would be similar to those for the original crossing construction.

Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity.

Based on the conservative assumption that the entire 3.2 acres of wild rice waterbodies within the Clearbrook-Carlton permanent right-of-way area includes viable stands of wild rice (not likely to be the case based on the discussion above), and will be affected simultaneously by repair or replacement activities, the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $2,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that operations of the Project would result in a long-term temporary impact on the local agricultural economy, occurring at irregular intervals;

permanent losses to wild rice crops would not be anticipated. The magnitude of said impacts is expected to be negligible to minor.

<u>Disturbance and Loss of Forested Lands and Timber Resources</u>

Forested lands would not be allowed to reestablish within the permanent right-of-way because it would be maintained clear of trees for operational purposes, such as facilitating aerial inspections, preserving pipeline integrity, and providing access for maintenance or emergency work. The permanent right-of-way for the Applicant's preferred route would include approximately 673 acres of forested land, of which the majority (88 percent) is deciduous forest. This land would permanently be removed from the ability to commercially produce timber for use in the wood product industries. Given the available timber resources in the area, as well as compensation that would be received by landowners, impacts on land that could be used in the production of timber products from operation of the pipeline are considered permanent and minor.

The current market value of the timber that would be removed is approximately $144,000 (Table 6.5.1-4). Assuming that this annual loss is continued into perpetuity, the present value of the foregone annual harvest is $4.8 million; the present value of annual timber harvest in Minnesota into perpetuity is $1.6 billion. Permanent conversion of 673 acres of forested land during operation of the Applicant's preferred route therefore would result in a permanent minor impact on the local timber economy.

The Applicant would continue to work with potentially affected landowners to determine whether any impacts would occur as a result of operations activities and would compensate them accordingly.

<u>Disturbance and Loss of Land Used for Mining</u>

Operation of the pipeline is not expected to affect land in active mineral areas. In terms of land with potential sand and gravel resources, 191 acres would be within the permanent right-of-way for the entire route, while approximately 7 acres would be within the permanent easement in the Clearbrook-to-Carlton segment. Impacts could involve permanently removing this land from current and future mining activities. Impacts on future mineral development would not constitute a significant loss of mineral resources or mineral availability because the resource potential is unknown. In addition, the width of the right-of-way is narrow relative to the expanse of areas with mineral resource potential. Operations-related impacts on land with potential mineral resources are likely to be permanent and negligible.

6.5.1.3.2 Route Alternatives (from Clearbrook to Carlton)

Route alternatives consist of temporary construction work areas and permanent pipeline rights-of-way along a specific alignment. The route alternatives would require pump stations and MLVs, but specific locations and designs of any aboveground facilities have not been identified. As such, the analysis of impacts focuses on the proximity of sensitive receptors to the identified pipeline corridor and recognizes that land used in the production of commodities could experience additional permanent impacts from the presence of aboveground facilities if a route alternative is selected and locations for these facilities have been identified.

Although impacts differ in location and quantity, the types of impacts would be similar between the Applicant's preferred route and the route alternatives. Impacts from construction on land used in the production of agricultural products would decrease productivity in the short term from removal of existing vegetation within the construction work area, whereas impacts from construction on forested land would be long term based on the time until trees within the temporary construction work area would regenerate. Impacts from operations primarily would be associated with the permanent clearing of trees and vegetation along the right-of-way and access roads, as well as with permanent aboveground facilities.

Route Alternative RA-03AM

Construction Impacts

Disturbance and Loss of Agricultural Land and Lost Yields

Construction of the RA-03AM route would affect 1,680 acres of agricultural land (cropland and grass/pasture) and 1,608 acres of farmland soils. During construction, production of crops on agricultural land typically would be prevented for one growing season, resulting in short-term minor losses to land currently being used for agricultural production. The estimated market value of crops lost during construction is approximately $482,000 annually. This amount represents less than one-half of a percent of the total market value of agricultural products in the counties that would be crossed by the route; therefore, it is likely that construction of RA-03AM would result in a temporary negligible impact on the local agricultural economy. In terms of agricultural production on farmland soils, short-term to long-term minor impacts on the current and future productivity of farmland soils could occur.

Disturbance and Loss of Wild Rice

RA-03AM would cross about 7.5 acres of the six wild rice waterbodies crossed within the construction work area (see Table 6.3.1.2-11). Three of these crossings would be the same as for the Applicant's preferred route: Mud Lake, Hay Creek, and Portage Lake. Hayden Lake would be crossed at the basin inlet and Fox Lake would be crossed near the lake shoreline; both of these crossings would be within an existing pipeline corridor. Specific construction methods for crossing of wild rice waterbodies along RA-03AM have not been determined. Hay Creek would be crossed by the Applicant's preferred route using HDD. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs.

Construction-related impacts and avoidance measures would be similar to those described for the Applicant's preferred route.

Based on the conservative assumption that the entire 7.5 acres within the Clearbrook-Carlton segment permanent right-of-way includes viable stands of wild rice (not likely to be the case based on the discussion above), the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $5,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that construction of the Project would result in a temporary negligible impact on the local agricultural economy.

Disturbance and Loss of Forested Lands and Timber Resources

RA-03AM also would affect 1,174 acres of forested land. The duration and magnitude of impacts during construction would be the same as those described for the Applicant's preferred route (minor long-term to permanent impacts). The estimated dollar value of harvestable timber that would be lost within the construction work area until the trees would be harvestable would be approximately $1.9 million.

Disturbance and Loss of Land Used for Mining

Construction of the RA-03AM route would not affect any land in active mine areas and would traverse the smallest amount of land area (442 acres) between Clearbrook and Carlton that contains potential sand and gravel resources. Given the temporary nature of construction coupled with the relatively undeveloped state of the resources and the average depth of their location below the surface (from 5 to 450 feet), impacts from construction on the future exploration or mining of these resources are likely to be temporary and negligible. If future discovery of metallic mineral resources occurs where the pipeline crosses state lands, realignment of the pipeline would be handled under standard licensing clauses.

Operations Impacts

Disturbance and Loss of Agricultural Land and Lost Yields

Following final restoration, agricultural activities would be able to resume across the construction work area and the permanent right-of-way, resulting in no additional impacts during continued operation of the pipeline. Operation of the pipeline would not affect land currently being used for agricultural production, except for land within the permanent footprint of pump stations, MLVs, and permanent access roads that would be converted to industrial/developed land uses. Because the location of permanent facilities and access roads have not been determined for the route alternatives, the amount of agricultural land permanently converted to industrial uses cannot be quantified; however, given that it is likely to be similar to the Applicant's preferred route, it is likely that operation along RA-03AM would result in a permanent but negligible impact on the local agricultural economy.

Disturbance and Loss of Wild Rice Waterbodies

During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described in discussion on construction impacts for the route.

Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity.

Based on the conservative assumption that the entire 3.1 acres of wild rice waterbodies within the Clearbrook-Carlton segment permanent right-of-way area includes viable stands of wild rice (not likely to be the case based on the discussion above), and will be affected simultaneously by repair or replacement activities, the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $2,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that operations of the Project would result in a long-term temporary impact on the local agricultural economy, occurring at irregular intervals; permanent losses to wild rice crops would not be anticipated. The magnitude of said impacts is expected to be negligible to minor.

Disturbance and Loss of Forested Lands and Timber Resources

Forested lands would not be allowed to reestablish within the permanent right-of-way to allow ongoing inspection and maintenance. The permanent easement for the RA-03AM route would include approximately 485 acres of forested land within the Clearbrook-to-Carlton segment, of which the majority (88 percent) is deciduous forest. This land would be permanently restricted from commercial timber production. Assuming that the current annual value of this timber would be lost into perpetuity, the present value of the timber removed from annual harvest is approximately $3.1 million, compared to the present value of the annual timber harvest in Minnesota over the same time period (perpetuity), which is $1.6 billion. Permanent conversion of 485 acres of forested land during operation of RA-03AM would result in a permanent minor impact on the local timber economy.

Disturbance and Loss of Land Used for Mining

Operation of the pipeline is not expected to affect land in active mineral areas. Operations could involve permanently removing land with potential sand and gravel resources from both current and future mining activities. Impacts on future mineral development would not constitute a significant loss of mineral resources or mineral availability because the resource potential is unknown. In addition, the width of the right-of-way is narrow relative to the expanse of areas with mineral resource potential. Impacts on land with potential mineral resources from operation are likely to be permanent and negligible.

Route Alternative RA-06

Construction Impacts

Disturbance and Loss of Agricultural Land and Lost Yields

Construction of RA-06 would affect 326 acres of agricultural land (cropland and grass/pasture) and 1,241 acres of farmland soils. During construction, production of crops on agricultural land would typically be prevented for one growing season, resulting in short-term minor losses to land currently being used for agricultural production. The estimated market value of crops lost during construction is approximately $52,000. This amount represents less than one-half of a percent of the total market value of agricultural products in the counties that would be crossed by the route; therefore, it is likely that construction of RA-06 would result in a temporary negligible impact on the local agricultural economy. The impacts on farmland soils would be the same as those described for the Applicant's preferred route (short term to long term and minor).

Disturbance and Loss of Wild Rice

RA-06 would cross about 11 acres of the wild rice waterbodies within the construction work area (see Table 6.3.1.2-15). Specific construction methods for crossing of wild rice waterbodies along RA-06 have not been determined. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs.

Construction-related impacts and avoidance measures would be similar to those described above for the Applicant's preferred route.

Based on the conservative assumption that the entire 10.6 acres within the Clearbrook-Carlton segment construction work area includes viable stands of wild rice (not likely to be the case based on the discussion above), the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $7,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that construction of the Project would result in a temporary negligible to minor impact on the local agricultural economy. Affects to the Fond du Lac Reservation, while likely to be disproportionately more significant, are still anticipated to be minor relative to the overall Fond du Lac Band economy.

Disturbance and Loss of Forested Lands and Timber Resources

The RA-06 route would cross 1,143 acres of forested land, which would result in impacts similar to those described for the Applicant's preferred route (minor long-term to permanent impacts). The estimated dollar value of harvestable timber that would be lost within the construction work area until the trees would be harvestable would be approximately $1.8 million.

Disturbance and Loss of Land Used for Mining

Unlike the other route alternatives, RA-06 route would cross 0.2 mile of land in active mine areas and would traverse a larger amount of land areas that contain potential sand and gravel resources (570 acres). Therefore, it is likely that construction of RA-06 could cause a temporary minor impact on current mining activities.

<u>Operations Impacts</u>

Disturbance and Loss of Agricultural Land and Lost Yields

Following final restoration, agricultural activities would be able to resume across the temporary construction work area and the permanent right-of-way, resulting in no additional impacts during continued operation of the pipeline. Operation of the pipeline would result in short-term minor losses to land currently being used for agricultural production. Because the location of permanent facilities and access roads have not been determined for the route alternatives, the amount of agricultural land permanently converted to industrial uses cannot be quantified; however, given that it is likely to be similar to the Applicant's preferred route, it is likely that operation along RA-06 would result in a permanent but negligible impact on the local agricultural economy.

Disturbance and Loss of Wild Rice Waterbodies

During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described in discussion on construction impacts for the route.

Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity.

Based on the conservative assumption that the entire 4.4 acres of wild rice waterbodies within the Clearbrook-Carlton segment construction work area includes viable stands of wild rice (not likely to be the case based on the discussion above), and will be affected simultaneously by repair or replacement activities, the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $3,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that operations of the Project would result in a long-term temporary impact on the local agricultural economy and the overall economy of the Fond du Lac Band, occurring at irregular intervals; permanent losses to wild rice crops would not be anticipated. The magnitude of said impacts is expected to be negligible to minor.

Disturbance and Loss of Forested Lands and Timber Resources

To allow for visual inspection and maintenance of the pipeline, forested lands would not be allowed to reestablish within the permanent right-of-way. The easement for RA-06 route would include approximately 476 acres of forested land within the Clearbrook-to-Carlton segment, of which the majority is deciduous forest. This land would permanently be removed from the ability to commercially produce timber for use in the wood product industries. Assuming that the current annual value of this timber is lost into perpetuity, the present value of the timber removed from annual harvest is approximately $3.0 million, compared to the present value of the annual timber harvest in Minnesota over the same time period (perpetuity), which is $1.6 billion. Permanent conversion of 476 acres of forested land during operation of the RA-06 route would result in a permanent minor impact on the local timber economy.

Disturbance and Loss of Land Used for Mining

Operation of the pipeline is not expected to affect land in active mineral areas. Operations could involve permanently removing land with potential sand and gravel resources from both current and future mining activities. Impacts on future mineral development would not constitute a significant loss of mineral resources or mineral availability because the resource potential is unknown. In addition, the width of the right-of-way is narrow relative to the expanse of areas with mineral resource potential. Operations impacts on land with potential mineral resources are likely to be permanent and negligible.

Route Alternative RA-07

<u>Construction Impacts</u>

Disturbance and Loss of Agricultural Land and Lost Yields

Construction of the RA-07 route would result in the second lowest total impacts on agricultural land (402 acres of agricultural land and 1,082 acres of farmland soils). During construction, production of crops on agricultural land typically would be prevented for one growing season, resulting in temporary minor losses to land currently being used for agricultural production. The estimated market value of crops lost during construction is approximately $39,000. This amount represents less than one-half of a percent of the total market value of agricultural products in the counties that would be crossed by the route; therefore, it is likely that construction of RA-07 would result in a temporary negligible impact on the local agricultural economy. The impacts on farmland soils would be the same as those described for the Applicant's preferred route (short term to long term and minor).

Disturbance and Loss of Wild Rice

RA-07 would cross about 6 acres of the wild rice waterbodies (one) within the construction work area (see Table 6.3.1.2-20). Specific construction methods for crossing of wild rice waterbodies along RA-07 have not been determined. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs.

Construction-related impacts and avoidance measures would be similar to those described above for the Applicant's preferred route.

Based on the conservative assumption that the entire 6.1 acres within the Clearbrook-Carlton segment construction work area includes viable stands of wild rice (not likely to be the case based on the discussion above), the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $4,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that construction of the Project would result in a temporary negligible to minor impact on the local agricultural economy. Impacts on the Fond du Lac and LLBO reservations, while likely to be disproportionately more significant, are still anticipated to be minor relative to the overall economies. For example, $4,000 per year is approximately 2% of the value of unprocessed wild rice to the overall LLBO economy in 2015.

Disturbance and Loss of Forested Lands and Timber Resources

The RA-07 route would cross 1,147 acres of forested land. Because RA-07 involves replacement of the existing Line 3, most impacts would be within the existing permanent right-of-way. The remainder of the construction footprint for RA-07 would be within the former construction footprint for Line 67, limiting the severity of impacts. Impacts on timber production would be long term but negligible because there should be little harvestable timber within the existing permanent right-of-way.

Disturbance and Loss of Land Used for Mining

The RA-07 route also would not cross any land in active mine areas but would traverse the largest amount of land areas with potential sand and gravel resources relative to the Applicant’s preferred route (562 acres), resulting in a temporary minor impact during construction.

Operations Impacts

Disturbance and Loss of Agricultural Land and Lost Yields

Following final restoration, agricultural activities would be able to resume across the construction work area and the permanent right-of-way, resulting in no additional impacts during continued operation of the pipeline. Operations for the RA-07 pipeline would not affect land currently being used for agricultural production, except for land within the permanent footprint of pump stations, MLVs, and permanent access roads that would be converted to industrial/developed land uses. Because the location of permanent facilities and access roads have not been determined for the route alternatives, the amount of agricultural land permanently converted to industrial uses cannot be quantified; however, given that it is likely to be similar to the Applicant’s preferred route, it is likely that operation along RA-07 would result in a permanent but negligible impact on the local agricultural economy.

Disturbance and Loss of Wild Rice Waterbodies

During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described in discussion on construction impacts for the route.

Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity.

Based on the conservative assumption that the entire x acres of wild rice waterbodies within the Clearbrook-Carlton segment permanent right-of-way area includes viable stands of wild rice (not likely to be the case based on the discussion above), and will be affected simultaneously by repair or replacement activities, the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $2,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that operations of the Project would result in a long-term temporary impact on the local agricultural economy and the overall economies of the Fond du Lac Band and LLBO, occurring at irregular intervals; permanent losses to wild rice crops would not be anticipated. The magnitude of said impacts is expected to be negligible to minor.

Disturbance and Loss of Forested Land and Timber Resources

To allow for visual inspection and maintenance of the pipeline, forested lands would not be allowed to reestablish within the permanent right-of-way. The easement for the RA-07 route would include approximately 257 acres of forested land within the Clearbrook-to-Carlton segment, of which the majority is deciduous forest. Given that the majority of this forested land already has been cleared within the permanent right-of-way of the existing Line 3 and in the construction of Line 67, little to no harvestable timber likely is present on the existing land, thereby resulting in a long-term negligible impact on the local timber industry.

Disturbance and Loss of Land Used for Mining

Operations for the RA-07 pipeline are not expected to affect land in active mineral areas. Operations could involve permanently removing land with potential sand and gravel resources from both current and future mining activities. Impacts on future mineral development would not constitute a significant loss of mineral resources or mineral availability because the resource potential is unknown. In addition, the width of the right-of-way is narrow relative to the expanse of areas with mineral resource potential. Impacts on land with potential mineral resources from operation are likely to be permanent and negligible.

Route Alternative RA-08

Construction Impacts

Disturbance and Loss of Agricultural Land and Lost Yields

Construction of the RA-08 route would affect 405 acres of agricultural land and 944 acres of farmland soils. During construction, production of crops on agricultural land typically would be prevented for one growing season, resulting in short-term minor losses to land currently being used for agricultural production. The estimated market value of crops lost during construction is approximately $41,000. This amount represents less than one-half of a percent of the total market value of agricultural products in the counties that would be crossed by the route; therefore, it is likely that construction of RA-08 would result in a temporary negligible impact on the local agricultural economy.

Disturbance and Loss of Wild Rice

RA-08 would cross approximately 10 acres of the wild rice waterbodies within the construction work area (see Table 6.3.1.2-20). Specific construction methods for crossing of wild rice waterbodies along RA-08 have not been determined. Where HDD is used as the crossing method, the wild rice waterbodies would not be affected unless a frac-out occurs.

Construction-related impacts and avoidance measures would be similar to those described above for the Applicant's preferred route.

Based on the conservative assumption that the entire 9.8 acres within the Clearbrook-Carlton segment construction work area includes viable stands of wild rice (not likely to be the case based on the discussion above), the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $6,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that construction of the Project would result in a temporary negligible to minor impact on the local agricultural economy. Impacts on the Fond du Lac and LLBO reservations, while likely to be disproportionately more significant, are still anticipated to be minor relative to the overall economies. For example, $6,000 per year is approximately 3% of the value of unprocessed wild rice to the overall LLBO economy in 2015.

Disturbance and Loss of Forested Land and Timber Resources

Construction of the RA-08 route would result in the lowest impact on total forested land (809 acres), resulting in a minor long-term impact on timber production. The estimated dollar value of harvestable timber that would be lost within the construction work area until the trees would be harvestable again would be approximately $1.3 million.

Disturbance and Loss of Land Used for Mining

The RA-08 route would not cross any land in active mine areas but would traverse a larger amount of land areas with potential sand and gravel resources relative to the Applicant's preferred route (555 acres). The impact on mining would be temporary and minor during construction.

<u>Operations Impacts</u>

Disturbance and Loss of Agricultural Land and Lost Yields

Following final restoration, agricultural activities would be able to resume across the construction work area and the permanent right-of-way, resulting in no additional impacts during continued operation of the pipeline. Operation of the pipeline would not affect land currently being used for agricultural production, except for land within the permanent footprint of pump stations, MLVs, and permanent access roads that would be converted to industrial/developed land uses. Because the location of permanent facilities and access road have not been determined for the route alternatives, the amount of agricultural land permanently converted to industrial uses cannot be quantified; however, given that it is likely to be similar to the Applicant's preferred route, it is likely that operation along RA-08 would result in a permanent but negligible impact on the local agricultural economy.

Disturbance and Loss of Wild Rice Waterbodies

During operation, wild rice waterbodies would not be affected unless it is necessary to repair or replace a section of pipe within the waterbody. In that event, the impacts would be similar to those for the initial construction of the pipeline through the waterbody, as described in discussion on construction impacts for the route.

Although the Applicant would restore the hydrology and soils of the affected portion of the wild rice waterbody after construction, rice yield could be reduced in the portion of the waterbody affected by the repair or replacement activities for the first growing season after completion of the activity.

Based on the conservative assumption that the entire 4.1 acres of wild rice waterbodies within the Clearbrook-Carlton segment construction work area includes viable stands of wild rice (not likely to be the case based on the discussion above), and will be affected simultaneously by repair or replacement activities, the approximate annual commodity economic loss for at least one year during or following construction, at a price of $2.00 per pound, is $3,000 per year. This amount represents less than one percent of the total market value of unprocessed wild rice to the Minnesota economy, approximately $2 million (Minnesota DNR 2017). Most wild rice production occurs in northern Minnesota, including counties crossed by the Project. Therefore, it is likely that operations of the Project would result in a long-term temporary impact on the local agricultural economy and the overall economies of Fond du Lac Band and LLBO, occurring at irregular intervals; permanent losses to wild rice crops would not be anticipated. The magnitude of said impacts is expected to be negligible to minor.

Disturbance and Loss of Forested Land and Timber Resources

To allow for visual inspection and maintenance of the pipeline, forested lands would not be allowed to reestablish within the permanent right-of-way. The permanent easement for RA-08 route would include approximately 335 acres of forested land within the Clearbrook-to-Carlton segment, of which the majority is deciduous forest. This land would permanently be removed from the ability to commercially produce timber for use in the wood product industries. Assuming that the current annual value of this timber would be lost into perpetuity, the present value of the timber removed from annual harvest is approximately $2.1 million, compared to present value of annual timber harvest in Minnesota over the same time period (perpetuity), which is $1.6 billion. The permanent conversion of 335 acres of forested land during operations for the RA-08 route therefore would cause a permanent minor impact on the local timber economy.

Disturbance and Loss of Land Used for Mining

Operation of the pipeline is not expected to affect land in active mineral areas. Operations could involve permanently removing land with potential sand and gravel resources from both current and future mining activities. Impacts on future mineral development would not constitute a significant loss of mineral resources or mineral availability because the resource potential is unknown. In addition, the width of the right-of-way is narrow relative to the expanse of areas with mineral resource potential. Impacts on land with potential mineral resources from operation are likely to be permanent and negligible.

6.5.1.4 Summary and Mitigation

6.5.1.4.1 Summary

Table 6.5.1-24 summarizes the potential impacts on commodity production in counties along the Applicant's preferred route and each of the route alternatives. Overall, the impact analysis found the following potential effects on agricultural land for the Applicant's preferred route and all of the route alternatives:

- Minor and short-term impacts during construction; and
- No to negligible impacts during continued operations, except for the land within the footprints of the pump stations, MLVs, and permanent access roads.

These impacts on agricultural land would lead to the following potential effects on the agricultural economies of the counties that would be crossed:

- Negligible temporary impacts during construction, and
- Negligible permanent impacts during operations.

These results are based on several factors. The aggregate value of the crop production foregone during construction is relatively low when compared to the overall aggregate value of those crops produced in the counties through which the pipeline routes pass. In addition, the Applicant would compensate for deferred crop production in the construction work area.

The aggregate value of wild rice production foregone during construction is low when compared with the overall aggregate value of wild rice produced in northern Minnesota, including the counties through which the pipeline routes pass. Impacts resulting from routes passing through the Fond du Lac Band and LLBO reservations could have disproportionate effects on the economies of these Indian communities, relative to the Minnesota economy. However, the anticipated magnitude would still be negligible to minor. The Applicant would utilize BMPs to minimize impacts on wild rice stands, particularly beyond the first growing season following construction. Impacts resulting from operations would be temporary, occurring during repair and other integrity activities, and negligible to minor in magnitude.

Removal of timber resources from the construction work area represents a permanent impact but, as with crop production, the economic impact would be partially offset by the sale of merchantable timber. For forested land and timber resources, the potential impact on timber production during construction of the pipelines would be long term and minor. It would take up to 50 years for the land cleared for construction to produce harvestable timber; however, the value of the timber lost is low relative to the value of the timber that remains available for harvest in the counties that would be crossed. Continued operation of the pipelines is expected to result in permanent negligible impacts on the agricultural economy, permanent minor impacts on the timber economy, and permanent negligible impacts on land with potential mineral resources.

No land in active mining areas would be affected by construction or operations of any route option, except for a temporary facility access road for the Applicant’s preferred route that would affect 0.5 acre in Carlton County (access roads would be required for all route alternatives, but none have been identified) and approximately 1 acre of the permanent right-of-way along RA-06. Although the potential for future mining based on mineral resources beneath the surface is unknown, it is expected that construction of the Applicant’s preferred route and route alternatives would result in a temporary negligible impact on this land, while operations would result in a permanent negligible impact.

Beyond the finding that impacts on commodity production would be negligible to minor and temporary to permanent, the Applicant’s preferred route and the route alternatives can be compared to each other based on projected impact values and differences identified among them.

When considering disturbance or loss of agricultural land from construction, the Applicant’s preferred route and RA-06, RA-07, and RA-08 are in a similar lower range of acreage affected, while RA-03AM would result in a much higher value. Lost agricultural yields has a similar result; RA-03AM has a much higher yield loss, more than four times as much as any of the other routes. In this case, however, the Applicant’s preferred route has a loss of yield that, while relatively small, is greater than RA-06, RA-07, and RA-08.

When considering disturbance or loss of wild rice stands from construction, the Applicant’s preferred route would affect the least amount of acreage, while RA-06 would affect the greatest amount. However, impacts would be similar in magnitude (acreage and dollar value). RA-06, RA-07, and RA-08 would potentially impact the Fond du Lac and/or LLBO communities’ economies, of which wild rice production is a greater proportion. However, the magnitude of economic impact to these communities would still be expected to be minor and temporary.

On the basis of disturbance and loss of forested land and associated economic yields during construction, the Applicant's preferred route affects the greatest amount of acreage and yield. All of the route alternatives were found to be in a similar range of impacts and loss of economic yield.

The comparative results for operations were similar to those for construction. For agricultural production and forestry, lower effects were predicted for RA-06, RA-07, and RA-08; and the Applicant's preferred route was at the high end of the range. The effects of RA-03AM were measurably higher.

For mining resources, the impacts for the Applicant's preferred route were significantly less than for all of the route alternatives.

6.5.1.4.2 Mitigation

The Applicant proposes several measures to minimize or avoid impacts that are discussed in the Agricultural Protection Plan (Appendix F). Beyond the Applicant-proposed measures to avoid and minimize impacts on commodity production, no mitigation has been identified.

Table 6.5.1-24. Summary of Potential Impacts on Commodity Production for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,i]	Route Alternative RA-08[g,i]
Construction Impacts					
Disturbance and loss of agricultural land	Short-term/minor impacts • 562 acres of agricultural land Short- to long-term/minor impacts • 1,278 acres of farmland soils	Short-term/minor impacts • 1,680 acres of agricultural land Short- to long-term/minor impacts • 1,608 acres of farmland soils	Short-term/minor impacts • 326 acres of agricultural land Short- to long-term/minor impacts • 1,241 acres of farmland soils	Short-term/minor impacts • 402 acres of agricultural land Short- to long-term/minor impacts • 1,082 acres of farmland soils	Short-term/minor impacts • 405 acres of agricultural land Short- to long-term/minor impacts • 944 acres of farmland soils
Lost agricultural land yields	Temporary/negligible impacts • $111,000 market value of crops	Temporary/negligible impacts • $481,000 market value of crops	Temporary/negligible impacts • $52,000 market value of crops	Temporary/negligible impacts • $39,000 market value of crops	Temporary/negligible impacts • $41,000 market value of crops
Disturbance and loss of wild rice production	Short-term/negligible to minor impacts	Short-term/negligible to minor impacts	Short-term/negligible to minor impacts Short-term/negligible to minor impacts on Indian communities	Short-term/negligible to minor impacts Short-term/negligible to minor impacts on Indian communities	Short-term/negligible to minor impacts Short-term/negligible to minor impacts on Indian communities
Disturbance and loss of forested land and timber resources	Long-term to permanent/ minor impacts • 1,446 acres of forested areas • $2.3 million market value of timber	Long-term to permanent/ minor impacts • 1,174 acres of forested areas • $1.9 million market value of timber	Long-term to permanent/ minor impacts • 1,143 acres of forested areas • $1.8 million market value of timber	Long-term/negligible impacts • 1,145 acres of forested areas • Negligible – occurs within existing right-of-way, which is cleared of trees	Long-term to permanent/ minor impacts • 809 acres of forested areas • $1.3 million market value of timber

Table 6.5.1-24. Summary of Potential Impacts on Commodity Production for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,i]	Route Alternative RA-08[g,i]
Disturbance and loss of land used for mining	Temporary/negligible impacts • 14 acres of land with potential sand and gravel resources No impact on active mines	Temporary/negligible impacts • 444 acres of land with potential sand and gravel resources No impact on active mines	Temporary/negligible impacts • 571 acres of land with potential sand and gravel resources Temporary/minor impact • 3 acres of active mines	Temporary/negligible impacts • 562 acres of land with potential sand and gravel resources No impact on active mines	Temporary/negligible impacts • 555 acres of land with potential sand and gravel resources No impact on active mines
Operations Impacts					
Disturbance and loss of agricultural land	Permanent/negligible impacts • 104 acres of agricultural land • 153 acres of farmland soils No additional impact on land within the permanent easement: • 252 acres of agricultural land • 559 acres of farmland soils	Permanent/negligible impacts on land within the footprint of the pump stations, MLVs, and permanent access roads. No additional impact land within the permanent easement: • 706 acres of agricultural land • 670 acres of farmland soils	Permanent/negligible impacts on land within the footprint of the pump stations, MLVs, and permanent access roads. No additional impact land within the permanent easement: • 136 acres of agricultural land • 518 acres of farmland soils	Permanent/negligible impacts on land within the footprint of the pump stations, MLVs, and permanent access roads. No additional impact land within the permanent easement: • 170 acres of agricultural land • 302 acres of farmland soils	Permanent/negligible impacts on land within the footprint of the pump stations, MLVs, and permanent access roads. No additional impact on land within the permanent easement: • 170 acres of agricultural land • 394 acres of farmland soils
Lost agricultural land yields	Permanent/negligible impacts • $64,000 market value of crops No additional lost yield on land within the permanent easement	Permanent/negligible impacts within facilities footprint No additional lost yield on land within the permanent easement	Permanent/negligible impacts within facilities footprint No additional lost yield on land within the permanent easement	Permanent/negligible impacts within facilities footprint No additional lost yield on land within the permanent easement	Permanent/negligible impacts within facilities footprint No additional lost yield on land within the permanent easement

Table 6.5.1-24. Summary of Potential Impacts on Commodity Production for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,i]	Route Alternative RA-08[g,i]
Disturbance and loss of wild rice production	Short-term/negligible to minor impacts at regular intervals No additional permanent lost yield within permanent right-of-way	Short-term/negligible to minor impacts at regular intervals No additional permanent lost yield within permanent right-of-way	Short-term/negligible to minor impacts at regular intervals No additional permanent lost yield within permanent right-of-way	Short-term/negligible to minor impacts at regular intervals No additional permanent lost yield within permanent right-of-way	Short-term/negligible to minor impacts at regular intervals No additional permanent lost yield within permanent right-of-way
Disturbance and loss of forested land and timber resources	Permanent/minor impacts • 631 acres of forested areas • $4.8 million market value of timber	Permanent/minor impacts • 485 acres of forested areas • $3.1 million market value of timber	Permanent/minor impacts • 476 acres of forested areas • $3.0 million market value of timber	Long-term/negligible impacts • 257 acres of forested areas • Negligible – occurs within existing right-of-way which is cleared of trees	Permanent/minor impacts • 335 acres of forested areas • $2.1 million market value of timber
Disturbance and loss of land used for mining	Permanent/negligible impacts • 7 acres of land with sand and gravel resources No impact on active mines	Permanent/negligible impacts • 184 acres of land with sand and gravel resources No impact on active mines	Permanent/negligible impacts • 238 acres of land with sand and gravel resources • 1 acre of active mines	Permanent/negligible impacts • 234 acres of land with sand and gravel resources No impact on active mines	Permanent/negligible impacts • 231 acres of land with sand and gravel resources No impact on active mines

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to commodity production. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, NRCS data was used to assess acreage of farmland soil impacted. While this dataset provides an indication of potential impacts to land with current and future agricultural value, it does not provide an indication of the type and extent of actual cultivation underway and must be considered in conjunction with crop production data to determine the specific impacts to agricultural commodity production. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-716 to 6-730. The table above, for example provides acreages of agricultural land and potential value of crops within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to cropland is contained in the text of this section (terms defined in Section 6.1.3).**

Table 6.5.1-24. Summary of Potential Impacts on Commodity Production for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c,h]	Route Alternative RA-03AM[d,i]	Route Alternative RA-06[e,i]	Route Alternative RA-07[f,i]	Route Alternative RA-08[g,i]

c Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-717 to 6-721. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

d Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-722 to 6-724. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

e Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-724 to 6-726. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

f As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-726 to 6-728. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

g RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-728 to 6-730. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

h Enbridge-provided footprints: Construction = construction work area, Operations = operations permanent right-of-way.

i Construction = 120-foot-wide construction footprint (except RA-07 would be 205 feet wide), Operations = 50-foot-wide permanent right-of-way.

6.5.1.5 References

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6.5.2 Recreation and Tourism

Recreational tourism dollars contribute to recreational economies. They are based on spending associated with participation in outdoor activities that take place on public lands and waters, such as parks, forests, and special management areas; state-designated land based trails; state-designated water trails and trout streams; and state- and federally designated scenic byways. Recreational activities contribute to the local economy through the influx of tourists, purchases of gear and related equipment, and trip-related spending (e.g., gas, lodging, and food).

The issues of concern related to recreation and tourism are the loss of recreation-based spending and the associated effects on the recreational economies in the counties that would be crossed. This potential loss would come from a measurable decrease in recreation-based visitation because of trail closings and access limitations during construction and operation of the Project. This section assesses the potential for construction and operation of the Applicant's preferred route and route alternatives to affect the recreation economy. Impacts on recreation and tourism that could occur during construction and operation include:

- Limitations to recreation access, and
- Changes to the recreational economy.

This section first describes the existing conditions within an area along the Applicant's preferred route and each of the route alternatives where recreation and tourism could be affected by construction or operation of the Project. The potential impacts of Project-related construction and operation on recreation and tourism are considered next. Potential impacts for each route alternative (RA-03AM, RA-06, RA-07, and RA-08) are assessed and compared to each other and to the Applicant's preferred route between Clearbrook and Carlton. A summary and comparison of the impacts are included at the end of the section. Chapter 10 addresses the potential impacts on recreation and tourism resulting an unanticipated release of crude oil.

6.5.2.1 Regulatory Context and Methodology

6.5.2.1.1 Regulatory Context

Minnesota Administrative Rules Part 7852.0700, Subpart (3) provides the criteria the Commission must consider in determining the route of a pipeline. This includes, among other things, the potential impacts of, and the methods to minimize or mitigate the potential impacts of, all proposed routes on, "the natural environment, public and designated lands, including but not limited to natural areas, wildlife habitat, water, and *recreational lands*," (emphasis added) and "economies within the route, including agricultural, commercial or industrial, forestry, *recreational*, and mining operations" (emphasis added).

6.5.2.1.2 Methodology

The ROI for the analysis of recreation and tourism impacts is twofold. It narrowly focuses on the public recreational lands and recreational waterbodies directly crossed by construction and operational areas the Applicant's preferred route and the route alternatives in order to qualitatively assess how Project-related changes would affect recreation-based visitation. It broadly includes the counties through which the Applicant's preferred route and the route alternatives pass to assess whether the Project-related changes would affect recreation-based visitation at the county-level and subsequently the local recreation-based economy. The counties where Project related impacts would occur represent the relevant local recreational economies that are likely to be the most sensitive to Project-related actions.

The analysis was undertaken by first identifying and inventorying in GIS all public recreational lands, trails, and waterbodies in the counties crossed by the Applicant's preferred route and the route alternatives. The following construction and operations footprints were overlaid to quantify resources affected by construction and operation:

- The route and estimated footprints for the pipeline and associated facilities for the Applicant's preferred route;
- The 120-foot-wide construction footprint for RA-03AM, RA-06, and RA-08; 205-foot-wide construction footprint for RA-07; and 50-foot-wide permanent right-of-way for all route alternatives.

The geographic extent (acres) of restricted access to recreational land from the construction work areas, permanent rights-of-way, and associated aboveground facilities—in addition to the geographic extent of restricted access to recreational waterbodies, land-based trails, and scenic byways—was determined by analyzing the number of crossings and crossing methods described by the Applicant. The analysis assumed that access would be restricted to the affected resource over the entire construction work area for the duration of construction. During operations the analysis assumed that access would be restricted during operations along the permanent right-of-way for pipelines and at any associated aboveground facilities.

The geographical extent of restricted access was assessed to determine potential impacts on localized recreational use and recreational economies at the county level. Current statistics on visitation to the specific recreation areas identified in this analysis and any associated recreational spending were not available; consequently, quantitative estimates of economic impacts could not be developed. However, a qualitative assessment was developed to assess the overall potential for disruption of these activities and the magnitude of the associated loss of tourism. A qualitative discussion of impacts on recreation-based tourism characterizes the direction and magnitude of potential impacts on the regional recreation/tourism economy at the county level.

Recreational land and waterbodies within the ROI for the Applicant's preferred route and route alternatives were identified using GIS datasets and layers in the following federal- and state-level data sources:

- PAD-US,
- Minnesota DNR water trails,
- Minnesota DNR snowmobile trails,
- Minnesota DNR state-designated trails,
- Minnesota DNR hunter walking trails, and
- Minnesota state-designated trout streams.

A more detailed discussion of the methodology may be found in Section 5.3.2.1.2.

No single one of these datasets provides a complete indication of all relevant impacts to recreation and tourism, but together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, while the state-designated trout stream dataset provides an indication of impacts to trout fishing, it does not provide information about other important recreational uses like hunting. Other datasets, like DNR hunter walking trails, must also be considered for a more complete understanding of recreational impacts.

Furthermore, the quantitative information from the analysis of these datasets should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide counts, for example, of state-designated trout streams crossed; however, a more complete discussion of the qualitative nature of impacts that could occur to recreational uses related to those streams is contained in the text of this section.

6.5.2.2 Existing Conditions

This section identifies recreational resources that could be affected by the Applicant's preferred route and route alternatives (see Section 5.3.2.2 for a full description of each resource). As previously described, changes to these resources could reduce or restrict recreational use, which could affect recreational spending at the county level. This section does not discuss current recreational use or spending at the county level because publicly available, accurate, and consistent data were not available for each of the resources discussed. For context, an estimate of the approximate acreages or total size of the resources are provided where appropriate for the Applicant's preferred route and each route alternative.

6.5.2.1.3 Applicant's Preferred Route

Section 5.3.2 describes existing conditions in Minnesota for recreational use of parks, forests, and special management areas; state-designated land-based trails; state-designated water trails and trout streams; and scenic byways. Information enabling comparison of the route alternatives to the Applicant's preferred route is provided below.

Parks, Forests, and Special Management Areas

Table 6.5.2-1 lists by county the miles and acres of parks, forests, and special management areas that would be crossed by the Applicant's preferred route. No federal or state parks in Minnesota would be crossed by the Applicant's preferred route. The Applicant's preferred route would not cross any federally owned forests but would cross approximately 32 miles of state forested land (all within the Clearbrook-to-Carlton segment) and approximately 1 mile of special management areas, which includes two WMAs (both in Aitkin County). The total amount of land used for recreational purposes in the ROI for the Applicant's preferred route (and all is within the Clearbrook-to-Carlton segment) is approximately 526 acres (including access roads, ATWS, and MLVs), compared to the total land available for recreation in the forests and WMAs that would be crossed (714,633 acres) (Table 6.5.2-1).

State-Designated Land-Based Trails

State-designated land-based trails include multi-use trails, hunter walking trails, and state-managed snowmobile trails. Minnesota has 25 state trails that were developed for multi-use purposes such as hiking, biking, horseback riding, and more. In addition, dozens of hunter walking trails are located within WMAs, and over 22,000 miles of groomed snowmobile trails are managed by Minnesota DNR.

The Applicant's preferred route would cross three state-designated multi-use trails, each located in the Clearbrook-to-Carlton segment. Two of the trails would be crossed once (Paul Bunyan State Trail in Cass County and Willard Munger State Trail in Carlton County), and a hunter walking trail in the Hill River State Forest would be crossed twice. The route would cross 0.8 mile of snowmobile/ATV trails.

No state-designated multi-use trails would be crossed in the Carlton-to-Wisconsin border segment or in the North Dakota border-to-Clearbrook segment.

Table 6.5.2-1. Parks, Forests, and Special Management Areas Crossed by the Applicant's Preferred Route (Clearbrook to Carlton)

County	Name	Total Size (acres)	Centerline (miles)	Construction Work Area (acres)	Permanent Right-of-Way (acres)	Access Roads	ATWS	Valves	Con Total[a]	Op Total[b]
Aitkin County	Grayling Marsh WMA	9,627	1.1	14	6	--	1	--	15	6
Aitkin County	Lawler WMA	235	0.3	3	2	--	--	--	3	2
Cass County	Foot Hills State Forest	46,896	3.1	42	19	8	5	--	55	19
Aitkin County	Hill River State Forest	124,204	8.0	103	48	6	5	--	114	48
Wadena County	Huntersville State Forest	33,963	7.1	97	43	11	8	--	116	43
Cass County	Land O'Lakes State Forest	49,890	9.6	130	58	22	9	--	161	58
Hubbard County	Mississippi Headwaters State Forest	45,290	1.8	25	11	7	4	0.2	35	11
Hubbard County	Paul Bunyan State Forest	150,113	--	<0.1	<0.1	--	--	--	0	0
Aitkin County	Savanna State Forest	238,954	0.8	9	5	0	0	--	9	5
Aitkin County	Waukenabo State Forest	15,461	1.4	16	8	1	1	--	17	8
TOTAL		**714,633**	**33.2**	**439**	**199.4**	**54.6**	**32.1**	**0.2**	**526**	**200**

Source: USGS GAP 2016.

[a] Con Total = For the Applicant's preferred route, the construction total is the sum of the Applicant-provided footprints, additional temporary workspaces (ATWS) that include pipe yards, and temporary access roads.

[b] Op Total = For the Applicant's preferred route, the operations total is the sum of the Applicant-provided pipeline permanent right-of-way, primary access roads, pump stations, and valves (where valves include valve pad and driveway).

Notes:

The Applicant's preferred route would not cross parks, forests, or special management areas from the North Dakota border to Clearbrook or from Carlton to the Wisconsin border.

Acres for the construction work area and the permanent right-of-way are based on Enbridge-provided footprints for the Applicant's preferred route and a 120-foot-wide construction footprint and 50-foot-wide permanent right-of-way used for the route alternatives.

"--" = no occurrence, WMA = Wildlife Management Area

In total, the Applicant's preferred route would cross 19 snowmobile trails within Minnesota, of which 12 trails are in the Clearbrook-to-Carlton segment. In Clearwater County, the Clearwater Blazer Trail would be crossed once; in Hubbard County, the North Country Trail and the Wadena Trail would be crossed once, and the Forest Rider Trail would be crossed six times; in Wadena County, the Wadena Trail would be crossed twice, and the Nevis Wilder Trail would be crossed once; in Cass County, the Cass County Trail would be crossed four times, and the Emily-Outing Snowbird Trail would be crossed twice; in Aitkin County, the Haypoint Trail would be crossed once, the Palisade Trail would be crossed three times, and the Tamarack Trail would be crossed four times; and in Carlton County, the Kettle Trail would be crossed once. No snowmobile trails would be crossed from Carlton to the Wisconsin border.

State-Designated Water Trails and Trout Streams

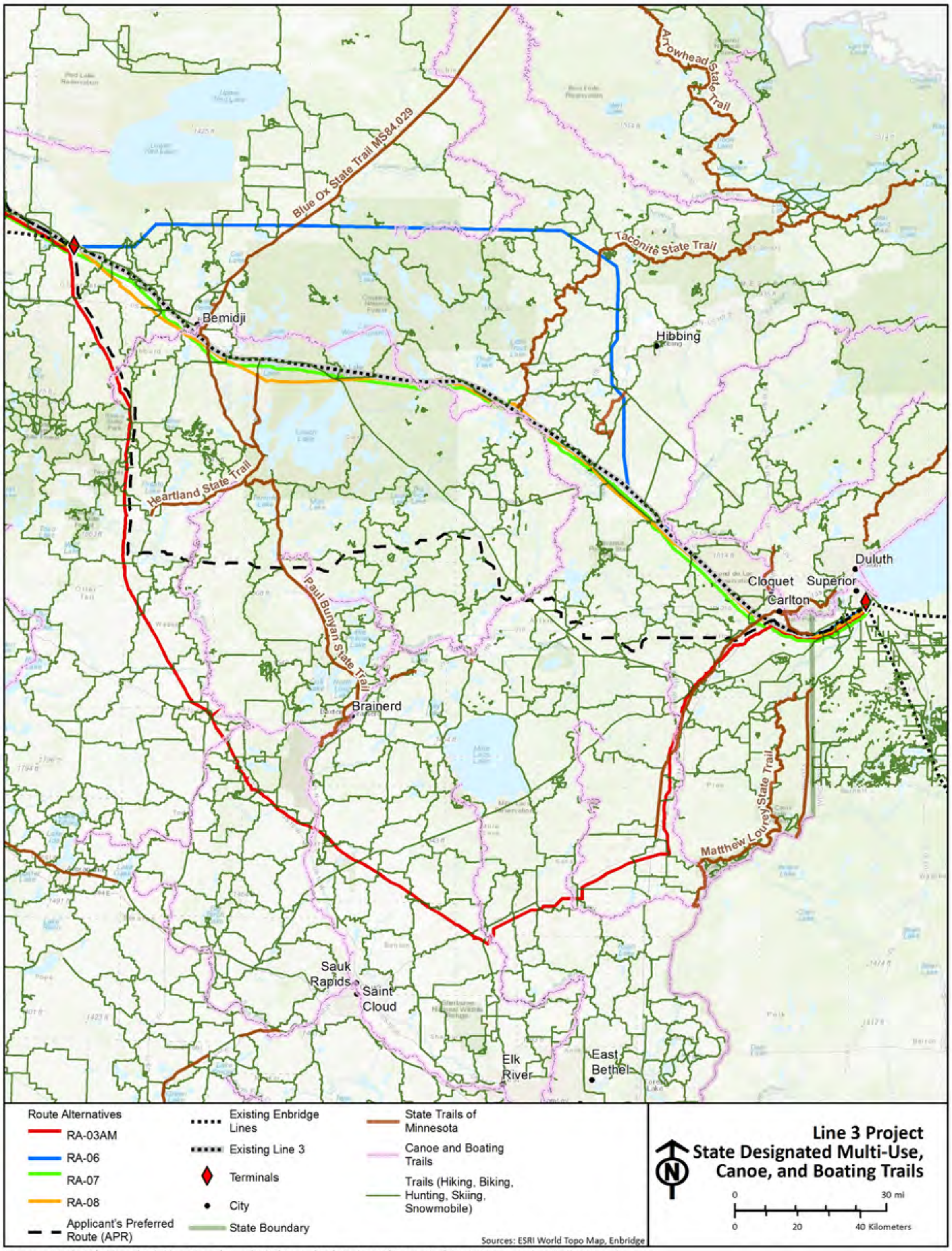
Water trails are marked routes on navigable waterways (e.g., rivers, lakes, canals, and coastlines) for people using small, non-motorized boats (e.g., kayaks, canoes, rafts, and rowboats). Minnesota has 35 state-designated canoe and boating routes totaling over 4,500 miles.

The Applicant's preferred route would cross five state-designated canoe and boating trails in Minnesota, three of which are between Clearbrook and Carlton. Two of the rivers (Crow Wing River in Wadena County and Pine River in Cass County) would be crossed once; while the Mississippi River would be crossed two times, once in Clearwater County and again in Aitkin County (Figure 6.5.2-1). Each of the rivers that would be crossed range in length from 60 miles (Pine River) to over 500 miles (Red River of the North).

State-designated trout streams provide an important source of recreational activity to local anglers. For context, Minnesota has 687 designated trout streams, totaling 3,782 miles. In total, the Applicant's preferred route would require crossing six state-designated trout streams, all located in the Clearbrook-to-Carlton segment (King Creek and an unnamed stream in Carlton County, Straight River in Hubbard County, Spring Brook in Cass County, Blackhoof River in Carlton County, and LaSalle Creek in Hubbard County). No trout streams would be crossed outside of the Clearbrook-to-Carlton segment.

Scenic Byways

In Minnesota, 21 scenic byways (8 of which are national byways) cross several of Minnesota's finest cultural, historic, recreational, and scenic locations. In total, the Applicant's preferred route would cross one national byway (the Great River Road) twice, once in Clearwater County and again in Aitkin County; and three state-designated byways, one of which is located in the Clearwater-to-Carlton segment (Lake Country in Hubbard County) (Figure 6.5.2-2).



Document Path: M:\Chicago\Enbridge_Line_3\Maps\MXD\Report\EIS\Final_2017\Recreation\EIS_ID42_Recreation_Trails_RA.mxd

Figure 6.5.2-1. State Designated Multi-Use, Canoe, and Boating Trails Crossed by the Applicant's Preferred Route and Route Alternatives

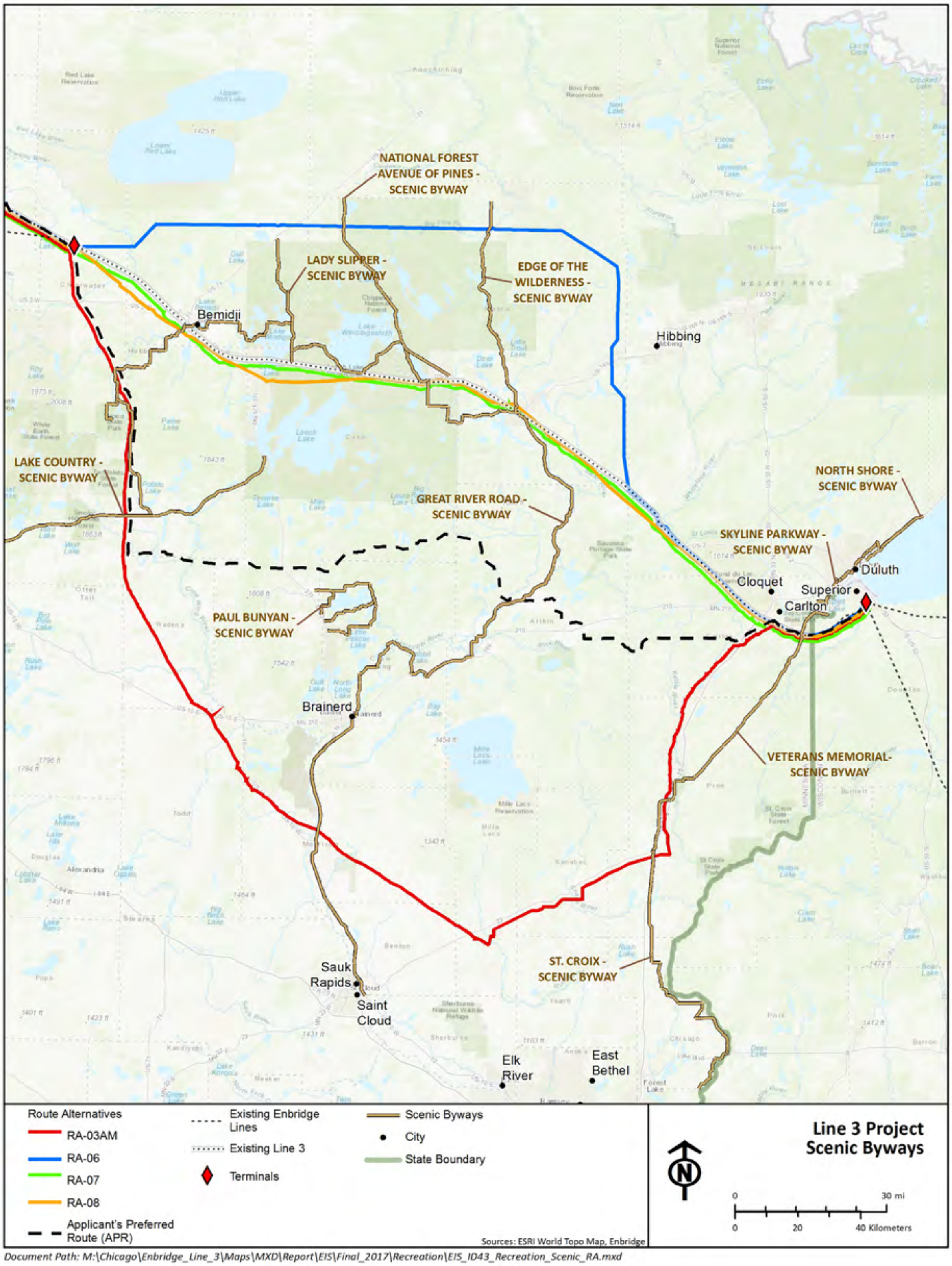


Figure 6.5.2-2. Scenic Byways Crossed by the Applicant's Preferred Route and Route Alternatives

6.5.2.1.4 Route Alternatives

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to recreation and tourism for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

Parks, Forests, and Special Management Areas

No federal or state parks would be crossed by RA-03AM (Table 6.5.2-2). The route would cross approximately 5 acres of WMAs, and 26 acres of state forest—all within the Mississippi Headwaters State Forest. The total amount of land used for recreational purposes in the ROI for RA-03AM within the Clearbrook-to-Carlton segment is 57 acres, compared to the total land available for recreation in the forests and WMAs that would be crossed (59,071 acres) (Table 6.5.2-2).

Table 6.5.2-2. Parks, Forests, and Special Management Areas Crossed by Route Alternative RA-03AM

County	Name	Total Area (acres)	Centerline (miles)	Construction Work Area (acres)	Permanent Right-of-Way (acres)
Hubbard County	Mississippi Headwaters State Forest	45,290	1.8	26	11
Morrison County	Neitermeier WMA	277	0.4	5	2
TOTAL		**59,071**	**4.0**	**57**	**24**

Source: USGS GAP 2016.

Notes:

Acres for the construction work area and the permanent right-of-way are based on a 120-foot-wide construction footprint and 50-foot-wide permanent right-of-way for RA-03AM. The specific locations of activities and facilities are not known for the route alternatives.

WMA = Wildlife Management Area

State-Designated Land-Based Trails

No hunter walking trails would be crossed by RA-03AM; however, it would cross one state-designated trail (Willard Munger State Trail) two times in Pine County and once in Carlton County (Figure 6.5.2-1). RA-03AM would cross the most snowmobile trails (16 trails/5.6 miles within the Clearbrook-to-Carlton segment).

State-Designated Water Trails and Trout Streams

RA-03AM would cross the highest number of state-designated canoe and boating trails (Kettle River in Pine County, Long Prairie River in Todd County, Mississippi River [two crossings] once in Clearwater County and again in Morrison County, Rum River in Mille Lacs County, and Snake River in Kanabec County) (Figure 6.5.2-1). RA-03AM would require the most trout stream crossings (nine crossings).

Scenic Byways

RA-03AM would require three crossings of scenic byways (Great River Road once in Clearwater County and again in Morison County, Lake Country in Hubbard County, and St. Croix in Pine County) (Figure 6.5.2-2).

Route Alternative RA-06

Parks, Forests, and Special Management Areas

No federal or state parks would be crossed by RA-06; however, it would cross through the Chippewa National Forest (Table 6.5.2-3). Furthermore, RA-06 would cross the highest amount of forest (over 59 miles), of which 54 miles, or 91 percent, is within state forests. RA-06 has the second largest land area of state forests and special management areas crossed by the route (approximately 875 acres), and the highest acreage of parks, forests, and special management areas remaining in the permanent right-of-way (approximately 365 acres). The total amount of land used for recreational purposes in the ROI for the RA-06 route within the Clearbrook-to-Carlton segment is 875 acres, compared to the total land available for recreation in the forests and WMAs that would be crossed (2,113,000 acres) (Table 6.5.2-3).

Table 6.5.2-3. Parks, Forests, and Special Management Areas Crossed by Route Alternative RA-06

County	Name	Total Land Area (acres)	Centerline (miles)	Construction Work Area (acres)	Permanent Right-of-Way (acres)
Cass County	Chippewa National Forest	1,600,000	5.9	86	36
Itasca County	George Washington State Forest	320,534	31.5	458	191
Itasca County	Big Fork State Forest	127,929	20.2	294	123
Carlton County	Fond du Lac State Forest	64,505	2.5	37	15
TOTAL		**2,112,968**	**60.1**	**875**	**365**

Source: USGS GAP 2016.

Notes:

Acres for the construction work area and the permanent right-of-way are based on a 120-foot-wide construction footprint and 50-foot-wide permanent right-of-way for RA-06. The specific locations of activities and facilities are not known for the route alternatives.

WMA = Wildlife Management Area

State-Designated Land-Based Trails

No hunter walking trails would be crossed by RA-06; however, it would cross the Blue Ox State Trail in Beltrami County, the Willard Munger State Trail in Carlton County, and the Taconite State Trail and Pengilly to Goodland State Trail—both located in Itasca County (Figure 6.5.2-1). The route would cross 0.7 mile of snowmobile/ATV trails.

State-Designated Water Trails and Trout Streams

RA-06 would cross one state-designated canoe and boating trail three times; would cross the Big Fork River in Itasca County (see Figure 6.5.2-1); and would require eight trout stream crossings (an unnamed creek, Clearwater River, Spring Creek, and O'Brien Creek in Beltrami County; two unnamed streams in Itasca County; and Otter Creek and an unnamed stream in Carlton County).

Scenic Byways

RA-06 would cross two byways: the National Forest Avenue of Pines Byway and the Edge of the Wilderness Byway, both in Itasca County (Figure 6.5.2-2).

Route Alternative RA-07

Parks, Forests, and Special Management Areas

No federal or state parks would be crossed by RA-07; however, it would cross through the Chippewa National Forest (Table 6.5.2-4). RA-07 would cross the greatest amount of land available for recreation (approximately 1,049 acres), primarily in the Bowstring State Forest (698 acres) in both Cass and Itasca counties. The total amount of land used for recreational purposes in the ROI for the RA-07 route within the Clearbrook-to-Carlton segment is approximately 1,049 acres, compared to the total land available for recreation in the forests and WMAs that would be crossed (2,236,364 acres) (Table 6.5.2-4).

Table 6.5.2-4. Parks, Forests, and Special Management Areas Crossed by Route Alternative RA-07

County	Name	Total Land Area (acres)	Centerline (miles)	Construction Work Area (acres)	Permanent Right-of-Way (acres)
Cass County	Bowstring State Forest	526,569	28.1	698	170
Carlton County	Fond du Lac State Forest	64,505	2.5	63	15
Beltrami County	Mississippi Headwaters State Forest	45,290	5.3	131	32
Cass County	Chippewa National Forest	1.6 million	6.0	157	36
TOTAL		**2,236,364**	**41.9**	**1,049**	**254**

Source: USGS GAP 2016.

Notes:

Acres for the construction work area and the permanent right-of-way are based on a 205-foot-wide construction footprint, 10 feet wide on the north side of existing Line 3 and 195 feet wide on the south side of existing Line 3and 50-foot-wide permanent right-of-way for RA-07. The specific locations of activities and facilities are not known for the route alternatives.

WMA = Wildlife Management Area

State-Designated Land-Based Trails

No hunter walking trails would be crossed by RA-07; however, RA-07 would cross the Paul Bunyan State Trail in Beltrami County, the Heartland State Trail in Cass County, and the Taconite State Trail in Itasca County (Figure 6.5.2-1). The route would cross 2.6 miles of snowmobile/ATV trails.

State-Designated Water Trails and Trout Streams

RA-07 would cross two state-designated canoe and boating trails (the Mississippi River) two times (once in Beltrami County, and again in Itasca County) and the St. Louis River in St. Louis County (Figure 6.5.2-1). The route would require six trout stream crossings (an unnamed creek and the Clearwater River in Beltrami County; the Necktie River in Hubbard County; and Otter Creek, Little Otter Creek, and an unnamed stream in Carlton County).

Scenic Byways

RA-07 would cross two byways: the Great River Road four times (once in Beltrami County and three times in Cass County) and the Edge of the Wilderness Byway in Itasca County (Figure 6.5.2-2).

Route Alternative RA-08

Parks, Forests, and Special Management Areas

No federal or state parks would be crossed by RA-08; however, it would cross through the Chippewa National Forest (Table 6.5.2-5). The total amount of land used for recreational purposes in the ROI for the RA-08 route within the Clearbrook-to-Carlton segment is approximately 663 acres, compared to the total land available for recreation in the forests and WMAs that would be crossed (2,496,073 acres) (Table 6.5.2-5).

Table 6.5.2-5. Parks, Forests, and Special Management Areas Crossed by Route Alternative RA-08

Route/ County	Name	Total Land Area (acres)	Centerline (miles)	Construction Work Area (acres)	Permanent Right-of-Way (acres)
Cass County	Chippewa National Forest	1,600,000	5.8	84	35
Beltrami County	Bemidji Slough WMA	49	0.3	4	2
Itasca County	Swan River Deer Yard WMA	909	0.5	7	3
Cass County	Bowstring State Forest	526,569	28.2	410	171
Carlton County	Fond du Lac State Forest	64,505	2.4	36	15
Beltrami County	Mississippi Headwaters State Forest	45,290	4.7	68	28
Cass Count	Welsh Lake State Forest	19,797	1.1	15	6
Aitkin County	Savanna State Forest	238,954	2.6	38	16
TOTAL		**2,496,073**	**45.6**	**663**	**276**

Source: USGS GAP 2016.

Notes:

Acres for the construction work area and the permanent right-of-way are based on a 120-foot-wide construction footprint and 50-foot-wide permanent right-of-way for RA-08. The specific locations of activities and facilities are not known for the route alternatives.

WMA = Wildlife Management Area

State-Designated Land-Based Trails

No hunter walking trails would be crossed by RA-08; however, it would cross the Paul Bunyan State Trail in Beltrami County, the Heartland State Trail in Cass County, and the Taconite State Trail in Itasca County (Figure 6.5.2-1). The route would cross 2.9 miles of snowmobile/ATV trails.

State-Designated Water Trails and Trout Streams

RA-08 would cross only one state-designated canoe and boating trail (the Mississippi River) three times: once in Beltrami County, once in Cass County, and again in Itasca County (see Figure 6.5.2-1). RA-08 would require the fewest number of state-designated trout stream crossings (four crossings): the

Necktie River in Beltrami County and the Little Otter Creek, Otter Creek, and an unnamed stream in Carlton County.

Scenic Byways

RA-08 would cross two byways: the Great River Road Byway twice (once in Beltrami and again in Itasca County) and the Edge of the Wilderness Byway, also in Itasca County (Figure 6.5.2-2).

6.5.2.3 Impact Assessment

6.5.2.1.5 Applicant's Preferred Route (in Minnesota)

Construction Impacts

Limitations to Recreation Access

Parks, Forests, and Special Management Areas

Based on a review of relevant maps and satellite imagery, most land within the construction work areas does not include developed recreational areas (i.e., areas with facilities such as parking, campsites, boat launches, and hiking trails). This is also true for the two WMAs in Aitkin County because they are primarily designated for undeveloped recreational use. Generally, the land affected by construction of the pipeline consists of open public land available for informal recreation and does not include any developed areas, with the exception of off-road trails, ATV trails, and snowmobile trails.

During construction, impacts on eight state forests, and two special management areas within the construction work area include removal of existing vegetation, grading, excavation, pipeline installation, and reconstruction (for trails). Access to the affected land would be limited or restricted during this time. The Applicant may need to temporarily close or restrict access to trails within state forests (both non-motorized and off road) during construction of the pipeline across any trails. Enbridge would cross trails using the bore or open-cut method. If a bore is used, no impacts on the trail would be expected. If the open-cut method is used, Enbridge would complete pipeline installation activities across trails within 48 hours.

Construction in any location would last for several days to several weeks depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; therefore, limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. After this time period, recreational activities on the affected acres could resume as normal. Additional detail on noise and visual disturbance is provided in Sections 6.2.2 and 6.2.3, respectively.

At the county level, the majority of the land disturbed during construction (156 acres) would occur in state forests and WMAs within Aitkin County (Table 6.5.2-1). A review of forest and WMA maps revealed that the disturbed land represents a very small portion (less than 1 percent) of the total amount of land that remains available in each forest and WMA that would be crossed by the pipeline. In total, over 388,000 acres of land in the same forests and WMAs in Aitkin County would remain unaffected and available during construction. This is also true in Cass County (217 acres of 96,876 total), Wadena County (116 acres of 33,963 total) and Hubbard County (36 acres of 45,290 total). Impacts on forests and special management areas are anticipated to be temporary and minor because impacts would be confined to small portions of the total land available for recreation and any closures of these areas would be limited to during and immediately following construction.

State-Designated Land-Based Trails

Construction-related activities would temporarily affect public access and use of land-based trails where the pipeline crosses the trail for a short time during pipeline installation. The Applicant proposes to use the bore or open-cut method at trail crossings. If the latter is used, trail use would be suspended for 48 hours during construction. After completion of pipeline installation, the Applicant would restore the trail surface to allow passage.

Based on a review of the trail route map for the Paul Bunyan and the Willard Munger state trails, the pipeline crossing would occur in areas with no designated public access or facilities. The Paul Bunyan State Trail is over 120 miles long, and the intersection would occur near the middle of the trail just south of Backus, which does not include any public access points or recreational facilities. The pipeline also crosses the Willard Munger State Trail, which is over 90 miles long. The intersection occurs just north of Mahtowa and does not include any public access points or recreational facilities. Construction-related impacts on these trails likely would result in a temporary restriction on recreational access where the pipeline crosses over during pipeline installation. Based on the overall length of the trails and alternative locations to access it, a temporary negligible impact on the recreational access of state trails is expected.

For the hunter walking trail in the Hill River State Forest, the Applicant would maintain access during the hunting season. Noise and visual disturbance may continue to affect the recreational experience in the disturbed areas during construction; however, restrictions in use would no longer be necessary. Overall, impacts on the recreational access to state-designated land-based trails are anticipated to be temporary and negligible. Impacts would be confined to the area where the pipeline crosses the trail, and any restrictions to access at these intersections would be limited to during and immediately following construction.

State-Designated Water Trails and Trout Streams

The Applicant's preferred route would cross three state-designated canoe and boating trails and six state-designated trout streams between Clearbrook and Carlton. Except for the Pine River, the canoe and boating trails would be crossed using HDD, resulting in no impacts on recreation or tourism. Public use and access to the Pine River would be interrupted temporarily at the intersection of the river and the pipeline during installation of the pipeline. After the pipeline is installed, river users would be allowed to cross the construction area. Based on a review of the trail route map, the pipeline crossing would occur near the end of the trail (on or around River Mile 45 of 59 miles), which does not include any public access points or recreational facilities. Construction-related impacts on the Pine River likely would result in a temporary restriction on recreational access where the pipeline crosses the river during pipeline installation. Based on the overall length of the Pine River (59 miles) and alternative sites to access the river, a temporary negligible impact on the overall recreational access of the Pine River is expected. Potential impacts associated with trout stream waterbody crossings are discussed in Section 5.3.2. Because impacts on these streams would be temporary and would not occur during designated trout fishing seasons, temporary negligible impacts on the recreational use of trout streams are anticipated.

Scenic Byways

The Applicant's preferred route would cross scenic byways using a bore or HDD, which would avoid road closures and any direct impacts on the roads. As a result, construction of the proposed Project would not disrupt use of the byways and therefore would not limit recreational access. Impacts associated with aesthetic changes along scenic byways are discussed in Section 6.2.3.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas

Construction could disrupt the activities or alter the recreational experience of people who regularly use the affected areas for specific recreational purposes. However, these impacts would be temporary, minor, and localized and would be limited to small portions of the overall recreational site (i.e., the forest or WMA). Because the majority of the land crossed by the Applicant's preferred route does not include developed recreational areas (e.g., facilities and trails) that are more likely to attract visitors from outside of the area, it is likely that impacts would be limited to local people who live in and around the immediate area.

During construction, local recreational users could re-locate to undisturbed areas throughout each of the state forests and WMAs, given the overall size of these areas relative to the area affected by the construction footprint (439 acres of land disturbed for construction of 714,633 acres of total land available). Construction-related impacts likely would result in a temporary, negligible impact on the number of recreation-based trips people take to state forests and WMAs. Construction impacts would be temporary (several days to several weeks depending on a variety of factors such as land use type, topography, weather, and other environmental conditions) and limited to areas with very little opportunities for developed recreation. In addition, recreational users have a variety of substitute or alternative sites both within the affected forest or WMA and in the county as a whole. Construction activities may limit access to the affected areas or reduce the quality of the experience. However, given the temporary nature of the activity and the opportunity to recreate in a variety of other places in the county, the loss of recreation-based visitation is not expected to be large enough to measure in terms of recreational spending at the county level. Consequently, impacts on the recreational economies in each of the counties that would be crossed would be temporary and negligible.

State-Designated Land-Based Trails

Because construction-related impacts are likely to be confined to a very short segment of the trail (on the order of 170 feet) and general access to the trail would not be restricted, the change in overall recreation-based visitation to trails at the county level would not be large enough to measurably affect the amount of recreation-based spending in the county. Subsequently, this would result in a temporary and negligible impact on the recreational economy at the county level.

State-Designated Water Trails and Trout Streams

Since only the Pine River would be affected temporarily by construction of the Applicant's preferred route where the pipeline crosses the waterbody, it is likely that construction-related impacts on the recreational use of state-designated water trails would not be large enough to measurably affect the amount of recreation-based spending at the county level. This would likely cause a temporary, negligible impact on the recreational economy.

Impacts on trout streams would not occur during designated trout fishing seasons; therefore, impacts on the recreational use of trout streams are likely to be temporary and negligible. Subsequently, temporary negligible impacts on the recreational economy at the county level could be expected.

Scenic Byways

The Applicant's preferred route would cross scenic byways using a bore or HDD, which would avoid road closures and any direct impacts on the roads. Therefore, there would be no impacts on the recreational economy.

Operations Impacts

<u>Limitations to Recreation Access</u>

Parks, Forests, and Special Management Areas

Operation of the pipeline for the Applicant's preferred route would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation. Access to parks, forests, and special management areas; trails; and scenic byways would not be restricted or limited as a result of maintenance mowing or inspection operation. Aboveground facilities, MLVs, and permanent access roads would also not limit recreational access to parks, forests, or special management areas. Therefore, no impacts on recreational use of parks, forests, or special management areas are expected during operation of the pipeline.

State-Designated Land-Based Trails

Access and use of state-designated trails that would be crossed by the Applicant's preferred route would not be affected during maintenance mowing and inspection activities during operation. Aboveground facilities, MLVs, and permanent access roads would not limit recreational access to state-designated land-based trails. Therefore, no impacts on recreational use of land-based trails during operation of the pipeline are expected.

State-Designated Water Trails and Trout Streams

Access and use of state-designated canoe routes and other waterbodies that would be crossed by the Applicant's preferred route would not be affected during maintenance mowing and inspection activities during operation. Aboveground facilities, MLVs, and permanent access roads would not affect recreation use of water trails or trout streams. Therefore, no impacts on recreational use of state-designated water trails or trout streams are expected during operation of the pipeline.

Scenic Byways

Access and use of federally and state-designated scenic highways that would be crossed by the Applicant's preferred route would not be affected during maintenance mowing and inspection activities during operation. Aboveground facilities, MLVs, and permanent access roads would not affect recreational use. Therefore, no impacts on recreational use of scenic byways are expected during operation of the pipeline.

<u>Changes to the Recreational Economy</u>

Parks, Forests, and Special Management Areas

Because recreational use of forests and special management areas would not be affected by the Applicant's preferred route during operations, the recreational economy in each of the counties crossed would not be affected.

State-Designated Land-Based Trails

Because recreational use of state-designated land-based trails would not be affected by the Applicant's preferred route during operations, the recreational economy in each of the counties crossed would not be affected.

State-Designated Water Trails and Trout Streams

Because recreational use of state-designated water trails and trout streams would not be affected by the Applicant's preferred route during operations, the recreational economy in each of the counties crossed would not be affected.

Scenic Byways

Because recreational use scenic byways would not be affected by the Applicant's preferred route during operations, the recreational economy in each of the counties crossed would not be affected.

6.5.2.1.6 Route Alternatives (from Clearbrook to Carlton)

The only segment where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The potential construction and operations impacts on recreational access and recreational economies for the route alternatives between Clearbrook and Carlton are described below.

Route Alternative RA-03AM

<u>Construction Impacts</u>

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. No federal or state parks would be crossed by RA-03AM between Clearbrook and Carlton. Unlike the other route alternatives, RA-03AM would not cross through the Chippewa National Forest. RA-03AM follows the same route as the Applicant's preferred route through the Mississippi Headwaters; therefore, the impacts on recreational access would be the same (i.e., temporary and minor). Similar to the Applicant's preferred route, the land affected by construction of the pipeline primarily consists of open public land that is available for informal recreation and does not include any developed recreational areas except for off-road trails, ATV trails, and snowmobile trails.

Construction in any location would last for several days to several weeks depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; therefore, limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. After this time period, recreational activities on the affected acres could resume as normal. Details on noise and visual disturbance are provided in Sections 6.2.2 and 6.2.3, respectively.

At the county level, the majority of the land disturbed during construction (approximately 31 acres) would occur in a NWR and WMA within Morrison County (Table 6.5.2-2). A review of maps revealed that the disturbed land represents a very small portion (less than one-half of a percent) of the total amount of land that remains available in the refuge and WMA that would be crossed by the pipeline. In total, over 13,781 acres of land within the same refuge and WMA in Morrison County would remain unaffected and available during construction. This is also true in Hubbard County (26 acres of 45,290 total). Therefore, impacts on access to forests, WMAs, and special management areas are anticipated to be temporary and minor. Impacts would be confined to small portions of the total land available for recreation, and any closures of these areas would be limited to during and immediately following construction.

State-Designated Land-Based Trails. RA-03AM would cross the most snowmobile trails (16 trails within the Clearbrook-to-Carlton segment). It also would cross the Willard Munger State Trail two times. In total, approximately 9 miles of the trail would be temporarily affected during construction, of 90 total miles of the trail. If bore or HDD crossing methods are used for crossings, no impacts on trails are expected. If the open-cut method is used, Enbridge would complete pipeline installation activities across trails within 48 hours and then would restore the trail surface to allow passage. Noise and visual disturbance may continue to affect the recreational trail experience in disturbed areas during construction; however, restrictions to access would no longer be necessary. Overall, impacts on state-designated land-based trails are anticipated to be temporary and negligible. Impacts would be confined to the area where the pipeline crosses the trail, and any restrictions to access at these intersections would be limited to during and immediately following construction.

State-Designated Water Trails and Trout Streams. RA-03AM would cross the highest number of state-designated canoe and boating trails (Kettle River in Pine County; Long Prairie River in Todd County; Mississippi River [two crossings], once in Clearwater County and again in Morrison County; Rum River in Mille Lacs County; and Snake River in Kanabec County). Canoe and boating trails crossed using HDD would not affect recreational access. Public use and access to the state water trails would be interrupted temporarily where the pipeline intersects the river during installation of the pipeline, resulting in a temporary negligible impact on the overall recreational use of the water trails.

Depending on the crossing method, impacts on trout streams are likely to be the same as those described for the Applicant's preferred route. The Applicant has proposed no in-channel work during peak trout season in each waterbody. Because impacts on these streams would be temporary, and assuming that construction would not occur during designated trout fishing seasons, temporary negligible impacts on the recreational use of trout streams are anticipated during construction of RA-03AM.

Scenic Byways. Three scenic byways crossings would be required during construction of RA-03AM. Assuming that bore or HDD is used for these three crossings to avoid road closures and any direct impacts on the roads, construction activities would not affect the recreational access of the byways. Impacts associated with aesthetic changes along scenic byways are discussed in Section 6.2.3.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. During construction for RA-03AM, local recreational users could re-locate to undisturbed areas throughout each of the affected resources, given the overall size of these areas relative to the area affected by the construction footprint (57 acres of land disturbed for construction of 59,071 acres of total land available) (Table 6.5.2-2). Given the temporary nature of the construction activity and the opportunity to recreate in a variety of other places in the county, a loss of recreation-based visitation is not expected to be large enough to measure in terms of recreation spending at the county level. Little to no net change in recreation-based trips would be expected at the county level, resulting in a temporary negligible impact on the recreational economies in each of the counties that would be crossed.

State-Designated Land-Based Trails. Since construction-related impacts for RA-03AM would be confined to specific segments of trails and general access to trails would not be limited, the change in overall recreation-based visitation to trails level would not be large enough to measurably affect the amount of recreation-based spending in the counties crossed. Subsequently, this would result in a temporary and negligible impact on the recreational economy at the county level.

State-Designated Water Trails and Trout Streams. Because of the limited number of crossings with associated impacts for RA-03AM and the temporary nature of the impacts, it is likely that construction-related impacts on the recreational use of state-designated water trails would not be large enough to measurably affect the amount of recreation-based spending at the county level, resulting in a temporary negligible impact on the recreational economy.

Impacts on trout streams would not occur during designated trout fishing seasons; therefore, temporary negligible impacts on the recreational use of trout streams are expected. Subsequently, temporary negligible impacts on the recreational economy at the county level could be expected.

Scenic Byways. The Applicant would cross each of the scenic byways using a bore or HDD, which would avoid road closures and any direct impacts on the roads. As a result, construction for RA-03AM would not affect the recreational economy of the counties crossed.

Operations Impacts

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. Operation of the RA-03AM pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation. Access to parks, forests, and special management areas would not be restricted or limited as a result of maintenance mowing and inspection operation. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of parks, forests, or special management areas during operation of the pipeline are expected.

State-Designated Land-Based Trails. Access and use of state-designated trails that would be crossed by RA-03AM would not be affected during maintenance mowing and inspection operation activities. Aboveground facilities, MLVs, and permanent access roads would not affect recreation use. Therefore, no impacts on recreational use of land-based trails are expected.

State-Designated Water Trails and Trout Streams. Access and use of state-designated canoe routes and other waterbodies that would be crossed by RA-03AM would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of state designated water trails or trout streams are expected.

Scenic Byways. Access and use of federally and state-designated scenic highways that would be crossed by RA-03AM would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of scenic byways are expected.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. Because recreational use of forests and special management areas would not be affected during operations for RA-03AM, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Land-Based Trails. Because recreational use of land-based trails would not be affected during operations for RA-03AM, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Water Trails and Trout Streams. Because recreational use of state-designated water trails and trout streams would not be affected during operations for RA-03AM, the recreational economy in each of the affected counties crossed would not be affected by pipeline operations.

Scenic Byways. Because recreational use of scenic byways would not be affected during operation of RA-03AM, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

Route Alternative RA-06

<u>Construction Impacts</u>

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. RA-06 would cross the Chippewa National Forest, George Washington State Forest, Big Fork State Forest, and Fond du Lac State Forest. RA-06 also crosses two lakes, one of which has a public campground. Therefore, it is likely that construction-related impacts could cause a temporary, minor impact on the recreational use of these areas near the route.

Construction in any location would last for several days to several weeks depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; therefore, limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. After this time period, recreational activities on the affected acres could resume as normal. Details on noise and visual disturbance are provided in Sections 6.2.2 and 6.2.3, respectively.

At the county level, the majority of the land disturbed during construction (753 acres) would occur in state forests within Itasca County (Table 6.5.2-3). Based on a review of forest and WMA maps, the disturbed land represents a very small portion (less than one-half of a percent) of the total amount of land that remains available in each forest that would be crossed by the pipeline. In total, approximately 447,000 acres of land within the same forests in Itasca County would remain unaffected and available during construction. This is also true in Cass County (86 acres of 1.6 million total), and Carlton County (37 acres of 64,505 total). Impacts on access to forests are anticipated to be temporary and minor because impacts would be confined to small portions of the total land available for recreation, and any closures of these areas would be limited to during and immediately following construction.

State-Designated Land-Based Trails. RA-06 would cross the Blue Ox State Trail in Beltrami County; the Willard Munger State Trail in Carlton County; and the Taconite State Trail and Pengilly to Goodland State Trail, both located in Itasca County. RA-06 would cross the Willard Munger State Trail two times in Pine County and once in Carlton County. Construction-related activities would temporarily affect public access and use of the trail where it intersects the pipeline for a short time during pipeline installation. The Applicant has proposed to use the bore or open-cut method at trail crossings. If the latter is used, trail use would be suspended for 48 hours during construction and then the trail surface would be restored to allow passage. Noise and visual disturbance may continue to affect the recreational experience in the affected areas during construction; however, restrictions in use would no longer be necessary. Overall, impacts on recreational access to state-designated land-based trails are anticipated to be temporary and negligible because impacts would be confined to the area where the pipeline crosses the trail, and any restricted access at these intersections would be limited to during and immediately following construction.

State-Designated Water Trails and Trout Streams. RA-06 would cross one state-designated canoe and boating trail, the Big Fork River in Itasca County, three times. Canoe and boating trails crossed using HDD would not affect recreation or tourism. Public use and access to the state water trail would be interrupted where the pipeline intersects the river temporarily during installation of the pipeline, resulting in a temporary negligible impact on the overall recreational use of the trail.

Depending on the crossing method, impacts on trout streams are likely to be the same as those described for the Applicant's preferred route. The Applicant has proposed no in-channel work during peak trout season in each waterbody. Because impacts on these streams would be temporary, and assuming that construction would not occur during designated trout fishing seasons, temporary negligible impacts on the recreational use of trout streams are anticipated during construction of RA-06.

Scenic Byways. Three scenic byways crossings would be required during construction of RA-06. Assuming that bore or HDD is used for these three crossings to avoid road closures and any direct impacts on the roads, construction activities would not affect recreational access to the byways. Impacts associated with aesthetic changes along scenic byways are discussed in Section 6.2.3.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. During construction for RA-06, local recreational users could re-locate to undisturbed areas throughout each of the affected resources, given the overall size of these areas relative to the area affected by the construction footprint (60 acres of land disturbed for construction of approximately 2.1 million acres of total land available) (Table 6.5.2-3). Given the temporary nature of the construction activity and the opportunity to recreate in a variety of other places with the county, the loss of recreation-based visitation at the county level is not expected to be large enough to measure in terms of recreation-based spending at the county level. Therefore, a temporary negligible impact on the recreational economies in each of the counties crossed would result.

State-Designated Land-Based Trails. Because construction-related impacts for RA-06 would be confined to specific segments of trails and general access to trails would not be limited, the change in overall recreation-based visitation to trails at the county level would not be large enough to measurably affect the amount of recreation-based spending at the county level. Subsequently, this would result in a temporary and negligible impact on the recreational economy at the county level.

State-Designated Water Trails and Trout Streams. Because of the limited number of crossings with associated impacts and the temporary nature of the impacts for RA-06, it is likely that construction-related impacts on the recreational use of state-designated water trails would not be large enough to measurably affect the amount of recreation-based spending at the county level, resulting in a temporary negligible impact on the recreational economy.

Impacts on trout streams would not occur during designated trout fishing seasons; therefore, temporary negligible impacts on the recreational use of trout streams are likely. Subsequently, temporary negligible impacts on the recreational economy at the county level could be expected.

Scenic Byways. The Applicant would cross each of the scenic byways using a bore or HDD, which would avoid road closures and any direct impacts on the roads. As a result, construction would not affect the recreational economy of the affected counties.

Operations Impacts

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. Operation of the RA-06 pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation. Access to parks, forests, and special management areas would not be restricted or limited as a result of maintenance mowing and inspection operation. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of parks, forests, or special management areas during operation of the pipeline are expected.

State-Designated Land-Based Trails. Access and use of state-designated trails that would be crossed by RA-06 would not be affected during maintenance mowing and inspection operation activities. Aboveground facilities, MLVs, and permanent access roads would not affect recreation use. Therefore, no impacts on recreational use of land-based trails are expected.

State-Designated Water Trails and Trout Streams. Access and use of state-designated canoe routes and other waterbodies that would be crossed by RA-06 would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of state-designated water trails or trout streams are expected.

Scenic Byways. Access and use of federally and state-designated scenic highways that would be crossed by the Applicant's preferred route would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of scenic byways are expected.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. Because recreational use of forests and special management areas would not be affected during operations for RA-06, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Land-Based Trails. Because recreational use of land-based trails would not be affected during operations for RA-06, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Water Trails and Trout Streams. Because recreational use of state-designated water trails and trout streams would not be affected during operations for RA-06, the recreational economy in each of the affected counties crossed would not be affected by pipeline operations.

Scenic Byways. Because recreational use of scenic byways would not be affected during operation of RA-06, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

Route Alternative RA-07

<u>Construction Impacts</u>

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. RA-07 would require the largest acreage for construction work area in state and national forests (1,049 acres), and could temporarily affect the recreational use of two lakes, as well as general recreation that occurs on less developed land in the Bowstring State Forest.

Construction in any location would last for several days to several weeks depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; therefore, limited use, access restrictions, and noise and visual disturbance could occur during this timeframe. After this time period, recreational activities on the affected acres could resume as normal. Details on noise and visual disturbance are provided in Sections 6.2.2 and 6.2.3, respectively.

At the county level, the majority of the land disturbed during construction (855 acres) would occur in forests within Cass County (Table 6.5.2-4). However, a review of forest and WMA maps revealed that the disturbed land represents a very small portion (less than one half of a percent) of the total amount of land that remains available in each forest that would be crossed by the pipeline. In total, there are over 2.1 million acres of land within the same forests in Cass County that would remain unaffected and available during construction. This is also true in Beltrami County (131 acres out of 45,290 total), and Carlton County (63 acres out of 64,505 total). Impacts on access to forests are anticipated to be temporary and minor because impacts would be confined to small portions of the total land available for recreation, and any closures of these areas would be limited to during and immediately following construction.

State-Designated Land-Based Trails. RA-07 would cross the Paul Bunyan State Trail in Beltrami County, the Heartland State Trail in Cass County, and the Taconite State Trail in Itasca County. Construction-related activities would temporarily affect public access and use of the trail where the trail intersects the pipeline for a short time during pipeline installation. The Applicant has proposed to use the bore or open-cut method at trail crossings. If the latter is used, trail use would be suspended for 48 hours during construction and then the trail surface would be restored to allow passage. Noise and visual disturbance may continue to affect the recreational experience in the affected areas during construction; however, restrictions in use would no longer be necessary. Overall, impacts on recreational access to state-designated land-based trails are anticipated to be temporary and negligible because impacts would be confined to the area where the pipeline crosses the trail, and any restricted access at these intersections would be limited to during and immediately following construction.

State-Designated Water Trails and Trout Streams. RA-07 would cross one state-designated canoe and boating trail (the Mississippi River) two times. Canoe and boating trails crossed using HDD would not affect recreational access. Public use and access to the state water trail would be interrupted temporarily where the pipeline crosses the river during installation of the pipeline, resulting in a temporary negligible impact on the overall recreational use of the trail.

Depending on the crossing method, impacts on trout streams are likely to be the same as those described for the Applicant's preferred route. The Applicant has proposed no in-channel work during peak trout season in each waterbody. Because impacts on these streams would be temporary, and assuming that construction would not occur during designated trout fishing seasons, temporary negligible impacts on the recreational use of trout streams are anticipated during construction of RA-07.

Scenic Byways. Three scenic byways crossings would be required during construction of RA-07. Assuming that bore or HDD is used for these three crossings to avoid road closures and any direct impacts on the roads, construction activities would not affect recreational access to the byways. Impacts associated with aesthetic changes along scenic byways are discussed in Section 6.2.3.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. During construction, local recreational users could re-locate to undisturbed areas throughout each of the affected resources, given the overall size of these areas relative to the area affected by the construction footprint (1,049 acres of land disturbed for construction of approximately 2.2 million acres of total land available) (Table 6.5.2-4). Because of the temporary nature of the construction activity and the opportunity to recreate in a variety of other places in the county, the loss of recreation-based visitation would not be large enough to measure in terms of recreation-based spending at the county level. Therefore, construction of RA-07 would result in a temporary negligible impact on the recreational economy in each of the counties crossed.

State-Designated Land-Based Trails. Because construction-related impacts would be confined to specific segments of trails and general access to trails would not be limited, the change in overall recreation-based visitation to trails at the county level would not be large enough to measurably affect the amount of recreation-based spending at the county level. Subsequently, this would result in a temporary negligible impact on the recreational economy at the county level.

State-Designated Water Trails and Trout Streams. Because of the limited number of crossings with associated impacts for RA-07 and the temporary nature of the impacts, it is likely that construction-related impacts on the recreational use of state-designated water trails would not be large enough to measurably affect the amount of recreation-based spending at the county level, resulting in a temporary negligible impact on the recreational economy.

Impacts on trout streams would not occur during designated trout fishing seasons; therefore, temporary negligible impacts on the recreational use of trout streams are expected. Subsequently, temporary negligible impacts on the recreational economy at the county level could be expected.

Scenic Byways. The Applicant would cross each of the scenic byways using a bore or HDD, which would avoid road closures and any direct impacts on the roads. As a result, construction would not affect the recreational economy of the counties crossed.

<u>Operations Impacts</u>

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. Operation of the RA-07 pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation. Access to parks, forests, and special management areas would not be restricted or limited as a result of maintenance mowing and inspection operation. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of parks, forests, or special management areas during operation of the pipeline are expected.

State-Designated Land-Based Trails. Access and use of state-designated trails that would be crossed by RA-07 would not be affected during maintenance mowing and inspection operation activities. Aboveground facilities, MLVs, and permanent access roads would not affect recreation use. Therefore, no impacts on recreational use of land-based trails are expected.

State-Designated Water Trails and Trout Streams. Access and use of state-designated canoe routes and other waterbodies that would be crossed by RA-07 would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of state designated water trails and trout streams are expected.

Scenic Byways. Access and use of federally and state-designated scenic highways that would be crossed by the Applicant's preferred route would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of scenic byways are expected.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. Because recreational use of forests and special management areas would not be affected during operations for RA-07, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Land-Based Trails. Because recreational use of land-based trails would not be affected during operations for RA-07, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Water Trails and Trout Streams. Because recreational use of state-designated water trails and trout streams would not be affected during operations for RA-07, the recreational economy in each of the affected counties crossed would not be affected by pipeline operations.

Scenic Byways. Because recreational use of scenic byways would not be affected during operation of RA-07, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

Route Alternative RA-08

<u>Construction Impacts</u>

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. RA-08 could temporarily affect the recreational use of two lakes, as well as general recreation that occurs on less developed land in the Bowstring State Forest. The route also crosses through the Chippewa National Forest, as well as six other state forests. It is likely that construction-related impacts could cause a temporary minor impact on the recreational use of these areas along RA-08.

Construction in any location would last for several days to several weeks depending on a variety of factors such as land use type, topography, weather, and other environmental conditions; therefore, limited use, access restrictions, and noise and visual disturbance could occur during this timeframe.

After this time period, recreational activities on the affected acres could resume as normal. Details on noise and visual disturbance are provided in Sections 6.2.2 and 6.2.3, respectively.

At the county level, the majority of the land disturbed during construction (510 acres) would occur in forests within Cass County (Table 6.5.2-5). A review of forest and WMA maps revealed that the disturbed land represents a very small portion (less than one-half of a percent) of the total amount of land that remains available in each forest that would be crossed by the pipeline. In total, over 2.1 million acres of land within the same forests in Cass County would remain unaffected and available during construction. This is also true in Beltrami County (72 acres of 45,339 total), Aitkin County (38 acres of 238,954 total), Itasca County (7 acres of 909 total) and Carlton County (36 acres of 64,505 total). Impacts on access to forests are anticipated to be temporary and minor because impacts would be confined to small portions of the total land available for recreation, and any closures of these areas would be limited to during and immediately following construction.

State-Designated Land-Based Trails. RA-08 would cross the Paul Bunyan State Trail in Beltrami County, the Heartland State Trail in Cass County, and the Taconite State Trail in Itasca County. Construction-related activities would temporarily affect public access and use of the trail for a short time during pipeline installation. The Applicant has proposed to use the bore or open-cut method at trail crossings. If the latter is used, trail use would be suspended for 48 hours during construction and then the trail surface would be restored to allow passage. Noise and visual disturbance may continue to affect the recreational experience in the affected areas during construction; however, restrictions in use would no longer be necessary. Overall, impacts on recreational access to state-designated land-based trails are anticipated to be temporary and negligible because impacts would be confined to the area where the pipeline crosses the trail, and any restricted access at these intersections would be limited to during and immediately following construction.

State-Designated Water Trails and Trout Streams. RA-08 would cross one state-designated canoe and boating trail (the Mississippi River) three times. Canoe and boating trails crossed using HDD would not affect recreational access. Public use and access to the state water trail would be interrupted temporarily where the pipeline intersects the trail during installation of the pipeline, resulting in a temporary negligible impact on the overall recreational use of the trail.

Depending on the crossing method, impacts on trout streams are likely to be the same as those described for the Applicant’s preferred route. The Applicant has proposed no in-channel work during peak trout season in each waterbody. Because impacts on these streams would be temporary, and assuming that construction would not occur during designated trout fishing seasons, temporary negligible impacts on the recreational use of trout streams are anticipated during construction of RA-08.

Scenic Byways. Three scenic byways crossings would be required during construction of RA-08. Assuming that bore or HDD is used for these three crossings to avoid road closures and any direct impacts on the roads, construction activities would not disrupt use of the byways. Impacts associated with aesthetic changes along scenic byways are discussed in Section 6.2.3.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. During construction of RA-08, local recreational users could re-locate to undisturbed areas throughout each of the affected resources, given the overall size of these areas relative to the area affected by the construction footprint (663 acres of land disturbed for construction of approximately 2.5 million acres of total land available) (Table 6.5.2-5). Given the temporary nature of the construction activity and the opportunity to recreate in a variety of other places with the county, the loss of recreation-based visitation at the county level is not expected to be large enough to measure in terms of tourism dollars. There would likely be little to no net change in recreation-based trips at the county level, which would result in a temporary negligible impact on the recreational economy in each of the counties crossed.

State-Designated Land-Based Trails. Because construction-related impacts for RA-08 would be confined to specific segments of trails and general access to trails would not be limited, the change in overall recreation-based visitation to trails at the county level would not be large enough to measurably affect the amount of recreation-based spending at the county level. Subsequently, this would result in a temporary negligible impact on the recreational economy at the county level.

State-Designated Water Trails and Trout Streams. Because of the limited number of crossings with associated impacts for RA-08 and the temporary nature of the impacts, it is likely that construction-related impacts on the recreational use of state-designated water trails would not be large enough to measurably affect the amount of recreation-based spending at the county level, resulting in a temporary negligible impact on the recreational economy.

Impacts on trout streams would not occur during designated trout fishing seasons; therefore, temporary negligible impacts on the recreational use of trout streams are expected. Subsequently, temporary negligible impacts on the recreational economy at the county level could be expected.

Scenic Byways. The Applicant would cross each of the scenic byways using a bore or HDD, which would avoid road closures and any direct impacts on the roads. As a result, construction would not affect the recreational economy of the counties crossed.

Operations Impacts

Limitations to Recreation Access

Parks, Forests, and Special Management Areas. Operation of the RA-08 pipeline would involve periodic inspection, pipeline maintenance activities, and mowing to maintain appropriate vegetation. Access to parks, forests, and special management areas would not be restricted or limited as a result of maintenance mowing and inspection operation. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of parks, forests, or special management areas during operation of the pipeline are expected.

State-Designated Land-Based Trails. Access and use of state-designated trails that would be crossed by RA-08 would not be affected during maintenance mowing and inspection operation activities. Aboveground facilities, MLVs, and permanent access roads would not affect recreation use. Therefore, no impacts on recreational use of land-based trails are expected.

State-Designated Water Trails and Trout Streams. Access and use of state-designated canoe routes and other waterbodies that would be crossed by RA-08 would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of state designated water trails and trout streams are expected.

Scenic Byways. Access and use of federally and state-designated scenic highways that would be crossed by RA-08 would not be affected during maintenance mowing and inspection operation activities. Although the exact location of aboveground facilities, MLVs, and permanent access roads is unknown, it is unlikely that they would limit recreational access. Therefore, no impacts on recreational use of scenic byways are expected.

Changes to the Recreational Economy

Parks, Forests, and Special Management Areas. Because recreational use of forests and special management areas would not be affected during operations for RA-08, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Land-Based Trails. Because recreational use of land-based trails would not be affected during operations for RA-08, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

State-Designated Water Trails and Trout Streams. Because recreational use of state-designated water trails and trout streams would not be affected during operations for RA-08, the recreational economy in each of the affected counties crossed would not be affected by pipeline operations.

Scenic Byways. Because recreational use of scenic byways would not be affected during operation of RA-08, the recreational economy in each of the counties crossed would not be affected by pipeline operations.

6.5.2.4 Summary and Mitigation

6.5.2.4.1 Summary

Table 6.5.2-6 presents the potential impacts from construction and operation of the Applicant's preferred route and the route alternatives on access to recreational resources and subsequent impacts on recreational economies at the county level. The results show that impacts on access to recreational resources for the Applicant's preferred route and all of the route alternatives would range from no impact to negligible or minor temporary impacts for construction and no impacts during operations. Similarly, potential effects on recreational spending and the regional economies of the counties through which the routes pass were found to be temporary and negligible or no impact during construction and nonexistent during operations.

The low level of impact occurs primarily for two reasons. The routes through forests and special management areas do not intersect any developed recreational sites; therefore, the only limited access to the forest or managed area would be at the actual construction work site. This limitation represents a small portion (less than one-half of a percent) of the overall land designated for recreational use in most affected areas. At linear recreation resources (e.g., waterways and trails), only a short portion of the waterway or trail would be restricted from temporary use where the pipeline crosses the trail, and the restriction would be limited to the short construction period.

Although the Applicant's preferred route and all of the route alternatives would experience negligible or no impacts, the geographic extent of the affected area within recreational lands differs among the route options. RA-07 would affect the greatest amount of land available for recreation in forests or special management areas (1,049 acres), while RA-03AM would affect the least (57 acres). The Applicant's preferred route would affect 439 acres.

Except for RA-03AM, all proposed routes each would cross three state-designated multi-use trails; RA-03AM would cross only one (three times). None of the route alternatives would cross hunter walking trails, but the Applicant's preferred route would cross one trail two times. RA-03AM would cross the most amount of snowmobile trails (16), whereas the Applicant's preferred route would cross the least (12). RA-03AM would cross the most amount of state-designated water trails (six). RA-06, RA-07, and RA-08 each would cross one water trail multiple times. RA-03AM would cross the most trout streams (nine), whereas RA-08 would cross the fewest (four); and the Applicant's preferred route would cross six. Based on the crossing methods proposed by the Applicant and the limited number of crossings, impacts on the recreational use of these trails and waterbodies are likely to be temporary and negligible. Although the crossing methods have not been identified for the route alternatives, construction impacts in recreation areas would be similar to those described for the Applicant's preferred route (negligible), with a corresponding negligible impact on the recreational economies of the counties crossed. Construction-related impacts are not expected to result in a measurable impact on overall visitation to trails and waterbodies at the county level, thereby resulting in a negligible impact on the amount of recreation-based spending at the county level.

Construction methods proposed by the Applicant for the Applicant's preferred route and route alternatives would not disrupt use of scenic byways and therefore would not affect their users or the recreational economies of the counties crossed. Operation of the pipeline would not cause additional impacts on land-based trails, water trails, trout streams, or byways and consequently would not affect the recreational economies in the counties crossed. For all alternatives, no impacts on recreational use or the recreational economy in the counties crossed would occur during operations.

6.5.2.4.2 Mitigation

Based on the limited impacts and implementation of Applicant-proposed measures to reduce impacts on recreation use, no mitigation measures have been identified to further reduce potential impacts on recreational access or economies.

Table 6.5.2-6. Summary of Potential Impacts on Recreation and Tourism for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Limited recreation access to parks, forests and special management areas during construction	Temporary/minor impacts • 439 acres	Temporary/minor impacts • 57 acres	Temporary/minor impacts • 875 acres	Temporary/minor impacts • 1,049 acres	Temporary/minor impacts • 663 acres
Limited recreation access to state-designated trails and trout streams during construction	Temporary/negligible impacts • 0.8 mile of snowmobile/ATV trail crossings • 4 land trail crossings • 1 water trail crossing • 6 trout stream crossings No impact due to crossing methods • 4 water trails	Temporary/negligible impacts • 5.6 miles of snowmobile/ATV trail crossings • 3 land trail crossings • 6 water trail crossings • 9 trout stream crossings	Temporary/negligible impacts • 0.7 mile of snowmobile/ATV trail crossings • 4 land trail crossings • 1 water trail crossing • 8 trout stream crossings	Temporary/negligible impacts • 2.6 miles of snowmobile/ATV trail crossings • 3 land trail crossings • 3 water trail crossings • 6 trout stream crossings	Temporary/negligible impacts • 2.9 miles of snowmobile/ATV trail crossings • 3 land trail crossings • 3 water trail crossings • 4 trout stream crossings
Limited recreation access to scenic byways	No impact	No impact *(assuming bore or HDD crossing method used)*	No impact *(assuming bore or HDD crossing method used)*	No impact *(assuming bore or HDD crossing method used)*	No impact *(assuming bore or HDD crossing method used)*
Changes to the recreational economy during construction	Temporary/no impact to negligible impacts	Temporary/ no impact to negligible impacts	Temporary/ no impact to negligible impacts	Temporary/ no impact to negligible impacts	Temporary/ no impact to negligible impacts
Operations Impacts					
Limitations to recreation access and changes to the recreational economy during operations	No impact	No impact	No impact	No impact	No impact

Table 6.5.2-6. Summary of Potential Impacts on Recreation and Tourism for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to recreation and tourism. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, while the state-designated trout stream dataset provides an indication of impacts to trout fishing, it does not provide information about other important recreational uses hiking. Other datasets, like DNR trails, must also be considered for a more complete understanding of recreational impacts.The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3), as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-750 to 6-765. The table above, for example, describes temporary access restrictions that could occur for certain recreational resources within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-750 to 6-754. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-754 to 6-757. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-757 to 6-759. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[f] **As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-760 to 6-762. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[g] **RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-762 to 6-765. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

6.5.2.5 References

U.S. Geological Survey, Gap Analysis Program (USGS GAP). 2016. Protected Areas Database of the United States (PAD-US). Version 1.4 Combined Feature Class. May.

6.5.3 Population

Population in the vicinity of the Applicant's preferred route and route alternatives may be affected by construction and operation of new facilities. The population analysis focuses on how populations may be affected by the direct increase in Project-related workers. It does not consider indirect population changes from increased local economic activities. Such indirect changes in growth are expected to be limited because the Project-related workforce is transitory. The analysis of effects on local populations includes changes in local workforces and disruption to local populations by the following potential impacts:

- Increases in local workforces from the influx of non-local workers temporarily or permanently moving to an area to support construction or operations. Changes in workforce population may affect demand on emergency services, increase traffic congestion from commuting, and the availability of housing.
- Disruptions to high-population areas and other populated areas in proximity to construction work areas from noise, dust, and vibrations from construction and operations equipment; disruptions to traffic and services such as water and gas during construction, and permanent displacement of residences and structures during operations.

Potential impacts on populations from pipeline crude oil releases are discussed in Chapter 10.

This section first describes the existing populations along the Applicant's preferred route and the route alternatives within an area where populations would be most directly affected by construction and operation of the pipeline (the ROI). The potential Project-related impacts of construction and operation on those populations are considered next. Potential impacts for each route alternative (RA-03AM, RA-06, RA-07, and RA-08) also are assessed and then compared to each other and to the Applicant's preferred route between Clearbrook and Carlton. A summary and comparison of the impacts are included at the end of the section.

6.5.3.1 Regulatory Context and Methodology

6.5.3.1.1 Regulatory Context

In Minnesota, the Commission must consider the existence and density of populated areas when routing a crude oil pipeline in the state (Minn. R. 7852.1900, Subp. 3[a]). No specific standards related to the proximity of populated areas to pipeline facilities were identified other than compliance with local planning and zoning ordinances. See Section 6.2.1 for a discussion of planning and zoning.

6.5.3.1.2 Methodology

The analysis for impacts on population is broken into two components: impacts associated with the non-local workforce re-locating to communities near the Project, and impacts associated with construction and operation of the pipeline near densely populated areas.

The additional pipeline workforce may affect communities during construction or operation if existing infrastructure and services are not adequate. Additionally, routing a pipeline through population centers or areas of higher population density is difficult because these areas have more infrastructure in place such as roads, structures, and utilities. A greater number of people potentially would be affected by noise, dust, population increase, and traffic during construction in these areas, which may increase the magnitude and duration of impacts compared to less populated areas. Associated impacts related to planning and zoning, noise, housing, transportation, and air quality are evaluated in Sections 6.2.1, 6.2.2, 6.2.4, 6.2.5, and 6.3.7, respectively.

Non-Local Workforce

Net change to local populations from worker influx were assessed by:

- Gathering current population statistics from the U.S. Census Bureau for the counties that would be crossed by the Applicant’s preferred route and the route alternatives;
- Estimating the total population increase that could result from workers moving to the counties with their families;
- Identifying the areas where the total population increase in a county could be 10 percent or more, and the expected impacts of the increase; and
- Qualitatively assessing impacts related to population increases based on the percent and duration of the change.

The ROI for assessment of non-local workforce effects is the counties that are crossed by the Applicant’s preferred route and the route alternatives. County-level data provide a summary of populations potentially affected by the influx of the construction workforce. Workers re-locating to the area would commute to work from various communities near, but not necessarily along, the pipeline route. The counties crossed by the pipeline reflect a reasonable estimate for where the workers are likely to re-locate and the level of current population that would be affected.

Populated Areas

Impacts on high-population areas and other populated areas that may occur from construction and operation of the Project were assessed by:

- Overlaying the Applicant’s preferred route and the route alternatives onto a map of high consequence areas that includes highly populated areas and other populated areas;
- Recording the total miles of populated areas crossed by the centerlines of each route and the total area of populated areas that would fall within 1,250 feet of the construction work area;
- Identifying all populated areas within the ROI; and
- Assessing the nature, extent, duration, and magnitude of impacts on populated areas and any measures to minimize potential impacts.

The ROI for the review of populated areas consists of the area within 1,250 feet of the construction footprint for the Applicant’s preferred route and the route alternatives. For this analysis, “populated areas, as defined by the U.S. Census Bureau, consist of incorporated areas or legal entities, and census-designated places, which are statistical entities.”

Data for populated areas within 1,250 feet of the routes were derived from the U.S. Census Bureau’s Master Address File / Topologically Integrated Geographic Encoding and Referencing Database (U.S. Census Bureau 2016). Impacts on these areas were quantified in terms of the number of populated areas crossed, the extent of the pipeline crossing in these populated areas (i.e., miles crossed by the centerline), and the populated area (acreage) within 1,250 feet of construction. These metrics are intended to capture the number of communities most affected and the degree to which each community would be affected. The miles of an area crossed by the centerline quantifies the relative extent of impact but does not reflect impacts on locations adjacent to the pipeline. Using a 1,250-foot buffer accounts for areas that may be affected by noise, dust, vibration, and increased traffic from construction (typical construction noise would most likely be within acceptable levels at a distance of 1,250 feet, as discussed in Section 6.2.2).

No single one of the data sources considered above provides a complete indication of all relevant impacts to population, but together the different metrics provide a reasonably comprehensive indication of the potential impacts. For example, while total population can aid in identifying the number of potentially affected people, an understanding of population density is needed in order to understand the potential stress that could be felt as the result of an influx of temporary workers.

Furthermore, the quantitative information from these data sources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide miles, for example, of the applicant's pipeline route and alternatives that would cross within populated areas and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to population centers is contained in the text of this section.

6.5.3.2 Existing Conditions

Existing conditions are described for the entire length of the Applicant's preferred route in Minnesota. RA-03AM, RA-06, RA-07 and RA-08 represent alternative routes to the Applicant's preferred route between Clearbrook and Carlton. Included in the description of existing conditions for the Applicant's preferred route is a subset of data for the segment from Clearbrook to Carlton to allow for direct comparison of the route alternatives to the Applicant's preferred route.

Populated areas and population density within those areas for the counties crossed by the Applicant's preferred route and route alternatives are shown in Figure 6.5.3-1.

6.5.3.2.1 Applicant's Preferred Route

The Applicant's preferred route would cross 12 counties in Minnesota. County population estimates for 2010 and 2015, the percentage population change, and the population density are presented in Appendix N. As described in Section 5.3.3.2.1, the population density along the Applicant's preferred route is low and generally similar to the statewide average.

Non-Local Workforce

The Applicant's preferred route would cross 12 counties in Minnesota. Of these, 7 counties (Kittson, Marshall, Pennington, Red Lake, Polk, Clearwater, and Carlton) would be crossed by all 5 route options (Figure 6.5.3-1). Between Clearbrook and Carlton, the Applicant's preferred route would cross seven counties (Clearwater, Hubbard, Wadena, Cass, Crow Wing, Aitkin, and Carlton). County population estimates for 2010 and 2015, the percentage population change, and the population density for all counties crossed by the Applicant's preferred route or the route alternatives are presented in Appendix N.

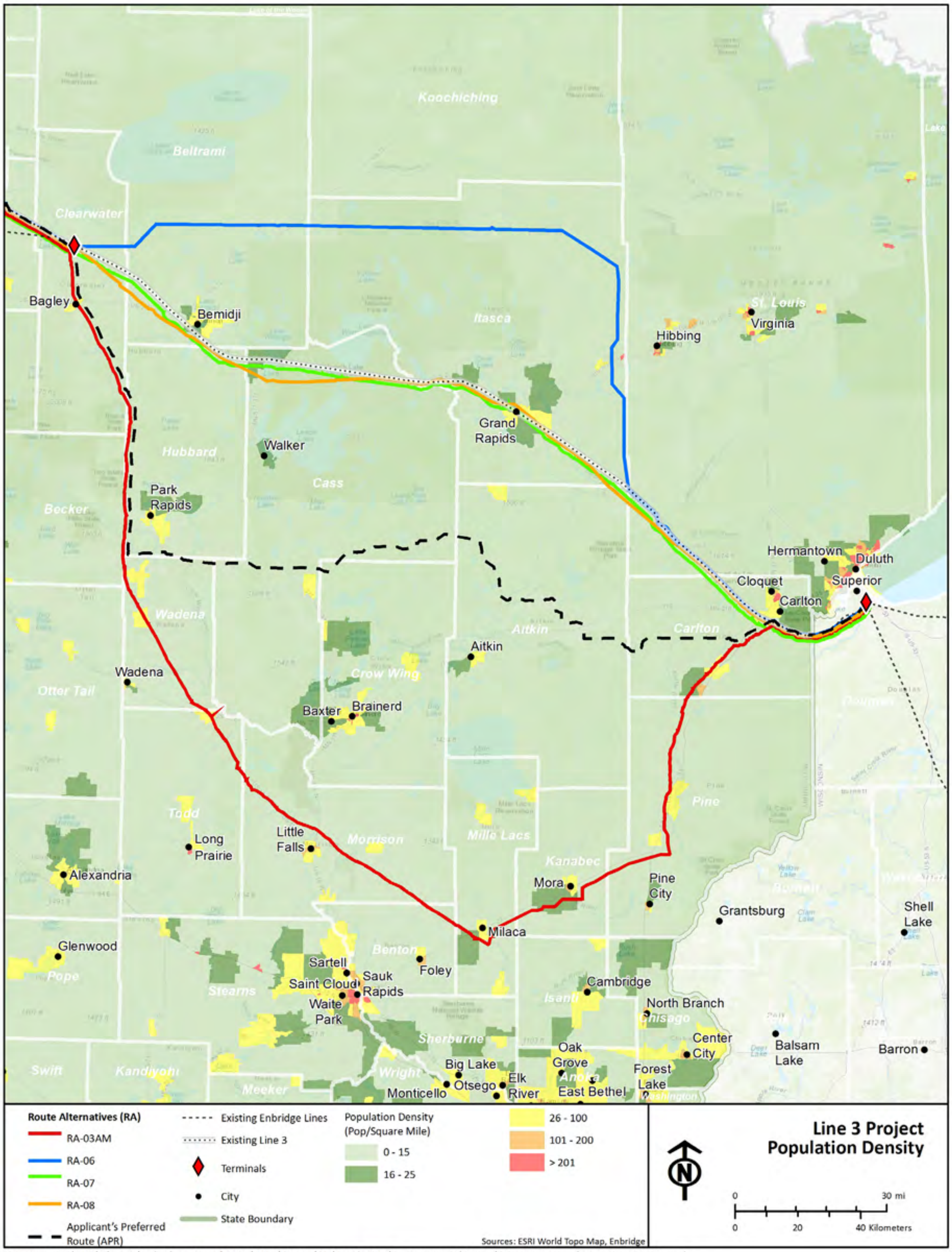


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Figure 6.5.3-1. Population Density for the Counties Crossed by the Applicant's Preferred Route and the Route Alternatives

Populated Areas

Table 6.5.3-1 lists the populated areas that occur along the Applicant's preferred route (divided into three segments to isolate the Clearbrook-to-Carlton segment). For each populated area, the table also gives the population of the local populated area, the length of the route centerline that passes through the populated area, and the total acreage of populated areas that would be located within 1,250 feet of the construction footprint. Across the entire route, 13 populated areas are located along the Applicant's preferred route; within these 13 populated areas 4,104 people are living within 1,250 feet of the construction work area. In the section of the Applicant's preferred route from Clearbrook to Carlton, five populated areas with 1,204 people are within 1,250 feet of the construction work area.

Table 6.5.3-1. Populated Areas near the Applicant's Preferred Route

Populated Area	Population[a]	Miles of Populated Areas Crossed by Pipeline Centerline	Populated Areas within 1,250 Feet of Construction Work Area (acres)
North Dakota Border to Clearbrook			
Clearbrook	518	0.0	33
Gonvick	282	0.0	0
Gully	66	0.0	12
Oklee	435	0.8	215
Plummer	292	2.0	605
Trail	46	0.7	217
Subtotal	***1,639***	***3.5***	***1,082***
Clearbrook to Carlton			
Clearbrook	518	0.0	38
Mahtowa	370	2.9	792
Mule Lake	--	0.0	3
Outing	--	0.0	41
Waukenabo	316	0.0	2
Subtotal	***1,204***	***2.9***	***876***
Carlton to Wisconsin Border			
Carlton	862	0.0	84
Chub Lake	--	0.0	6
Wrenshall	399	0.1	79
Subtotal	***1,261***	***0.1***	***170***
TOTAL	**4,104**	**6.5**	**2,127**

[a] Source: U.S. Census Bureau 2010.

"--" = These areas are not census-designated areas; therefore, population information is not available.

6.5.3.2.2 Route Alternatives

Route Alternative RA-03AM

<u>Non-Local Workforce</u>

Of the 10 counties (Clearwater, Hubbard, Wadena, Todd, Morrison, Benton, Mille Lacs, Kanabec, Pine, and Carlton) through which RA-03AM passes, Benton County has the highest population density, at 97 people per square mile. The lowest population density is 9 people per square mile in Clearwater County. For context, the overall population density of the State of Minnesota is 69 people per square mile.

Population growth between 2010 and 2015 in the affected Minnesota counties was highest in Benton County, which grew 3 percent. Todd County's population decreased 3 percent in the same timeframe, which was the largest decrease of the affected counties. All of the counties saw a lower percentage population change than the 4-percent increase in population for the State of Minnesota.

<u>Populated Areas</u>

Table 6.5.3-2 presents the population of populated areas near RA-03AM, the miles of populated areas that would be crossed by the pipeline centerline, and the total acreage of populated areas that would be located within 1,250 feet of the construction footprint. These populated areas also are labeled in Figure 6.5.3-1.

Table 6.5.3-2. Populated Areas near Route Alternative RA-03AM

Populated Area	Population[a]	Miles of Populated Areas Crossed by Pipeline Centerline	Populated Areas within 1,250 Feet of Construction Work Area (acres)
Bock	106	0.0	59
Brook Park	522	1.1	315
Finlayson	456	0.5	192
Hinckley	1,800	2.0	526
Mahtowa	370	6.5	1,716
Milaca	2,946	0.5	199
Mora	3,571	0.7	284
Ogilvie	369	1.3	341
Quamba	123	0.9	280
Randall	650	0.0	7
Staples	2,981	1.4	476
Sturgeon Lake	439	0.0	35
TOTAL	**14,333**	**14.9**	**4,429**

[a] Source: U.S. Census Bureau 2010.

Route Alternative RA-06

Non-Local Workforce

RA-06 would pass through six counties (Clearwater, Beltrami, Itasca, Aitkin, St. Louis, and Carlton). Of these, the county with the greatest existing population density is Carlton County, at 41 people per square mile. The lowest population density is 9 people per square mile in Aitkin County. This compares to a statewide population density of 69 people per square mile.

Population growth between 2010 and 2015 in the affected Minnesota counties was highest in Beltrami County, which grew 3 percent. Aitkin County experienced a decline in population of 3 percent in the same timeframe, which was the lowest. The population of the State of Minnesota as a whole increased by 4 percent for the same time period.

Populated Areas

Table 6.5.3-3 presents the population of populated areas near RA-06, the miles of populated areas that would be crossed by the pipeline centerline, and the total acreage of populated areas that would be located within 1,250 feet of the construction footprint.

Table 6.5.3-3. Populated Areas near Route Alternative RA-06

Populated Area	Population[a]	Miles of Populated Areas Crossed by Pipeline Centerline	Populated Areas within 1,250 Feet of Construction Work Area (acres)
Big Lake	10,060	0.9	284
Bigfork	446	0.0	16
Cloquet	12,124	0.1	42
Floodwood	528	0.4	167
Nashwauk	938	2.0	619
TOTAL	**24,096**	**3.4**	**1,127**

[a] Source: U.S. Census Bureau 2010.

Route Alternative RA-07

Non-Local Workforce

RA-07 would pass through eight counties (Clearwater, Beltrami, Hubbard, Cass, Itasca, Aitkin, St. Louis, and Carlton). The county with the greatest existing population density is Carlton County, at 41 people per square mile. The lowest population density is 9 people per square mile in Aitkin County. This compares to a statewide population density of 69 people per square mile.

Population growth between 2010 and 2015 in the affected Minnesota counties was highest in Beltrami County, which grew 3 percent. Aitkin County experienced a decline in population of 3 percent in the same timeframe, which was the lowest of the counties. The overall population of the State of Minnesota increased by 4 percent for the same time period.

Populated Areas

Table 6.5.3-4 presents the population of populated areas near RA-07, the miles of populated areas that would be crossed by the pipeline centerline, and the total acreage of populated areas that would be located within 1,250 feet of the construction footprint.

Table 6.5.3-4. Populated Areas near Route Alternative RA-07

Populated Area	Population[a]	Miles of Populated Areas Crossed by Pipeline Centerline	Populated Areas within 1,250 Feet of Construction Work Area (acres)
Ball Club	342	1.8	492
Bemidji	13,431	4.7	1,749
Bena	116	0.8	250
Big Lake	10,060	0.9	304
Blackberry	--	1.6	402
Cass Lake	770	1.6	566
Chub Lake	--	0.0	2
Cloquet	12,124	0.1	41
Cohasset	2,698	3.4	1,126
Coleraine	1,970	3.3	1,051
Deer River	930	0.0	9
Floodwood	528	0.4	173
Grand Rapids	10,869	4.6	1,509
Grant Creek	--	0.0	18
La Prairie	665	0.0	17
Leonard	41	0.2	54
Midge Lake	--	0.0	15
Pinewood	--	0.0	39
Portage Lake	--	0.0	18
Rosby	--	0.6	155
Warba	181	1.0	344
Wilton	204	1.6	561
Zemple	93	1.1	311
TOTAL	**55,022**	**27.7**	**9,205**

[a] Source: U.S. Census Bureau 2010.

"--" = These areas are not census-designated areas; therefore, population information is not available.

Route Alternative RA-08

Non-Local Workforce

RA-08 would pass through eight counties (Clearwater, Beltrami, Hubbard, Cass, Itasca, Aitkin, St. Louis, and Carlton). The county with the greatest existing population density is Carlton County, at 41 people per square mile. The lowest population density is 9 people per square mile in Aitkin County. This compares to a statewide population density of 69 people per square mile.

Population growth between 2010 and 2015 in the affected Minnesota counties was highest in Beltrami County, which grew 3 percent. Aitkin County experienced the lowest population growth and declined 3 percent in the same timeframe. These growth rates compare to an overall 4-percent increase in population for the State of Minnesota for the same time period.

Populated Areas

Table 6.5.3-5 presents the population of populated areas near RA-08, the miles of populated areas that would be crossed by the pipeline centerline, and the total acreage of populated areas that would be located within 1,250 feet of the construction footprint.

Table 6.5.3-5. Populated Areas near Route Alternative RA-08

Populated Area	Population[a]	Miles of Populated Areas Crossed by Pipeline Centerline	Populated Areas within 1,250 Feet of Construction Work Area (acres)
Ball Club	342	1.6	456
Bemidji	13,431	4.4	1,453
Bena	116	0.0	37
Big Lake	10,060	1.0	299
Blackberry	--	0.4	165
Cloquet	12,124	0.1	37
Cohasset	2,698	4.3	1,370
Coleraine	1,970	2.0	626
Floodwood	528	0.3	132
Grand Rapids	10,869	4.5	1,431
La Prairie	665	0.7	224
Rosby	--	0.5	159
Warba	181	0.8	249
Zemple	93	1.3	370
TOTAL	**53,077**	**21.9**	**7,008**

[a] Source: U.S. Census Bureau 2010.

"--" = These areas are not census-designated areas; therefore, population information is not available.

6.5.3.3 Impact Assessment

Impacts on populations may result from an influx of workers from outside the ROI during the anticipated 12-month construction period or operation. The additional population may increase the demand for local amenities, services, infrastructure, and temporary housing and hospitality (e.g., restaurants). Areas with greater populations and amenities are able to absorb the influx of temporary workers more readily than areas with lower populations and fewer amenities (e.g., hotels, restaurants).

Conversely, the more populated the area, the more people who may be disrupted by construction and the greater the potential impact (e.g., greater density of roads, residents, and businesses). Services may be disrupted when pipeline construction crosses underground utilities or roads. Noise, dust, and vibrations caused by construction equipment may disturb more people in nearby homes and businesses. Following construction land within the permanent right-of-way easement would be restricted from further development for certain uses.

6.5.3.3.1 Applicant's Preferred Route (in Minnesota)

Construction Impacts

<u>Non-Local Workforce</u>

The Applicant provided an estimate that construction would occur simultaneously over seven separate construction spreads for the portion of the overall Line 3 Project located in Minnesota. Each construction spread would require approximately 600 workers, resulting in a total maximum workforce of 4,200 workers to construct the entire Project. Based on the length of the Applicant's preferred route, each spread would cover approximately 49 miles. While it is likely that Enbridge would use some local workers, as a worst case, it was assumed that all workers would be non-local and would need to temporarily re-locate to the area during construction. Additionally, some workers could be accompanied by their families. According to the U.S. Census Bureau (2014), the average number of persons per household in the United States is approximately three. If each of the non-local workers brought their families, the increase in local population could be approximately 12,600 people. This represents a 5-percent increase to the current population of all counties that would be crossed by the Applicant's preferred route. Given the transitory nature of the Project and the limited time period of construction, however, it is unlikely that all workers would re-locate with their families so the total temporary change in population would be less than 5 percent.

In the event that two construction spreads are adjacent to each other during construction, a maximum of 1,200 workers could be present in a county at a given time. In the largest county crossed by the Applicant's preferred route (Crow Wing County), it would represent a 2-percent increase in population. In the smallest county crossed by the route (Red Lake County), this would represent 30 percent of the county's total population. Additionally, Kittson County (27 percent), Marshall County (13 percent), and Clearwater County (14 percent) all would experience population increases over 10 percent of their current population. For these counties, additional strain may be expected in a worst-case scenario. Added population would create more traffic on roadways and emergency services, as discussed in Section 6.2.5. As discussed in Section 6.2.4, the total housing available is expected to be adequate. While adequate housing may be available across the ROI and the potential population increase would be less than 10 percent for most counties, 4 of the 12 counties (Red Lake, Kittson, Marshall, and Clearwater) could experience more than a 10-percent increase in population if all workers from two construction spreads were present in the county at the same time. This could result in congestion on the roads and within the service industry area (e.g., restaurants, gas stations). However, the worst-case scenario of two construction spreads operating close to each other would be temporary as pipeline construction moves along the route, and any local impacts would diminish. Overall, impacts related to the influx of non-local workforce are expected to be minor and temporary, but could be major and temporary for those counties with low population density if a large number of workers bring their families and if construction spreads operate in proximity to each other.

Populated Areas

A total of 13 populated areas would be proximal to the Applicant's preferred route. These areas have a total population of 3,586 people. A total of approximately 6 miles of populated areas would be crossed by the Applicant's preferred route, and a total of 2,127 acres of populated areas would be within the ROI in Minnesota.

For the segment of the Applicant's preferred route between Clearbrook and Carlton, five populated areas would be proximal to the construction area, with a total population of 1,204 people. A total of 3 miles of populated areas would be crossed by the centerline in this segment, and 876 acres of populated areas would be within the ROI.

Impacts on the populated areas within the ROI during construction would be caused by noise, dust, and vibrations from equipment; displaced residences and structures; the potential for traffic disruptions; and the potential for disrupted services such as water, electricity, or gas during construction. Populated areas are more likely to be affected by these impacts due to the higher density of people, structures, and infrastructure.

As described in Section 6.2.2, calculations show that typical construction noise attenuates to compliance levels with the daytime noise standards at 1,250 feet from the noise source. If a large portion of land that falls within a populated area is within this distance, there is a greater likelihood of impacts, including the number of people who would experience noise at levels that exceed the daytime standard. Applicant-proposed measures to limit noise during construction include limiting construction to daylight hours, maintaining equipment in good working order, limiting transportation to areas of active construction, and using manufacturer-supplied silencers when available. Detailed noise and vibration analyses are given in Section 6.2.2, as are additional recommendations that should be implemented to further reduce noise or vibration impacts.

During construction, increased dust can be harmful or bothersome to people located near work areas. Dust from construction is discussed in Section 6.3.7. Enbridge would wet construction areas and roadways as necessary to minimize dust.

The potential for displaced structures is increased when the pipeline is routed through populated areas. Structures in the permanent right-of-way would be removed or re-located during construction. No structures would be permitted in the permanent right-of-way during operation. Section 6.2.4 further discusses displacement of residences. Enbridge has reached agreements with landowners for all structures identified within the permanent right-of-way.

Populated areas have a higher density of roads and driveways than more rural areas. Additionally, the roadways generally have more traffic on them, and more people would be affected by traffic congestion created by the movement of construction workers and equipment or road closures. To minimize traffic impacts, Enbridge has proposed to cross all paved roads using the bore technique or HDD. These methods would prevent road closures by tunneling underneath the road surface. Impacts on roads are further discussed in Section 6.2.5.

Enbridge would consult with all utility companies prior to construction and utilize the Minnesota GSOC system prior to excavation to ensure that all adjacent pipelines and underground utilities are properly marked prior to construction. This would minimize the potential for service interruptions from construction. Nevertheless, interruptions would be more likely in areas of dense population due to the amount of infrastructure, with potential effects on more people. Utilities are further discussed in Section 6.2.5.

Overall, relatively few populated areas are crossed by the Applicant's preferred route, and the areas that are crossed have relatively small populations. With implementation of Applicant-proposed measures, impacts on populated areas during construction would be temporary and minor.

Operations Impacts

Non-Local Workforce

Enbridge estimates that operation of the pipeline would require few workers along the pipeline route; therefore, populations of local communities would not be affected.

Populated Areas

During operations, populated areas may be affected through restrictions placed on land within the permanent right-of-way or pipeline leaks or spills. The presence of a pipeline easement would prevent further development within the easement. Populated areas with more miles crossed by the pipeline centerline would have more land with this restriction. For the Applicant's preferred route, approximately 6 miles of populated areas would be crossed, with 3 miles of that occurring between Clearbrook and Carlton. While the restrictions would be placed on structures along the right-of-way, the existence of the permanent right-of-way would not restrict access across the easement. Typically, the pipeline would be buried at least 48 inches underground. Potential impacts associated with an accidental release of crude oil and associated emergency response procedures are discussed in Chapter 10.

Standard maintenance of the permanent right-of-way would include periodic mowing to prevent woody vegetation from interfering with inspection of the right-of-way or encroaching on the pipeline itself. In populated areas, mowing activity may be noticed by more people, but it would be infrequent and transitory.

Overall, operational impacts on populated areas would be negligible but permanent.

6.5.3.3.2 Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

Construction Impacts

Non-Local Workforce

For RA-03AM, the route from Clearbrook to Carlton would be 275 miles long, about 54 miles longer than the Applicant's preferred route. Based on the length of the route, it could require five construction spreads, resulting in the need for 3,000 workers. Assuming that each worker would be accompanied by their family, the population increase within the RA-03AM ROI would be 1 percent. Given the transitory nature of the Project and the limited time period for construction, it is unlikely that all workers would re-locate with their families.

In the event that two construction spreads are adjacent to each other during construction, a maximum of 1,200 workers could be present in a county at a given time. In the largest county crossed by RA-03AM (Benton County), this would represent a 3-percent increase in population. In the smallest county crossed by the route (Clearwater County), this would represent 14 percent of the county's total population. Added population would create more traffic on roadways and emergency services, as discussed in Section 6.2.5. As discussed in Section 6.2.4, the total housing available is expected to be adequate. Overall, impacts related to the non-local workforce are expected to be minor and temporary but could be major and temporary in areas with low population density.

Populated Areas

Impacts on populated areas would be similar to those described for the Applicant's preferred route. Differences between the Applicant's preferred route and the route alternatives would be due to the number and size of populated areas crossed and the extent to which they would be crossed. RA-03AM would affect 12 populated areas with a total population of 14,333. The largest populated area within the ROI would be Mora with 3,571 people. A total of 14.9 miles of populated areas would be crossed by the pipeline centerline, and 4,429.1 acres would be within the ROI. Impacts on populated areas would be minor because of the relatively low population affected and the temporary construction duration.

Operations Impacts

Non-Local Workforce

Enbridge estimates that operation of the route alternatives would not require significant numbers of workers along the pipeline route; therefore, populations would not be affected by a non-local workforce.

Populated Areas

Operations impacts on populated areas along the route alternatives would be similar to those presented for the Applicant's preferred route, constituting a negligible but permanent impact.

Route Alternative RA-06

Construction Impacts

Non-Local Workforce

The length of the RA-06 route is to the Applicant's preferred route and would require approximately four construction spreads. The four construction spreads would total roughly 2,400 workers, which would represent about 1 percent of the population in the counties crossed by RA-06. If two construction spreads were in the same county at the same time, impacts could be magnified and up to 1,200 workers could be located in one county. The largest county crossed by RA-06 (St. Louis County) has a population of 200,431 people; two spreads would represent 1 percent of that population. The smallest county crossed would be Clearwater County, with 8,803 people; two construction spreads would represent 14 percent of that population. Impacts related to the non-local workforce would be minor and temporary but could be major and temporary in the instance of multiple construction spreads working at the same time in the smaller counties with low populations.

Populated Areas

RA-06 would affect five populated areas, with a total population of 24,096. The largest populated area within the ROI would be Cloquet, with 12,124 people. A total of 3.4 miles of populated areas would be crossed by the pipeline centerline, and 1,127 acres would be within the ROI. Impacts on populated areas would be minor and temporary because of the relatively low population affected and the transitory nature of construction.

Operations Impacts

Non-Local Workforce

Enbridge estimates that operation of the route alternatives would not require significant numbers of workers along the pipeline route; therefore, populations would not be affected by a non-local workforce.

Populated Areas

Operations impacts on populated areas along the route alternatives would be similar to those presented for the Applicant's preferred route, constituting a negligible but permanent impact.

Route Alternative RA-07

Construction Impacts

Non-Local Workforce

The length of the RA-07 route is similar to the Applicant's preferred route and would require approximately four construction spreads. The four construction spreads would total roughly 2,400 workers, representing about 1 percent of the population in the counties crossed by RA-07. If two construction spreads were in the same county at the same time, impacts could be magnified and up to 1,200 workers could be located in one county. The largest county crossed by RA-07 (St. Louis County) has a population of 200,431 people; two spreads would represent 1 percent of the population. The smallest county crossed would be Clearwater County, with 8,803 people; two construction spreads would represent 14 percent of the population. Impacts related to the non-local workforce would be minor and temporary but could be major and temporary in the instance of multiple construction spreads working at the same time in the smaller counties with low populations.

Populated Areas

RA-07 would affect 23 populated areas, with a total population of 55,022. The largest populated area within the ROI would be Bemidji, with 13,431 people. A total of 27.7 miles of populated areas would be crossed by the pipeline centerline and 9,205 acres of populated areas would be within the ROI. Impacts on populated areas would be minor because of the relatively low population of the areas affected. As noted for the Applicant's preferred route, populated areas are more likely to be affected by construction impacts because of the higher density of people, structures, and infrastructure. Impacts would be temporary during construction.

Operations Impacts

Non-Local Workforce

Enbridge estimates that operation of the route alternatives would not require significant numbers of workers along the pipeline route; therefore, populations would not be affected by a non-local workforce.

Populated Areas

Operations impacts on populated areas along the route alternatives would be similar to those presented for the Applicant's preferred route, constituting a negligible but permanent impact.

Route Alternative RA-08

Construction Impacts

Non-Local Workforce

The length of the RA-08 route is similar to the Applicant's preferred route and would require approximately four construction spreads. The four construction spreads would total roughly 2,400 workers, representing about 1 percent of the population in the counties crossed by RA-08. If two construction spreads were in the same county at the same time, impacts could be magnified and up to 1,200 workers could be located in one county. The largest county crossed by RA-07 (St. Louis County) has a population of 200,431 people; two spreads would represent 1 percent of that population. The smallest county crossed would be Clearwater County, with 8,803 people; two construction spreads would represent 14 percent of the population. Impacts related to the non-local workforce would be minor and temporary, but could be major and temporary in the instance of multiple construction spreads working at the same time in the smaller counties with low populations.

Populated Areas

RA-08 would affect 14 populated areas, with a total population of 53,077. The largest populated area within the ROI would be Bemidji, with 13,431 people. A total of 21.9 miles of populated areas would be crossed by the pipeline centerline, and 7,008 acres of populated areas would be within the ROI. Impacts on populated areas would be minor because of the relatively low population levels in the areas affected and would be temporary during construction.

Operations Impacts

Non-Local Workforce

Enbridge estimates that operation of the route alternatives would not require significant numbers of workers along the pipeline route; therefore, populations would not be affected by a non-local workforce.

Populated Areas

Operations impacts on populated areas along the route alternatives would be similar to those presented for the Applicant's preferred route, constituting a negligible but permanent impact.

6.5.3.4 Summary and Mitigation

6.5.3.4.1 Summary

Impacts on population for the Applicant's preferred route and the route alternatives are summarized in Table 6.5.3-6. Overall, the influx of construction workers to build and operate the Applicant's preferred route or any of the route alternatives would result in negligible to minor impacts except in those few counties with the lowest populations. The influx of non-local workers is not expected to affect the local populations unless two construction spreads are working in proximity to each other within a single low-population county. The nature of the construction work requires the workers to move through each area after a short time, and the existing services and housing in the areas on a county-wide basis are adequate to support the worker influx. In the circumstance where two construction spreads are active in the same low-population county, temporary but major impacts could occur.

Potential impacts from operations would be permanent but negligible for the Applicant's preferred route and all of the route alternatives. Pipeline operations would require relatively few additional employees and thus would not affect the local workforce, need for housing, or local services.

When comparing the Applicant's preferred route and the route alternatives to each other, the Applicant's preferred route would be expected to have the lowest impact on populated areas. It has the lowest number of populated areas within the ROI and the lowest total population within those populated areas. It also has the least acreage along of permanent right-of-way that crosses populated areas and would restrict surface land use within populated areas.

The next highest population exposure would occur from RA-03AM, where approximately 10 times as many people are in populated areas proximal to the pipeline route. The permanent right-of-way acreage that would need to remain cleared in the populated areas would be five times greater for RA-03AM than for the Applicant's preferred route.

RA-06, RA-08, and RA-07, in that order, would increase the exposed population within populated areas; and the amount of exposed population increases significantly. However, at all levels of population exposure, impacts are expected to be negligible to minor as shown in Table 6.5.3-6.

The amount of acreage restricted for surface land use also is higher for RA-06, RA-07, and RA-08, as shown in Table 6.5.3-6.

6.5.3.4.2 Mitigation

Beyond the Applicant-proposed measures described for the Applicant's preferred route, mitigation measures to address potential major impacts of traffic congestion for the rail and truck alternatives could include:

- Freeways – Construct additional freeway lanes, off ramps and other traffic flow features in congested areas to reduce traffic density.
- Highways – Upgrade (widening) or add lanes to existing state and county highways to increase traffic flow and reduce traffic density. Construction of additional lane capacity or dedicated truck-only lanes on State Highway 92 near Clearbrook may be required.
- Populated areas – Construct dedicated access roads to the Clearbrook terminal.

Given the temporary nature of the construction activity (the construction spread moves along the construction route), potential impacts are expected to be minor to negligible and temporary. Likewise, pipeline operations would require relatively few additional employees and thus would not affect the local workforce, need for housing, or local services. No additional mitigation has been identified associated with employment.

Table 6.5.3-6. Summary of Potential Impacts on Population for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Changes in Population from Non-Local Workforce					
Percentage increase in local population across all counties	Temporary/minor impacts • 6.7 percent increase Temporary/major impacts *(in counties where population increase would be greater than 10 percent)*	Temporary/minor impacts • 5.1 percent increase Temporary/major impacts *(in counties where population increase would be greater than 10 percent)*	Temporary/minor impacts • 3.6 percent increase Temporary/major impacts *(in counties where population increase would be greater than 10 percent)*	Temporary/minor impacts • 3.1 percent increase Temporary/major impacts *(in counties where population increase would be greater than 10 percent)*	Temporary/minor impacts • 3.1 percent increase Temporary/major impacts *(in counties where population increase would be greater than 10 percent)*
Disruptions to Populated Areas					
Number of populated areas crossed or within 1,250 feet of construction work area	Temporary/minor impacts • 5 populated areas	Temporary/minor impacts • 12 populated areas	Temporary/minor impacts • 5 populated areas	Temporary/minor impacts • 23 populated areas	Temporary/minor impacts • 14 populated areas
Total population of populated areas crossed	Temporary/minor impacts • 1,204	Temporary/minor impacts • 14,333	Temporary/minor impacts • 24,096	Temporary/minor impacts • 55,022	Temporary/minor impacts • 53,077
Total area of populated areas crossed or within 1,250 feet of construction work area (acres)	Temporary/minor impacts • 875.7 acres	Temporary/minor impacts • 4,429.1 acres	Temporary/minor impacts • 1,127.0 acres	Temporary/minor impacts • 9,205.1 acres	Temporary/minor impacts • 7,008.4 acres

Table 6.5.3-6. Summary of Potential Impacts on Population for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Operations Impacts					
Changes in Population from Non-Local Workforce					
Increase in local population across all counties	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts
Disruptions to Populated Areas					
Miles of populated areas crossed by pipeline centerline	Permanent/negligible impacts • 2.9 miles	Permanent/negligible impacts • 14.9 miles	Permanent/negligible impacts • 3.4 miles	Permanent/negligible impacts • 27.7 miles	Permanent/negligible impacts • 21.9 miles

[a] **No single dataset in this summary table provides a complete indication of all relevant impacts to population. Each dataset contains useful information, but also has limitations. However, together these datasets provide a reasonably comprehensive indication of the potential impacts. For example, while total population can aid in identifying the number of potentially affected people, an understanding of population density and percentage change in local population is needed in order to understand the potential stress that could be felt as the result of an influx of temporary workers. The individual rows containing quantitative information should not be viewed in isolation, they should be viewed together to gain a comprehensive understanding of project impacts. The appropriate weight to place on any given dataset is a subject of debate, even among technical experts; therefore, the weight that the user places on one dataset versus another may legitimately vary based on individual preferences and values.**

[b] **Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3), as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-779 to 6-784. The table above, for example, describes miles of populated areas within the ROI and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to populated areas is contained in the text of this section (terms defined in Section 6.1.3).**

[c] **Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-779 to 6-781. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[d] **Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-781 to 6-782. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

[e] **Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-782 to 6-783. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.**

Table 6.5.3-6. Summary of Potential Impacts on Population for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-783 to 6-784. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on page 6-784. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.5.3.5 References

U.S. Census Bureau. 2010. 2010 Census. QuickFacts. https://www.census.gov/quickfacts/table/PST045215/00. Accessed on January 23, 2017.

_____. 2014. 2010 – 2014 American Community Survey. American Fact Finder. https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed on January 23, 2017.

_____. 2016. 2016 TIGER Geodatabases. https://www.census.gov/geo/maps-data/data/tiger-geodatabases.html.

6.5.4 Employment, Income, and Tax Revenues

Employment and income statistics provide insight into local economic conditions. Changes in employment and income influence the level of tax revenues received by local and state governments, making tax revenues another important indicator of how well an economy is doing. The issues addressed in this section related to employment, income, and tax revenue associated with construction and operation of the Applicant's preferred route and route alternatives are:

- Construction-related employment, payroll spending, and expenditures on materials, supplies and equipment;
- Operation-related employment and payroll spending;
- Income tax revenue from workers during construction and operation;
- Property taxes paid by the Applicant during operation; and
- Impacts on property taxes, if any, of appraised property value changes due to construction and operations.

This section first describes the regulatory context and methods used in the assessment of impacts (Section 6.5.4.1), followed by a description of relevant economic conditions within the counties along the Applicant's preferred route and each of the route alternatives (Section 6.5.4.2); these counties could experience changes in employment, income, and tax revenue as a result of construction and operation of the Project. Section 6.5.4.3 addresses the potential impacts on employment, income, and tax revenue from construction and operation of the Project. That section identifies the potential impacts for all the route options (the Applicant's preferred route and route alternatives RA-03AM, RA-06, RA-07, and RA-08). A summary and comparison of the impacts are presented in Section 6.5.4.4.

6.5.4.1 Regulatory Context and Methodology

6.5.4.1.1 Regulatory Context

Minnesota Administrative Rules Part 7852.1900, Subpart (3) describes what the Commission must consider in determining the route of a pipeline. Among other things, the Commission must consider the potential impacts, and methods to minimize or mitigate the potential impacts, of all proposed routes on "economies within the route." A "local economy" is defined as the activities that take place within a designated geographic area.

6.5.4.1.2 Methodology

The assessment addressed the impacts on employment, income, and tax revenue from construction and operation of the Applicant's preferred route and route alternatives. This assessment consisted of the following:

- Describing the existing economic conditions in the counties that would be crossed by the Applicant's preferred route and route alternatives using county-level employment, income, and tax revenues (where available); and
- Determining potential impacts on the economic baseline by using employment numbers and construction related expenditures provided by the Applicant to provide a qualitative discussion of the relative magnitude (i.e., negligible, minor, or major) of Project-related changes to county-

level employment and income levels, and to quantitatively estimate the potential increase in tax revenue by county.

For this analysis, the ROI encompasses the counties crossed by the Applicant's preferred route and route alternatives. County-level data provide a reasonable basis for defining a local economy and determining Project-related impacts in each county crossed by each route. The comparison of impacts on most of the other resources in this EIS consider the alternative routes between the Enbridge terminals at Clearbrook and Carlton since the routes of those alternatives are the same between the North Dakota border and Clearbrook and between Carlton and the Wisconsin border. However, because the impact analysis for this section is based on county data, the comparisons were made using (1) data for existing conditions in all of Clearwater County, in which Clearbrook is located, and all of Carlton County, in which Carlton is located; and (2) construction employment for the four construction spreads between the Enbridge terminals at Clearbrook and Carlton.

The employment and income statistics used to describe the economic baseline (or existing conditions) include median household income from the U.S. Census Bureau, and per capita income, total labor force numbers, and unemployment rates from the U.S. Bureau of Labor Statistics. Median household income is commonly used to describe a household's economic status or to track economic trends, whereas per capita household income often is used to measure the standard of living within a geographic area. Labor force numbers represent the total number of people (15 years and older) who are currently employed or unemployed but looking for work, while the unemployment rate represents the percentage of the labor force that is currently unemployed. All data are from the most recent survey years available when this EIS was prepared, unless otherwise noted.

Existing conditions for tax revenues were based on available data from the Minnesota Department of Revenue for the ROI except for Benton and Pine counties. These data include total government revenue and the portion of revenue from property taxes. Construction of a pipeline and associated facilities would generate tax revenues in the form of property taxes paid by the Applicant for the life of the Project. Property tax revenue used in the impact assessment was based on the appraised value of the pipeline easement and the state and local tax rates. Enbridge has appealed the amount of property taxes it paid between 2012 and 2016, alleging that the Minnesota Department of Revenue overvalued the value of the pipeline property, resulting in overpayment of taxes to counties and Minnesota. The appeal has not been settled at the time this document was prepared. This revenue would be in addition to the amount that the current landowner pays and represents additional revenue to the county and the state.

County governments receive income tax appropriations from the state of Minnesota. The state determines the amount each county receives. Output from a national IMPLAN model (an economic input-output model) and the number of miles of pipeline per county were used to allocate the potential change in income taxes appropriated from the State of Minnesota to each county in the ROI for the Applicant's preferred route and route alternatives (see Appendix R). The total estimated labor income to Minnesota was generated using the IMPLAN output along with each county's share of the total pipeline (in miles). The total estimated income tax to the state was generated using the IMPLAN output and Minnesota's current income tax rate of 7.08 percent. The resultant estimated state income tax was allocated to each county in the ROI based on the number of miles of pipeline in the county.

No single one of the data sources referenced above provides a complete indication of all relevant impacts to employment, income, and tax revenues, but together the estimates provided give a

reasonably comprehensive indication of the potential impacts. For example, while estimates of total employment and income provide an indication of a subset of the socioeconomic effects of the projects, other datapoints, like estimated tax revenues can provide an understanding the potential revenue that might be generated at a broader level within a particular county.

Furthermore, the quantitative information from these datasources should be coupled with an understanding of the qualitative descriptions of impacts that are contained in the text in this section. Tables in this section provide estimated impacts, for example, related to tax revenues and numbers of jobs created by the applicant's pipeline route and alternatives and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to is contained in the text of this section.

It is likely that the Applicant would hire local residents during construction of any of the alternative routes for a portion of its workforce, based on Enbridge's commitment to the use of labor unions for the construction of the Line 3 Project (as referenced in the direct testimony of Barry Simonson, lines 505-513, the current labor agreements in Minnesota require that at least 50% of workers will be expected to be employed from local union halls). This is noted elsewhere in this EIS, as well as that impacts on population and housing are based primarily on the assumption that all of the workers would be from outside of the counties crossed by the routes and they would therefore re-locate to the area during construction in order to evaluate a worst-case scenario (see Section 6.2.4.3). These workers may reside in Minnesota or may be out-of-state workers, which is a common situation in pipeline construction projects.

6.5.4.2 Existing Conditions

6.5.4.2.1 Applicant's Preferred Route

Employment and Income

Summary statistics of employment, per capita income, and median household income for the counties that would be crossed by the Applicant's preferred route are listed in Table 6.5.4-1. In all of the counties, the median household income is below the state average of $60,828, and only one county (Kittson) is above the state average for per capita personal income of $50,541; however, Kittson County also had the highest unemployment rate (7 percent).

Tax Revenues

Table 6.5.4-2 lists the current total government revenue and the portion of revenue from property taxes for each county that would be crossed by the Applicant's preferred route. For many of these counties, property taxes are an important source of income. Pennington and Red Lake counties have the highest share of their total revenues from property taxes (86 and 74 percent, respectively). Crow Wing County has the highest total government revenue at $77 million. In 2015, income taxes received by the State of Minnesota were approximately $11 billion (U.S. Census 2015).

6.5.4.2.2 Route Alternatives

The only area where the route alternatives would vary from the alignment of the Applicant's preferred route is between Clearbrook and Carlton in Minnesota. The existing conditions relevant to employment, income, and tax revenue for the route alternatives between Clearbrook and Carlton are described below. However, because this assessment incorporates county data, the information associated with routes in Carlton County includes data for the entire county, although the differences in the alignments of the route alternatives extend only between the Enbridge terminals at Clearbrook and Carlton.

Route Alternative RA-03AM

<u>Employment and Income</u>

Summary statistics of employment, per capita income, and median household income for the counties that would be crossed by RA-03AM between Clearbrook and Carlton are listed in Table 6.5.4-3. Kanabec and Pine counties have the highest unemployment rates (5 percent), and the median household income averaged $47,475 for all the counties crossed.

Table 6.5.4-1. Employment and Income Conditions in Counties Crossed by the Applicant's Preferred Route in Minnesota

County	Per Capita Personal Income 2014[a] ($2015)	Median Household Income 2010–2014[b] ($2015)	Labor Force (August 2015 – September 2016)[a]	Unemployment Rate (August 2015 – September 2016)[a]
North Dakota Border to Clearbrook				
Kittson	$52,326	$48,950	2,543	7.0%
Marshall	$47,271	$53,373	5,574	4.9%
Pennington	$48,980	$47,436	8,933	3.4%
Red Lake	$45,722	$47,253	2,259	3.9%
Polk	$42,157	$51,085	16,795	3.8%
Clearwater	$36,512	$45,158	4,493	6.7%
Subtotal/Average	***Average = $45,495***	***Average = $48,876***	***Subtotal = 40,957***	***Average = 4.6%***
Clearbrook to Carlton[c]				
Hubbard	$36,338	$46,466	9,847	4.5%
Wadena	$32,836	$38,706	6,236	4.6%
Cass	$42,349	$45,620	14,690	5.1%
Crow Wing	$37,863	$49,244	32,402	3.9%
Aitkin	$36,363	$42,085	6,757	4.4%
Carlton	$36,801	$53,492	17,328	4.2%
Subtotal/average	***Average = $37,092***	***Average = $45,936***	***Subtotal = 87,260***	***Average = 4.5%***
TOTAL/AVERAGE	**AVERAGE = $41,616**	**AVERAGE = $47,519**	**TOTAL = 127,857**	**AVERAGE = 4.7%**

[a] Source: U.S. Bureau of Economic Analysis 2015.

[b] Source: U.S. Census Bureau 2014.

[c] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

Table 6.5.4-2. Government Revenue in Counties Crossed by the Applicant's Preferred Route in Minnesota

County	Portion of Pipeline through County	Government Revenue ($2015 thousands)[a]	County Property Tax Revenue ($2015 thousands)[a]	Share of Government Revenue from Property Taxes
North Dakota Border to Clearbrook				
Kittson	5%	$12,209	$3,346	27%
Marshall	11%	$17,237	$5,463	32%
Pennington	6%	$8,289	$7,153	86%
Red Lake	5%	$2,977	$2,198	74%
Polk	4%	$55,276	$20,562	37%
Clearwater[b]	12%	$12,209	$3,346	27%
Subtotal/average	***Subtotal = 43%***	***Subtotal = $108,197***	***Subtotal = $42,068***	***Average = 47%***
Clearbrook to Carlton[c]				
Hubbard	13%	$18,828	$6,142	33%
Wadena	2%	$31,732	$12,200	38%
Cass	14%	$21,289	$7,675	36%
Crow Wing	1%	$50,103	$20,332	41%
Aitkin	15%	$71,060	$35,583	50%
Carlton	11%	$35,408	$11,457	32%
Subtotal/average	***Subtotal = 57%***	***Subtotal = $228,420***	***Subtotal = $93,389***	***Average = 38%***
TOTAL/AVERAGE	**TOTAL = 100%**	**TOTAL = $336,617**	**TOTAL = $135,457**	**AVERAGE = 43%**

[a] Source: Minnesota Office of the State Auditor 2015, adjusted to $2015 based on the consumer price index where necessary.

[b] Includes data for all of Clearwater County.

[c] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

Table 6.5.4-3. Employment and Income Conditions in Counties Crossed by Route Alternative RA-03AM between Clearbrook and Carlton

County	Per Capita Personal Income 2014[a] ($2015)	Median Household Income 2010–2014[b] ($2015)	Labor Force (August 2015 – September 2016)[a]	Unemployment Rate (August 2015 – September 2016)[a]
Hubbard	$36,338	$46,466	9,847	4.5%
Wadena	$32,836	$38,706	6,236	4.6%
Todd	$38,082	$45,432	12,822	3.4%
Morrison	$37,448	$40,080	17,717	3.9%
Benton	$41,101	$60,589	21,694	3.6%
Mille Lacs	$34,168	$48,763	12,761	4.4%
Kanabec	$35,290	$46,872	8,860	5%
Pine	$35,290	$46,872	8,860	5%
Carlton[c]	$36,801	$53,492	17,328	4.2%
TOTAL/AVERAGE	**AVERAGE = $36,373**	**AVERAGE = $47,475**	**TOTAL = 116,125**	**AVERAGE = 4.29%**

[a] Source: U.S. Bureau of Economic Analysis 2015.

[b] Source: U.S. Census Bureau 2014.

[c] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

<u>Tax Revenues</u>

Table 6.5.4-4 lists the current total government revenue and the portion of revenue from property taxes for each county crossed by RA-03AM between Clearbrook and Carlton. For many of these counties, property taxes are an important source of income, averaging 40 percent. No data were available for Todd, Benton, or Pine counties.

Table 6.5.4-4. Government Revenue in Counties Crossed by Route Alternative RA-03AM between Clearbrook and Carlton

County	Portion of Pipeline through County	Government Revenue ($2015 thousands)[a]	County Property Tax Revenue ($2015 thousands)[a]	Share of Government Revenue from Property Taxes
Hubbard	9%	$18,828	$6,142	33%
Wadena	9%	$31,732	$12,200	38%
Todd	3%	NA	NA	--
Morrison	12%	41,762	16,964	41%
Benton	1%	NA	NA	--
Mille Lacs	4%	$34,234	15,052	44%
Kanabec	6%	$26,625	$11,094	42%
Pine	11%	NA	NA	--
Carlton[b]	6%	$35,408	$11,457	32%
TOTAL/AVERAGE	**61% (of total route)[c]**	**$138,029**	**$54,567**	**40%**

[a] Source: Minnesota Office of the State Auditor 2015, adjusted to $2015 based on the consumer price index where necessary.

[b] Includes data for all of Carlton County.

[c] Does not sum to 100% since this represents only the portion of the pipeline from Clearbrook to Carlton.

NA = Data were not readily available or available publicly via the Internet, "--" = Could not calculate because no data were available.

Route Alternative RA-06

Employment and Income

Summary statistics of employment, per capita income, and median household income for the counties that would be crossed by RA-06 between Clearbrook and Carlton are listed in Table 6.5.4-5. Itasca County has the highest unemployment rates (5.8 percent), and the median household income averaged $46,765 for all the counties crossed.

Table 6.5.4-5. Employment and Income Conditions in Counties Crossed by Route Alternative RA-06 between Clearbrook and Carlton

County	Per Capita Personal Income 2014[a] ($2015)	Median Household Income 2010–2014[b] ($2015)	Labor Force (August 2015 – September 2016)[a]	Unemployment Rate (August 2015 – September 2016)[a]
Beltrami	$35,078	$43,990	23,451	4.1%
Itasca	$36,367	$47,122	22,967	5.8%
Aikin	$36,363	$42,085	6,757	4.4%
St. Louis	$39,861	$47,138	8,569	3.4%
Carlton[c]	$36,801	$53,492	17,328	4.2%
TOTAL/AVERAGE	**AVERAGE = $36,894**	**AVERAGE = $46,765**	**TOTAL = 79,072**	**AVERAGE = 4.4%**

[a] Source: U.S. Bureau of Economic Analysis 2015.
[b] Source: U.S. Census Bureau 2014.
[c] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

Tax Revenues

Table 6.5.4-6 summarizes the current total government revenue and the portion of revenue from property taxes for each county between Clearbrook and Carlton that would be crossed by RA-06. For many of these counties, property taxes are an important source of income, averaging 38 percent.

Table 6.5.4-6. Government Revenue in Counties Crossed by Route Alternative RA-06 between Clearbrook and Carlton

County	Portion of Pipeline through County	Government Revenue ($2015 thousands)[a]	County Property Tax Revenue ($2015 thousands)[a]	Share of Government Revenue from Property Taxes
Beltrami	12%	$72,476	$26,651	37%
Itasca	34%	$94,707	$28,855	30%
Aitkin	0.2%	$71,060	$35,583	50%
St. Louis	8%	$278,021	$111,234	40%
Carlton[b]	5%	$35,408	$11,457	32%
TOTAL/AVERAGE	**62% (of total route)[c]**	**TOTAL = $551,672**	**TOTAL = $213,780**	**AVERAGE = 38%**

[a] Source: Minnesota Office of the State Auditor 2015, adjusted to $2015 based on the consumer price index where necessary.
[b] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.
[c] Does not sum to 100% since this represents only the portion of the pipeline from Clearbrook to Carlton.

Route Alternative RA-07

Employment and Income

Summary statistics of employment, per capita income, and median household income for the counties that would be crossed by RA-07 between Clearbrook and Carlton are listed in Table 6.5.4-7. Itasca County has the highest unemployment rates (5.8 percent), and the median household income averaged $46,559 for all the counties crossed.

Table 6.5.4-7. Employment and Income Conditions in Counties Crossed by Route Alternative RA-07 between Clearbrook and Carlton

County	Per Capita Personal Income 2014[a] ($2015)	Median Household Income 2010–2014[b] ($2015)	Labor Force (August 2015 – September 2016)[a]	Unemployment Rate (August 2015 – September 2016)[a]
Beltrami	$35,078	$43,990	23,451	4.1%
Hubbard	$36,338	$46,466	9,847	4.5%
Cass	$42,349	$45,620	14,690	5.1%
Itasca	$36,367	$47,122	22,967	5.8%
Aitkin	$36,363	$42,085	6,757	4.4%
St. Louis	$39,861	$47,138	8,569	3.4%
Carlton[c]	$36,801	$53,492	17,328	4.2%
TOTAL/AVERAGE	**AVERAGE = $37,594**	**AVERAGE = $46,559**	**TOTAL = 103,609**	**AVERAGE = 4.5%**

[a] Source: U.S. Bureau of Economic Analysis 2015.

[b] Source: U.S. Census Bureau 2014.

[c] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

Tax Revenues

Table 6.5.4-8 lists the current total government revenue and the portion of revenue from property taxes for each county crossed by RA-07 between Clearbrook and Carlton. For many of these counties, property taxes are an important source of income, averaging 37 percent.

Table 6.5.4-8. Government Revenue in Counties Crossed by Route Alternative RA-07 between Clearbrook and Carlton

County	Portion of Pipeline through County	Government Revenue ($2015 thousands)[a]	County Property Tax Revenue ($2015 thousands)[a]	Share of Government Revenue from Property Taxes
Beltrami	8%	$72,476	$26,651	37%
Hubbard	3%	$18,828	$6,142	33%
Cass	12%	$21,289	$7,675	36%
Itasca	17%	$94,707	$28,855	30%
Aitkin	0.4%	$71,060	$35,583	50%
St. Louis	9%	$278,021	$111,234	40%
Carlton[b]	5%	$35,408	$11,457	32%
TOTAL/AVERAGE	**54% (of total route)[c]**	**TOTAL = $519,313**	**TOTAL = $200,946**	**AVERAGE = 37%**

[a] Source: Minnesota Office of the State Auditor 2015, adjusted to $2015 based on the consumer price index where necessary.

[b] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

[c] Does not sum to 100% since this represents only the portion of the pipeline from Clearbrook to Carlton.

Route Alternative RA-08

Employment and Income

Summary statistics of employment, per capita income, and median household income for the counties that would be crossed by RA-08 between Clearbrook and Carlton are listed in Table 6.5.4-9. Itasca County has the highest unemployment rates (5.8 percent), and the median household income averaged $46,559 for all the counties crossed.

Table 6.5.4-9. Employment and Income Conditions in Counties Crossed by Route Alternative RA-08 between Clearbrook and Carlton

County	Per Capita Personal Income 2014[a] ($2015)	Median Household Income 2010–2014[b] ($2015)	Labor Force (August 2015 – September 2016)[a]	Unemployment Rate (August 2015 – September 2016)[a]
Beltrami	$35,078	$43,990	23,451	4.1%
Hubbard	$36,338	$46,466	9,847	4.5%
Cass	$42,349	$45,620	14,690	5.1%
Itasca	$36,367	$47,122	22,967	5.8%
Aitkin	$36,363	$42,085	6,757	4.4%
St. Louis	$39,861	$47,138	8,569	3.4%
Carlton[c]	$36,801	$53,492	17,328	4.2%
TOTAL/AVERAGE	**AVERAGE = $37,594**	**AVERAGE = $46,559**	**TOTAL = 103,609**	**AVERAGE = 4.5%**

[a] Source: U.S. Bureau of Economic Analysis 2015.

[b] Source: U.S. Census Bureau 2014.

[c] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

Tax Revenues

Table 6.5.4-10 lists the current total government revenue and the portion of revenue from property taxes for each county crossed by RA-08 between Clearbrook and Carlton. For many of these counties, property taxes are an important source of income, averaging 37 percent.

Table 6.5.4-10. Government Revenue in Counties Crossed by Route Alternative RA-08 between Clearbrook and Carlton

County	Portion of Pipeline through County	Government Revenue ($2015 thousands)[a]	County Property Tax Revenue ($2015 thousands)[a]	Share of Government Revenue from Property Taxes
Beltrami	7%	$72,476	$26,651	37%
Hubbard	3%	$18,828	$6,142	33%
Cass	12%	$21,289	$7,675	36%
Itasca	16%	$94,707	$28,855	30%
Aitkin	2%	$71,060	$35,583	50%
St. Louis	8%	$278,021	$111,234	40%
Carlton[b]	5%	$35,408	$11,457	32%
TOTAL/AVERAGE	**53% (of total route)[c]**	**TOTAL = $519,313**	**TOTAL = $200,946**	**AVERAGE = 37%**

[a] Source: Minnesota Office of the State Auditor 2015, adjusted to $2015 based on the consumer price index where necessary.

[b] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

[c] Does not sum to 100% since this represents only the portion of the pipeline from Clearbrook to Carlton.

6.5.4.3 Impact Assessment

Construction and operation of the Applicant's preferred route or an alternative route would increase employment, income, and tax revenue. Direct impacts on employment would be driven by the large number of construction personnel. Although it is expected that the workers would not live in the counties where construction would occur, they may temporarily re-locate to these counties during construction or spend money locally, which could result in temporary county-level income changes in supporting industries. Tax revenues would increase due to the increase in labor income (i.e., taxable income), sales tax on the purchase of goods locally, and property taxes. Construction would also have a temporary indirect influence on economic conditions due to employment and income for service industries supporting construction activities (e.g., the hotel industry, fueling services, and the food service industry).

6.5.4.3.1 Applicant's Preferred Route (in Minnesota)

Construction Impacts

Employment and Income

Construction of the Applicant's preferred route across Minnesota is expected to require up to a maximum of 4,200 workers across 7 different construction spreads over an 8 to 12-month period. The portion of the route between Clearbrook and Carlton would require up to 2,400 workers across 4 construction spreads.

It is expected that Enbridge would use some local workers – as referenced in the direct testimony of Barry Simonson (lines 505-513) current labor agreements in Minnesota require that at least 50% of workers would be expected to be employed from local union halls. As construction jobs are typically permanent in nature and spatially temporary in the sense that workers move from project to project, permanent jobs may result from said construction (this is also dependent on an unquantifiable backlog of other construction project demand). Based on this assumption, it is likely that direct construction-related employment would have a minor positive impact on county-level unemployment and per capita and/or median household income levels.

Furthermore, it is likely that some of the non-technical work could be accomplished by local labor (e.g., clearing and trenching); hiring of local labor for those positions would have a temporary (over the duration of construction and post-construction restoration activities) and negligible to minor impact on county-level unemployment or per capita and/or median household income levels, depending on the nature of work activities.

Construction workers who do re-locate to the Project area would spend a portion of their income on local goods and services such as food, gas, and lodging. These expenditures would increase revenues to those secondary or supporting industries (i.e., industries that indirectly support the construction industry) for the duration of the construction period in the area of the construction spread. This would result in a temporary, minor positive impact on the secondary industries. If businesses in the secondary industries hire additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment and unemployment within each county along the route.

In addition to direct Project-related employment and payroll spending, a large portion of the construction-related expenses would be for construction materials, supplies, equipment, parts, and other goods and services such as fuel and hardware. The Applicant estimated the material costs for construction of its preferred route in Minnesota to be $438.9 million. According to the IMPLAN model results, the top industries (as defined in the model) that would be positively affected by construction-related spending are construction services for new, non-residential structures; food services and drinking places; real estate businesses; wholesale trade business (businesses engaged in wholesaling merchandise such as agriculture and mining); architectural and engineering services; offices of health practitioners; private hospitals; employment services; and financial services (see Appendix R). These expenditures during construction would result in temporary and negligible to minor indirect, positive impacts on those industries, particularly within the counties along the route. The magnitude of the impact on the industries would depend on the size of the industries and the portion of the expenditures that would be spent locally in each county crossed by the route.

If businesses in these industries hire local additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment, unemployment, and per capita income at the county level along the route.

If the Applicant employs some local residents during construction, there would be a greater influence on employment, unemployment, and per capita income at the county level along the route; and the temporary, positive impact would be greater.

Tax Revenues

Construction of the Applicant's preferred route would generate state and local taxes from a variety of sources. State and county tax revenues would increase due to increased employment payrolls directly associated with construction (i.e., wages paid to construction workers). In other words, regardless of where a construction worker lives, a portion of their wages would be subject to Minnesota state income taxes since the construction occurs in Minnesota over an extended period of time. In addition, if the industries indirectly affected by construction hire additional staff to accommodate the increased business as described above, wages paid to those workers would also increase state and county tax revenues. In terms of property taxes, as previously stated, it was assumed that property taxes would not begin to accrue until the operations phase of the Project; therefore, construction of the pipeline would not affect property taxes at the county level.

As previously discussed, income taxes are generated at the state level and reapportioned to county governments as determined by the state. Table 6.5.4-11 presents the estimated increase in the state income tax that would be appropriated to each county in the ROI based on the portion of total length of the pipeline through each county. Based on these estimates, Aitkin County would receive the highest increase in income tax revenue at $15.2 million. The counties along the Clearbrook-to-Carlton segment would receive approximately $55.9 million in income tax revenue from construction of the Project. This positive impact on income tax revenues to the counties would be temporary and minor to major (i.e., depending on the allocation to each individual county).

Operations Impacts

<u>Employment and Income</u>

The Applicant stated that the existing operations staff would be able to operate the Project and that few additional employees would be hired to assist the staff. As a result, operation of the pipeline would have no measureable impact on local employment, per capita household income, median household income, or unemployment in the ROI.

<u>Tax Revenues</u>

Since there would be few additional staff members hired for operation of the Project, there would be very little change in income tax or sales tax revenues due to increased spending by permanent operational staff. Therefore, the impact on income tax and sales tax revenues would be permanent, but at most negligible.

Property tax revenues would be the largest source of ongoing revenue to the counties along the route. Local and state governments would continue to collect annual property taxes from the Applicant based on the assessed value of the pipeline easements for the life of the Project. This would result in permanent, major positive impacts on property tax revenues for the counties along the route.

Table 6.5.4-11. Estimated Income Tax Generated from Construction-Related Income for the Applicant's Preferred Route

County	Miles of Pipeline through County	Estimated Income Tax Generated from Direct and Indirect Construction-Related Income ($2016 millions)[a]
North Dakota Border to Clearbrook		
Kittson	15.4	$4.5
Marshall	36.3	$10.7
Pennington	19.7	$5.8
Red Lake	15.7	$4.6
Polk	14.0	$4.1
Clearwater	42.2	$12.4
Subtotal	***143.3***	***$42.1***
Clearbrook to Carlton		
Hubbard	44.6	$13.1
Wadena	7.1	$2.1
Cass	47.4	$12.0
Crow Wing	4.8	$1.4
Aitkin	51.6	$15.2
Carlton[b]	41.0	$12.1
Subtotal	***196.5***	***$55.9***
TOTAL	**339.8**	**$98.0**

[a] The estimates represent a conservative upper bound on the actual values. The underlying data are based on results from an IMPLAN model that uses national data, rather than data at the state level. The national data inflate the results at a more localized level, compared to a state-level model (see Appendix R).

[b] Carlton County extends to the Wisconsin border; because this is a county-level analysis, it includes data for all of Carlton County.

6.5.4.3.2 Route Alternatives (from Clearbrook to Carlton)

Route Alternative RA-03AM

Construction Impacts

Employment and Income

RA-03AM is between 55 miles longer than the other routes between the Clearbrook and Carlton terminals, and construction between Clearbrook to Carlton and may require five spreads and an additional 600 workers (up to 3,000 total) during construction.

As stated in previous sections, it is expected that Enbridge would use some local labor (at least 50% from local union halls) regardless of the route alternative selected. As construction jobs are typically permanent in nature and spatially temporary in the sense that workers move from project to project, permanent jobs may result from said construction (this is also dependent on an unquantifiable backlog of other construction project demand). Based on this assumption, it is likely that direct construction-related employment would have a minor positive impact on county-level unemployment and per capita and/or median household income levels.

Furthermore, it is likely that some of the non-technical work could be accomplished by local labor (e.g., clearing and trenching); hiring of local labor for those positions would have a temporary (over the duration of construction and post-construction restoration activities) and negligible to minor impact on county-level unemployment or per capita and/or median household income levels, depending on the nature of work activities.

Construction workers who re-locate to the Project area would spend a portion of their income on local goods and services such as food, gas, and lodging. Construction of RA-03AM would have the largest increase of local spending on goods and services of all alternatives due to the additional 600 workers. These expenditures would increase revenues to those secondary or supporting industries (i.e., industries that indirectly support the construction industry) for the duration of the construction period in the area of the construction spread. This would result in a temporary, minor positive impact on the secondary industries. If businesses in the secondary industries hire additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment and unemployment within each county along the route.

A large portion of the construction-related expenses would be for construction materials, supplies, equipment, parts, and other goods and services such as fuel and hardware. According to the IMPLAN model results, the top industries (as defined in the model) that would be positively affected by construction-related spending are construction services for new, non-residential structures; food services and drinking places; real estate businesses; wholesale trade business (i.e., businesses engaged in wholesaling merchandise like agriculture, and mining); architectural and engineering services; offices of health practitioners; private hospitals; employment services; and financial services (see Appendix R). These expenditures during construction would result in temporary and negligible to minor indirect, positive impacts on those industries, particularly within the counties along the route. The magnitude of the impact on the industries would depend on the size of the industries and the portion of the expenditures that would be spent locally in each county crossed by the route.

If businesses in these industries hire local additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment, unemployment, and per capita income at the county level along the route.

Tax Revenues

Construction of RA-03AM would generate state and local taxes from a variety of sources. State and county tax revenues would increase due to increased employment payrolls directly associated with construction (i.e., wages paid to construction workers). This increase in income tax revenues would be highest for RA-03AM compared to the other alternatives as a result of the increase in workers for the route. If the industries indirectly affected by construction hire additional staff to accommodate the increased business as described above, wages paid to those workers would also increase state and county tax revenues. As noted above, it was assumed that property taxes would not begin to accrue until the operations phase of the Project; therefore, construction of the pipeline would not affect property taxes at the county level.

As previously discussed, income taxes are generated at the state level and reapportioned to county governments as determined by the state. Table 6.5.4-12 presents the estimated increase in the state income tax that would be appropriated to each county in the ROI based on the portion of total length of the pipeline through each county. Based on the IMPLAN output in Table 6.5.4-12, counties crossed by RA-03AM would receive the highest total amount of income taxes ($73 million) as compared to that of the other alternatives. This positive impact on income tax revenues to the counties would be temporary and minor to major (i.e., depending on the allocation to each individual county) (see Appendix R).

Table 6.5.4-12. Estimated Income Tax Generated from Construction-Related Income for Route Alternative RA-03AM

County	Miles of Pipeline through County	Estimated Income Tax Generated from Direct and Indirect Construction-Related Income[a] ($2016 millions)
Hubbard	33.7	$9.7
Wadena	35.9	$10.4
Todd	12.6	$3.7
Morrison	47.8	$13.9
Benton	5.5	$1.6
Mille Lacs	15.6	$4.5
Kanabec	22.0	$6.4
Pine	43.6	$12.6
Carlton[b]	34.1	$9.9
TOTAL	**250.8**	**$72.7**

[a] The estimates represent a conservative upper bound on the actual values. The underlying data are based on results from an IMPLAN model that uses national data, rather than data at the state level. The national data inflate the results at a more localized level, compared to a state-level model (see Appendix R).

[b] Carlton County extends to the Wisconsin border; since this is a county-level analysis, this includes data for all of Carlton County.

Operations Impacts

Employment and Income

As for the Applicant's preferred route, the existing operations staff would be able to operate RA-03AM and few additional employees would be hired to assist the staff. As a result, operation of the pipeline would have no measureable impact on local employment, per capita household income, median household income, or unemployment in the ROI.

Tax Revenues

Since there would be few additional staff members hired for operation of the Project, there would be very little change in income tax or sales tax revenues due to increased spending by permanent operational staff. Therefore, the impact on income tax and sales tax revenues would be permanent, but at most negligible.

Property tax revenues would be the largest source of ongoing revenue to the counties along the route. Local and state governments would continue to collect annual property taxes from the Applicant based on the assessed value of the pipeline easements for the life of the Project. This would result in permanent, major positive impacts on property tax revenues for the counties along the route.

Route Alternative RA-06

Construction Impacts

Employment and Income

The portion of the RA-06 between Clearbrook and Carlton would require up to 2,400 workers across 4 construction spreads.

As stated in previous sections, it is expected that Enbridge would use some local labor (at least 50% from local union halls) regardless of the route alternative selected. As construction jobs are typically permanent in nature and spatially temporary in the sense that workers move from project to project, permanent jobs may result from said construction (this is also dependent on an unquantifiable backlog of other construction project demand). Based on this assumption, it is likely that direct construction-related employment would have a minor positive impact on county-level unemployment and per capita and/or median household income levels.

Furthermore, it is likely that some of the non-technical work could be accomplished by local labor (e.g., clearing and trenching); hiring of local labor for those positions would have a temporary (over the duration of construction and post-construction restoration activities) and negligible to minor impact on county-level unemployment or per capita and/or median household income levels, depending on the nature of work activities.

Construction workers who re-locate to the Project area would spend a portion of their income on local goods and services such as food, gas, and lodging. These expenditures would increase revenues to those secondary or supporting industries (i.e., industries that indirectly support the construction industry) for the duration of the construction period in the area of the construction spread. This would result in a temporary, minor positive impact on the secondary industries. If businesses in the secondary industries hire additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment and unemployment within each county along the route.

A large portion of the construction-related expenses would be for construction materials, supplies, equipment, parts, and other goods and services such as fuel and hardware. According to the IMPLAN model results, the top industries (as defined in the model) that would be positively affected by construction-related spending are construction services for new, non-residential structures; food services and drinking places; real estate businesses; wholesale trade business (i.e., businesses engaged in wholesaling merchandise like agriculture, and mining); architectural and engineering services; offices of health practitioners; private hospitals; employment services; and financial services (Appendix R). These expenditures during construction would result in temporary and negligible to minor indirect, positive impacts on those industries, particularly within the counties along the route. The magnitude of the impact on the industries would depend on the size of the industries and the portion of the expenditures that would be spent locally in each county crossed by the route.

If businesses in these industries hire local additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment, unemployment, and per capita income at the county level along the route.

Tax Revenues

Construction of RA-06 would generate state and local taxes from a variety of sources. State and county tax revenues would increase due to increased employment payrolls directly associated with construction (i.e., wages paid to construction workers). If the industries indirectly affect by construction hire additional staff to accommodate the increased business as described above, wages paid to those workers would also increase state and county tax revenues. In terms of property taxes, it was assumed that property taxes would not begin to accrue until the operations phase of the Project; therefore, construction of the pipeline would have no impact on property taxes at the county level.

As previously discussed, income taxes are generated at the state level and reapportioned to county governments as determined by the state. Table 6.5.4-13 presents the estimated increase in the state income tax that would be appropriated to each county in the ROI based on the portion of total length of the pipeline through each county. Based on the IMPLAN output in Table 6.5.4-13, counties crossed by RA-06 would receive $58.2 million in taxes, and Itasca County would experience the greatest revenue increase from income taxes ($32.1 million) (see Appendix R). This positive impact on income tax revenues to the counties would be temporary and minor to major (i.e., depending on the allocation to each individual county).

Table 6.5.4-13. Estimated Income Tax Generated from Construction-Related Income for Route Alternative RA-06

County	Miles of Pipeline through County	Estimated Income Tax Generated from Direct and Indirect Construction-Related Income[a] ($2016 millions)
Beltrami	38.4	$11.4
Itasca	108.2	$32.1
Aitkin	0.8	$0.2
St. Louis	24.7	$7.3
Carlton[b]	24.2	$7.2
TOTAL	**196.3**	**$58.2**

[a] The estimates represent a conservative upper bound on the actual values. The underlying data are based on results from an IMPLAN model that uses national data, rather than data at the state level. The national data inflate the results at a more localized level, compared to a state-level model (Appendix R).

[b] Carlton County extends to the Wisconsin border; since this is a county-level analysis, it includes data for all of Carlton County.

Operations Impacts

Employment and Income

The existing operations staff would be able to operate SA-06 and few additional employees would be hired to assist the staff. As a result, operation of the pipeline would have no measureable impact on local employment, per capita household income, median household income, or unemployment in the ROI.

Tax Revenue

Since there would be few additional staff members hired for operation of the Project, there would be very little change in income tax or sales tax revenues due to increased spending by permanent operational staff. Therefore, the impact on income tax and sales tax revenues would be permanent, but at most negligible.

Property tax revenues would be the largest source of ongoing revenue to the counties along the route. Local and state governments would continue to collect annual property taxes from the Applicant based on the assessed value of the pipeline easements for the life of the Project. This would result in permanent, major positive impacts on property tax revenues for the counties along the route.

Route Alternative RA-07

Construction Impacts

Employment and Income

The portion of the RA-07 between Clearbrook and Carlton would require up to 2,400 workers across 4 construction spreads.

As stated in previous sections, it is expected that Enbridge would use some local labor (at least 50% from local union halls) regardless of the route alternative selected. As construction jobs are typically permanent in nature and spatially temporary in the sense that workers move from project to project, permanent jobs may result from said construction (this is also dependent on an unquantifiable backlog of other construction project demand). Based on this assumption, it is likely that direct construction-related employment would have a minor positive impact on county-level unemployment and per capita and/or median household income levels.

Furthermore, it is likely that some of the non-technical work could be accomplished by local labor (e.g., clearing and trenching); hiring of local labor for those positions would have a temporary (over the duration of construction and post-construction restoration activities) and negligible to minor impact on county-level unemployment or per capita and/or median household income levels, depending on the nature of work activities.

Construction workers who re-locate to the Project area would spend a portion of their income on local goods and services such as food, gas, and lodging. These expenditures would increase revenues to those secondary or supporting industries (i.e., industries that indirectly support the construction industry) for the duration of the construction period in the area of the construction spread. This would result in a temporary, minor positive impact on the secondary industries. If businesses in the secondary industries hire additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment and unemployment within each county along the route.

A large portion of the construction-related expenses would be for construction materials, supplies, equipment, parts, and other goods and services such as fuel and hardware. According to the IMPLAN model results, the top industries (as defined in the model) that would be positively affected by construction-related spending are construction services for new, non-residential structures; food services and drinking places; real estate businesses; wholesale trade business (i.e., businesses engaged in wholesaling merchandise like agriculture, and mining); architectural and engineering services; offices of health practitioners; private hospitals; employment services; and financial services (see Appendix R). These expenditures during construction would result in temporary and negligible to minor indirect, positive impacts on those industries, particularly within the counties along the route. The magnitude of the impact on the industries would depend on the size of the industries and the portion of the expenditures that would be spent locally in each county crossed by the route.

If businesses in these industries hire local additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment, unemployment, and per capita income at the county level along the route.

Tax Revenues

Construction of RA-07 would generate state and local taxes from a variety of sources. State and county tax revenues would increase due to increased employment payrolls directly associated with construction (i.e., wages paid to construction workers). If the industries indirectly affect by construction hire additional staff to accommodate the increased business as described above, wages paid to those workers would also increase state and county tax revenues. As previously noted, it was assumed that property taxes would not begin to accrue until the operations phase of the Project; therefore, construction of the pipeline would not affect property taxes at the county level.

As previously discussed, income taxes are generated at the state level and reapportioned to county governments as determined by the state. Table 6.5.4-14 presents the estimated increase in the state income tax that would be appropriated to each county in the ROI based on the portion of total length of the pipeline through each county. Based on the IMPLAN output in Table 6.5.4-14, counties crossed by RA-07 would receive $49.6 million in taxes, and Itasca County would receive the greatest portion of revenue increases from income taxes ($15.1 million) (see Appendix R). This positive impact on income tax revenues to the counties would be temporary and minor to major (i.e., depending on the allocation to each individual county).

<u>Operations Impacts</u>

Employment and Income

The existing operations staff would be able to operate SA-07 and few additional employees would be hired to assist the staff. As a result, operation of the pipeline would have no measureable impact on local employment, per capita household income, median household income, or unemployment in the ROI.

Tax Revenues

Since there would be few additional staff members hired for operation of the Project, there would be very little change in income tax or sales tax revenues due to increased spending by permanent operational staff. Therefore, the impact on income tax and sales tax revenues would be permanent, but at most negligible.

Property tax revenues would be the largest source of ongoing revenue to the counties along the route. Local and state governments would continue to collect annual property taxes from the Applicant based on the assessed value of the pipeline easements for the life of the Project. This would result in permanent, major positive impacts on property tax revenues for the counties along the route.

Table 6.5.4-14. Estimated Income Tax Generated from Construction-Related Income for Route Alternative RA-07

County	Miles of Pipeline through County	Estimated Income Tax Generated from Direct and Indirect Construction-Related Income[a] ($2016 millions)
Beltrami	22.9	$6.9
Hubbard	7.9	$2.4
Cass	34.2	$10.2
Itasca	50.3	$15.1
Aitkin	1.1	$0.3
St. Louis	24.7	$7.4
Carlton[b]	24.2	$7.3
TOTAL	**165.3**	**$49.6**

[a] The estimates represent a conservative upper bound on the actual values. The underlying data are based on results from an IMPLAN model that uses national data, rather than data at the state level. The national data inflate the results at a more localized level, compared to a state-level model (see Appendix R).

[b] Carlton County extends to the Wisconsin border; since this is a county-level analysis, it includes data for all of Carlton County.

Route Alternative RA-08

Construction Impacts

Employment and Income

The portion of the RA-08 between Clearbrook and Carlton would require up to 2,400 workers across 4 construction spreads.

As stated in previous sections, it is expected that Enbridge would use some local labor (at least 50% from local union halls) regardless of the route alternative selected. As construction jobs are typically permanent in nature and spatially temporary in the sense that workers move from project to project, permanent jobs may result from said construction (this is also dependent on an unquantifiable backlog of other construction project demand). Based on this assumption, it is likely that direct construction-related employment would have a minor positive impact on county-level unemployment and per capita and/or median household income levels.

Furthermore, it is likely that some of the non-technical work could be accomplished by local labor (e.g., clearing and trenching); hiring of local labor for those positions would have a temporary (over the duration of construction and post-construction restoration activities) and negligible to minor impact on county-level unemployment or per capita and/or median household income levels, depending on the nature of work activities.

Construction workers who re-locate to the Project area would spend a portion of their income on local goods and services such as food, gas, and lodging. These expenditures would increase revenues to those secondary or supporting industries (i.e., industries that indirectly support the construction industry) for the duration of the construction period in the area of the construction spread. This would result in a temporary, minor positive impact on the secondary industries. If businesses in the secondary industries hire additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment and unemployment within each county along the route.

A large portion of the construction-related expenses would be for construction materials, supplies, equipment, parts, and other goods and services such as fuel and hardware. According to the IMPLAN model results, the top industries (as defined in the model) that would be positively affected by construction-related spending are construction services for new, non-residential structures; food services and drinking places; real estate businesses; wholesale trade business (i.e., businesses engaged in wholesaling merchandise like agriculture, and mining); architectural and engineering services; offices of health practitioners; private hospitals; employment services; and financial services (see Appendix R). These expenditures during construction would result in temporary and negligible to minor indirect, positive impacts on those industries, particularly within the counties along the route. The magnitude of the impact on the industries would depend on the size of the industries and the portion of the expenditures that would be spent locally in each county crossed by the route.

If businesses in these industries hire local additional staff to accommodate increased business, there would be a temporary, positive but negligible indirect impact on employment, unemployment, and per capita income at the county level along the route.

Tax Revenues

Construction of RA-08 would generate state and local taxes from a variety of sources. State and county tax revenues would increase due to increased employment payrolls directly associated with construction (i.e., wages paid to construction workers). If the industries indirectly affected by construction hire additional staff to accommodate the increased business as described above, wages paid to those workers would also increase state and county tax revenues. As noted, it was assumed that property taxes would not begin to accrue until the operations phase of the Project; therefore, construction of the pipeline would not affect property taxes at the county level.

As previously discussed, income taxes are generated at the state level and reapportioned to county governments as determined by the state. Table 6.5.4-15 presents the estimated increase in the state income tax that would be appropriated to each county in the ROI based on the portion of total length of the pipeline through each county. Based on the IMPLAN output in Table 6.5.4-15, counties crossed by RA-08 would receive $48.2 million in taxes, and Itasca County would receive the greatest portion of revenue increases from income taxes ($13.9 million) (see Appendix R). This positive impact on income tax revenues to the counties would be temporary and minor to major (i.e., depending on the allocation to each individual county).

Operations Impacts

Employment and Income

The existing operations staff would be able to operate SA-08 and few additional employees would be hired to assist the staff. As a result, operation of the pipeline would have no measureable impact on local employment, per capita household income, median household income, or unemployment in the ROI.

Tax Revenues

Since there would be few additional staff members hired for operation of the Project, there would be very little change in income tax or sales tax revenues due to increased spending by permanent operational staff. Therefore, the impact on income tax and sales tax revenues would be permanent, but at most negligible.

Property tax revenues would be the largest source of ongoing revenue to the counties along the route. Local and state governments would continue to collect annual property taxes from the Applicant based on the assessed value of the pipeline easements for the life of the Project. This would result in permanent, major positive impacts on property tax revenues for the counties along the route.

Table 6.5.4-15. Estimated Income Tax Generated from Construction-Related Income for Route Alternative RA-08

County	Miles of Pipeline through County	Estimated Income Tax Generated from Direct and Indirect Construction-Related Income[a] ($2016 millions)
Beltrami	20.4	$6.1
Hubbard	8.3	$2.5
Cass	34.3	$10.3
Itasca	46.3	$13.9
Aitkin	4.7	$1.4
St. Louis	22.6	$6.8
Carlton[b]	23.9	$7.2
TOTAL	**160.5**	**$48.2**

[a] The estimates represent a conservative upper bound on the actual values. The underlying data are based on results from an IMPLAN model that uses national data, rather than data at the state level. The national data inflate the results at a more localized level, compared to a state-level model (see Appendix R).

[b] Carlton County extends to the Wisconsin border; since this is a county-level analysis, it includes data for all of Carlton County.

6.5.4.4 Summary and Mitigation

6.5.4.4.1 Summary

Potential impacts on employment, income, and tax revenue were assessed for construction and operation of the Applicant's preferred route and route alternatives. These evaluations considered construction-related employment, payroll spending, and expenditures on materials, supplies and equipment; operation-related employment and payroll spending, income tax revenue from workers during construction and operation, and property taxes paid by the Applicant during operation. The ROI for this analysis consists of the counties in Minnesota crossed by the Applicant's preferred route and route alternatives. Table 6.5.4-16 provides a summary list of the potential impacts of construction and operation of the Applicant's preferred route and route alternatives, including the anticipated duration and magnitude of the impacts.

Construction Impacts

Pipeline construction would require a substantial workforce. Based on the assumption that Enbridge would use some local labor (at least 50% from local union halls) regardless of the route alternative selected, it is likely that direct construction-related employment would have a minor positive impact on county-level unemployment and per capita and/or median household income levels.

Furthermore, it is likely that some of the non-technical work could be accomplished by local labor (e.g., clearing and trenching); hiring of local labor for those positions would have a temporary (over the duration of construction and post-construction restoration activities) and negligible to minor impact on county-level unemployment or per capita and/or median household income levels, depending on the nature of work activities.

If the Applicant employs additional local labor during construction, there would be a greater influence on employment, unemployment, and per capita income at the county level that would result in a temporary positive but still minor impact. As construction jobs are typically permanent in nature and temporary in these sense that workers move from project to project, permanent impact may also be realized (this is also dependent on an unquantifiable backlog of other construction project demand).

During construction, there could be an increase in hiring in secondary industries (i.e., the industries that support the construction industry). The impact of that increase in employment would have temporary, negligible impacts on employment and income at the county level. If the Applicant employs some local residents during construction, there would be a greater influence on employment, unemployment, and per capita income at the county level and the temporary, positive impact would be somewhat greater.

Construction-related tax revenues would be largely due to income taxes paid at the state level and apportioned to the counties crossed by the pipeline, as well as sales and use taxes on construction-related goods and services. Tax revenues generated during construction are likely to be temporary and minor to major for all alternatives.

Employment and income effects as well as the impacts on tax revenues during construction would be substantially the same for all of the routes. Differences in impacts would be due to the differences in length of the route options. RA-03AM would have the largest positive impact on the tax revenues during construction, with an estimated $73 million in income tax revenue, because it has the longest route. The Applicant's preferred route and RA-06 are the next longest, followed by RA-07 and RA-08.

Operations Impacts

Operation of the Applicant's preferred route and each of the route alternatives would require a small number of new hires since the new pipeline would be operated primarily by the existing operations staff for the Enbridge Mainline. Therefore, operation would not result in a measureable effect on county-level income and employment levels. In addition, the small number of permanent staff required to operate each pipeline would not be substantial enough to change tax revenues at the county-level. However, property taxes would be substantial and would result in a permanent, major impact on county-level tax revenues. As noted above, the impact on property taxes would differ slightly, with the longest route (RA-03AM) generating higher taxes than the shorter routes.

6.5.4.4.2 Mitigation

The major impacts of the Applicant's preferred route or route alternatives on employment, income, and tax revenue would be associated with beneficial increases in tax revenue for all route options, including temporary increases in local tax during construction and permanent increases in property tax revenue during operation. No other mitigation measures have been identified to address impacts on employment, income, or tax revenues.

Table 6.5.4-16. Summary of Potential County-Level Impacts on Employment, Income, and Tax Revenues for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Construction Impacts					
Employment, unemployment, per capita income, median household income	Temporary and permanent/ negligible to minor impacts • 2,400 workers (combination of local labor utilized per Enbridge commitments, non-local labor) • Increase in income/jobs in secondary industries that support construction	Temporary and permanent/ negligible to minor impacts • 3,000 workers (*combination of local labor utilized per Enbridge commitments, non-local labor* • Increase in income/jobs in secondary industries that support construction	Temporary and permanent/ negligible to minor impacts • 2,400 workers (*combination of local labor utilized per Enbridge commitments, non-local labor*) • Increase in income/jobs in secondary industries that support construction	Temporary and permanent/ negligible to minor impacts • 2,400 workers (*combination of local labor utilized per Enbridge commitments, non-local labor*) • Increase in income/jobs in secondary industries that support construction	Temporary and permanent/ negligible to minor impacts • 2,400 workers (*combination of local labor utilized per Enbridge commitments, non-local labor*) • Increase in income/jobs in secondary industries that support construction
Property tax revenue during construction	No impact	No impact	No impact	No impact	No impact
Income tax revenue during construction	Temporary/minor to major impacts (*depending on the allocation to each individual county*) • $56 million in income tax revenue	Temporary/minor to major impacts (*depending on the allocation to each individual county*) • $73 million in income tax revenue	Temporary/minor to major impacts (*depending on the allocation to each individual county*) • $58 million in income tax revenue	Temporary/minor to major impacts (*depending on the allocation to each individual county*) • $49 million in income tax revenue	Temporary/minor to major impacts (*depending on the allocation to each individual county*) • $48 million in income tax revenue
Operations Impacts					
Employment, unemployment, per capita income, median household income	No impact • Few new staff needed	No impact • Few new staff needed	No impact • Few new staff needed	No impact • Few new staff needed	No impact • Few new staff needed

Table 6.5.4-16. Summary of Potential County-Level Impacts on Employment, Income, and Tax Revenues for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]
Property tax revenue during operations	Permanent/major impacts	Permanent/major impacts • Longest route, greatest property tax revenue	Permanent/major impacts	Permanent/major impacts	Permanent/major impacts • Shortest route, least property tax revenue
Income tax revenue during operations	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts	Permanent/negligible impacts

[a] No single dataset in this summary table provides a complete indication of all relevant impacts to employment, income, and tax revenue. However, together the estimates provide a reasonably comprehensive indication of the potential impacts. For example, while estimates of total employment and income provide an indication of a subset of the socioeconomic effects of the projects, other data points, like the estimated magnitude of property tax revenues can provide an understanding the potential revenue that might be generated at a broader level within a particular county. The appropriate weight to place on any given impact is the subject to debate, even among technical experts, so the weight that the user places on one type of impact or another may legitimately vary based on individual preferences and values.

[b] Quantitative information in this table should be coupled with an understanding of the duration and magnitude descriptions in the table (terms defined in Section 6.1.3) as well as the qualitative descriptions of impacts that are contained in the text in this section on pages 6-801 to 6-813. The table above, for example, describes temporary increases in local workforce and a general assessment of the duration and magnitude of potential impacts; however, a more complete discussion of the qualitative nature of impacts that could occur to is contained in the text of this section (terms defined in Section 6.1.3).

[c] Between Clearbrook and Carlton, the Applicant's preferred route is co-located with other oil pipelines for 66.2 miles, with transmission line infrastructure for 92.0 miles, and with roadways for 2.9 miles of its 220.9-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-801 to 6-804. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[d] Between Clearbrook and Carlton, RA-03AM is co-located with with oil and natural gas pipelines for 223.6 miles, with transmission line infrastructure for 13.8 miles, and roadways for 24.8 miles of its 275.1-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-804 to 6-807. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[e] Between Clearbrook and Carlton, RA-06 is co-located with oil and natural gas pipelines for 40.3 miles of its 196.7-mile length (see Section 6.7). Along these shared corridors, impacts reported in this EIS are the incremental impacts of construction and operation of this route on the resources that currently exist within the ROI along these existing corridors. The nature of these incremental impacts is discussed on pages 6-807 to 6-809. Where corridor paralleling influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

[f] As an in-trench replacement option, RA-07 is co-located with other pipelines in the Enbridge Mainline corridor for its entire length. Construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of removal of existing Line 3 and in-trench replacement on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-809 to 6-811. Where the fact that construction of RA-07 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

Table 6.5.4-16. Summary of Potential County-Level Impacts on Employment, Income, and Tax Revenues for the Applicant's Preferred Route and Route Alternatives between Clearbrook and Carlton[a,b]

Impact	Applicant's Preferred Route[c]	Route Alternative RA-03AM[d]	Route Alternative RA-06[e]	Route Alternative RA-07[f]	Route Alternative RA-08[g]

[g] RA-08 is located adjacent to other pipelines in the Enbridge Mainline corridor for its entire length. Construction and operation of RA-08 would take place within and adjacent to the Enbridge Mainline corridor where existing conditions have been altered by previous projects. Impacts reported in this EIS are the incremental impacts of construction and operation of RA-08 on the resources that currently exist within the ROI along the mainline corridor. The nature of these incremental impacts is discussed on pages 6-811 to 6-813. Where the fact that construction of RA-08 would take place within and adjacent to the Enbridge Mainline corridor and operation activities would occur entirely within the Mainline corridor influences the extent of the incremental impacts, relevant discussion is included in the text of the impacts assessment.

6.5.4.5 References

Minnesota Office of the State Auditor. 2015. http://www.osa.state.mn.us/list.aspx?get=8 Accessed on November 16, 2016.

U.S. Census Bureau. 2014. 2010–2014 American Community Survey. American Fact Finder. https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed on November 11, 2016.

U.S. Bureau of Economic Analysis. 2015. Local Personal Income 2015. http://www.bea.gov/newsreleases/regional/lapi/lapi_newsrelease.htm. Accessed on November 11, 2016.

6.6 COST COMPARISON

Project costs is one of the factors to be considered by the Commission for approval of a pipeline (Minn. R. 7850.4100, Subp. L). Two major categories of cost were considered: construction costs and operations costs; these costs were considered on a comparative basis.

6.6.1 Methodology

To estimate costs, information supplied by Enbridge for the cost of the Applicant's preferred route was used to determine a per-mile cost for the pipeline. The per-mile cost then was applied to the length of each route alternative to derive comparative costs. Cost estimates were prepared for the entire length of each route alternative in Minnesota. Costs also were broken out for the Clearbrook-to-Carlton segment of each route where the route alternative varies from the Applicant's preferred route.

6.6.2 Construction Costs

Construction costs include the costs for acquiring right-of-way easements or land purchase, construction equipment, pipe and associated equipment, pump station equipment, expendable supplies, and labor. Enbridge has reported that construction of the Applicant's preferred route across Minnesota would cost approximately $2.1 billion, or an average of $6.2 million per mile. After subtracting the cost of pump stations, the cost of a pipeline project of a given pipe diameter is highly correlated to the length of the project. Nevertheless, site-specific conditions, such as acquisition of easements, obtaining access, and special construction methods influence actual costs.

The average cost per mile for the Applicant's preferred route was applied to the length of each route alternative to obtain a cost for comparison (see Table 6.6-1). Total costs were calculated for each route alternative over the entire route in Minnesota and for the portion of the route between Clearbrook and Carlton that varied from the Applicant's preferred route. Overall construction costs across Minnesota ranged from $1.8 billion dollars (RA-07 and RA-08) to $2.4 billion dollars (RA-03AM). The significant portion of the cost would be for construction of the route segment between Clearbrook and Carlton, which would total between $1.0 billion (RA-08) and $1.7 billion (RA-03AM).

Table 6.6-1. Estimated Construction Costs for the Applicant's Preferred Route and Route Alternatives

Route	Minnesota Total		Clearbrook-to-Carlton Segment	
	Miles	Cost ($ billions)	Miles	Cost ($ billions)
Applicant's preferred route	339.7	$2.1	220.9	$1.4
Route alternative RA-03AM	394.9	$2.4	275.1	$1.7
Route alternative RA-06	316.6	$2.0	196.7	$1.2
Route alternative RA-07	287.5	$1.8	167.7	$1.0
Route alternative RA-08	284.6	$1.8	164.8	$1.0

Source: Average cost per mile for the Applicant's preferred route (Enbridge 2016).

6.6.3 Operations Costs

An estimate of operations costs was not available for the Minnesota portion of the proposed Project, as Enbridge would operate the Line 3 Project as part of its proprietary Mainline system. However, pumping costs (energy) is a major factor in the cost of operating the proposed Project in Minnesota. Like construction costs, pumping costs are related to pipeline length. Other length-related costs are surveillance and maintenance of the permanent right-of-way. Enbridge has indicated that energy use for the Applicant's preferred route would total over 533 million kilowatt-hours per year. Based on the average energy use per mile and the estimated cost of energy per kilowatt, the energy cost of operation was estimated for each route alternative (see Table 6.6-2). The annual energy costs for RA-03AM would be approximately 116 percent higher than for the Applicant's preferred route for the entire route in Minnesota. Energy costs for RA-06, RA-07, and RA-08 would be from 84 to 93 percent of the energy costs for the Applicant's preferred route in Minnesota. For the portion of the route between Clearbrook and Carlton that contains the route alternatives, energy costs for RA-03AM would be approximately 124 percent of the costs for the Applicant's preferred route; costs for RA-06, RA-07, and RA-08 would range from 75 to 88 percent of the costs for the Applicant's preferred route (Table 6.6-2).

Table 6.6-2. Estimated Annual Energy Costs during Operation for the Applicant's Preferred Route and Route Alternatives

	Minnesota Total		Clearbrook-to-Carlton Segment	
Route	Miles	Cost ($ millions)	Miles	Cost ($ millions)
Applicant's preferred route	339.7	$47.1	220.9	$30.7
Route alternative RA-03AM	394.9	$54.8	275.1	$38.2
Route alternative RA-06	316.6	$43.9	196.7	$27.3
Route alternative RA-07	287.5	$39.9	167.7	$23.3
Route alternative RA-08	284.6	$39.5	164.8	$22.9

Sources: Average cost per mile for Applicant's preferred route based on energy use provided by Enbridge (2016) and the average commercial energy cost in Minnesota in 2016 of 8.84 cents per kilowatt-hour (Electricity Local 2016).

6.6.4 References

Electricity Local. 2016. Minnesota Electricity Rates & Consumption. Electricitylocal.com/states/Minnesota. Accessed on December 19, 2016.

Enbridge Energy, Limited Partnership (Enbridge). 2016. Environmental Assessment Worksheet (EAW). November. Response to Data Request 01 to provide additional details for the EAW filed by Enbridge in April 2015.

6.7 RIGHT-OF-WAY SHARING OR PARALLELING

The Commission considers the extent of right-of-way sharing or right-of-way paralleling in its review of pipeline routes (Minn. R. 7850.4200, Subp. H and J). Right-of-way sharing or paralleling is a desirable land use policy because it concentrates the effects of linear infrastructure within corridors. Both right-of-way sharing and right-of-way paralleling avoid creating new corridors and habitat fragmentation, and can reduce the extent of new disturbance of vegetation and surface soils during construction compared to the creation of new corridors. Right-of-way sharing typically further reduces the extent of disturbance to vegetation and surface soils because of the overlap of the two standard rights-of-way widths.

The types of existing linear infrastructure in the shared or paralleled corridor also can influence the allowable proximity of adjacent infrastructure. For example, new oil pipelines may be co-located closer to an existing crude oil or refined products pipeline than to a highway or high-voltage transmission line, especially when the pipelines are owned by the same company, out of consideration for constructability, safety, and easement rights.

6.7.1 Regulatory Context and Methodology

6.7.1.1 Regulatory Context

Right-of-way sharing occurs when the permanent right-of-way of new linear infrastructure overlaps with the permanent right-of-way of existing infrastructure. For example, Enbridge's existing Mainline system in Minnesota contains six adjacent pipelines spaced approximately 10 to 15 feet from each other within a permanent right-of-way. Right-of-way paralleling occurs when the right-of-way of a new linear infrastructure is located adjacent to the permanent right-of-way of another linear infrastructure system but does not overlap. For example, two pipelines with 50-foot permanent rights-of-way (25 feet on either side of each pipe) would result in the two pipelines being 50 feet apart. Although no state-level regulations currently require right-of-way sharing or paralleling, the practice of resource management agencies is to encourage right-of-way sharing or paralleling.

6.7.1.2 Methodology

To assess right-of-way sharing or paralleling, the permanent rights-of-way for the Applicant's preferred route and each of the route alternatives were overlain on maps of existing infrastructure corridors using GIS to determine the portions of each route that would share, parallel, or be located independently of existing oil and gas pipelines, electric transmission lines, railroads, and highways.

6.7.2 Co-Location of Applicant's Preferred Route and Route Alternatives

Between Clearbrook and Carlton, the Applicant's preferred route and most of the route alternatives would share or parallel existing rights-of-way for the majority of their length (see Table 6.7-1). RA-07 would parallel the right-of-way with the Enbridge Mainline system from the North Dakota border to the Wisconsin border and share the right-of-way from Clearbrook to Carlton. RA-08 would share or parallel rights-of-way with existing pipelines for its entire length. The Applicant's preferred route would share or parallel existing rights-of-way along 73 percent of its length between Clearbrook and Carlton. RA-06 has the lowest proportion of its route co-located with existing rights-of-way between Clearbrook and Carlton (20 percent).

Table 6.7-1. Extent of Co-Location for the Applicant's Preferred Route and Route Alternatives

Segment	Total Length (miles)	New Right-of-Way (miles)	Type of Existing Infrastructure (miles)[a]			Percent of Co-Location
			Oil and gas pipeline	Transmission /utility lines	Road	
North Dakota Border to Clearbrook						
Applicant's preferred route	109.3	0	109.3	0	0	100
Clearbrook to Carlton						
Applicant's preferred route	220.9	59.8	66.2	92.0	2.9	73
Route alternative RA-03AM	275.1	12.9	223.6	13.8	24.8	95
Route alternative RA-06	196.7	156.5	40.3	0	0	20
Route alternative RA-07	167.7	0	167.7	0	0	100
Route alternative RA-08	164.8	0	164.8	0	0	100
Carlton to Wisconsin Border						
Applicant's preferred route	9.6	0	9.6	0	0	100

[a] Total miles co-located may be greater than total length due to areas where segment is shared with multiple types of existing infrastructure.

6.8 REGULATORY CONTROL

A wide variety of state and federal permits and approvals are required initially for approval of the Project and subsequently for various elements of Project construction and operation. The primary state regulations and associated major permits are described in Chapter 3. Resource-specific regulations and permits are discussed in the "Regulatory Context and Methodology" sub-sections found for each of the resources in Chapters 5 and 6.

Not all regulations require a permit or jurisdictional approval. Those that do are listed in Table 6.8-1, along with the government agency that issues approval, the type of application, the application status, and the general purpose for the permit.

Minnesota Statutes § 216G.02 Subdivision 3, Subpart (b)(4) states that the Commission must give "consideration of local government land use laws," including pipeline setback ordinances. Subdivision 4 also states that, while the statute requires consideration of the local laws, the pipeline permit supersedes those laws. Subdivision 4 stipulates that issuance of a pipeline routing permit "is the only site approval required" and that "the pipeline routing permit supersedes and preempts all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local, and special purpose governments." Because of this pre-emption, all local permits—and in particular, local land use/zoning permits—are not included in Table 6.8-1.

Table 6.8-1. Status of Required Permits and Approvals

Unit of Government	Type of Application	Status		Reason Required
		Applicant's Preferred Route	Route Alternatives	
U.S. Army Corps of Engineers – St. Paul District and Minnesota Pollution Control Agency (Minnesota PCA)	Section 10/404 Individual Permit and associated state 401 Individual Water Quality Certification	Application submitted and determined complete (January 28, 2016) - pending submittal of revised application	Not initiated	Authorizes discharge of dredged and fill material into waters of the United States, including wetlands, and crossing of navigable waters of the United States
U.S. Army Corps of Engineers – St. Paul District: Consent and Permission to Cross Flowage Easement and USACE Civil Works project, if needed.	33 USC 408	Not initiated	Not initiated	

Table 6.8-1. Status of Required Permits and Approvals

Unit of Government	Type of Application	Status		Reason Required
		Applicant's Preferred Route	Route Alternatives	
U.S. Fish & Wildlife Service	Section 7 Endangered Species Act (ESA) consultation (federally endangered species)	Consultation ongoing	Not initiated	Establishes conservation measures and authorizes, as needed, take of federally protected species
	Bald Eagle Nest Removal Permit	Pending submittal	Not initiated	Allows for removal of a known bald eagle nest in proximity to construction activities
U.S. Department of the Interior, Bureau of Indian Affairs	25 Code of Federal Regulations (CFR) Section 169	Not applicable	Applicable, but not initiated	Considers issuing a right-of-way grant (easement) across tribal land.
U.S. Department of Agriculture, U.S. Forest Service, Chippewa National Forest (CNF)	39 CFR Section 219; 16 U.S. Code 1601–1604	Not applicable	Applicable, but not initiated	Reviews the Project for consistency with CNF Land and Resource Management Plan; considers issuance of special use permit; Section 7 ESA and Section 106 National Historic Preservation Act (NHPA) consultations
Advisory Council on Historic Preservation	Section 106 of the NHPA	Not applicable	Applicable, but not initiated	Reviews and comments on the effects of the Project on historic properties
Leech Lake Band of Ojibwe	Section 7 of the ESA	Not applicable	Applicable, but not initiated	Coordinates in preparation of Biological Assessment /Biological Evaluation
	Section 106 of the NHPA	Not applicable	Applicable, but not initiated	Reviews and comments on the effects of the Project on historic properties and properties of religious and cultural importance
	Leech Lake Land Use Plan	Not applicable	Applicable, but not initiated	Considers issuance of land use permit
	Leech Lake Open Burning, Burn Barrel, and Fire Prevention Ordinance	Not applicable	Applicable, but not initiated	Considers need for burning permit

Table 6.8-1. Status of Required Permits and Approvals

Unit of Government	Type of Application	Status		Reason Required
		Applicant's Preferred Route	Route Alternatives	
Fond du Lac Band of Lake Superior Chippewa (FDL)	Section 106 of the NHPA	Not applicable	Applicable, but not initiated	Reviews and comments on the effects of the Project on historic properties and properties of religious and cultural importance
	FDL Wetlands Protection and Management Ordinance 03/06	Not applicable	Applicable, but not initiated	Reviews and considers applications for Wetland Activity Permits
	Section 401 of the Clean Water Act, FDL Water Quality Certification Standards, Ordinance 01/06	Not applicable	Applicable, but not initiated	Considers issuing 401 Water Quality Certificate and Tribal Water Quality Certification for areas within the FDL Reservation
	Special Use and Shoreland Use under FDL Land Use Ordinance 02/07	Not applicable	Applicable, but not initiated	Reviews and considers applications for Conditional Use Permits
	FDL Open Burning Restrictions and Permitting Requirements Ordinance 5/93	Not applicable	Applicable, but not initiated	Reviews and considers applications for burning permits, if appropriate
	FDL Ordinance 5/84 and Secretarial Order 3215.	Not applicable	Applicable, but not initiated	Considers issuance of a Timber Cutting Permit based on results of timber surveys
Minnesota Public Utilities Commission	Certificate of Need	Application submitted	Not initiated	Determines the need for the pipeline, including questions of size, type, and timing
	Route permit	Application submitted	Not initiated	Authorizes construction of the pipeline along a specific route, subject to certain conditions

Table 6.8-1. Status of Required Permits and Approvals

Unit of Government	Type of Application	Status		Reason Required
		Applicant's Preferred Route	Route Alternatives	
Minnesota DNR	License to Cross Public Waters	Application submitted	Not initiated	50-year license that allows a proposed utility to cross public waters
	License to Cross Public Lands	Application submitted	Not initiated	50-year license that allows a proposed utility to cross public lands
	Long-term Lease – Access Roads	Pending submittal	Not initiated	Authorizes use of access roads managed by Minnesota DNR during construction and operation
	Water Appropriation Permit – Pipeline and Facilities	Pending submittal	Not initiated	Authorizes withdrawal and use of water from surface water or groundwater sources
	State Endangered Species Permit and Avoidance Plan	Pending submittal	Not initiated	Outlines plans for avoidance, minimization, and mitigation of take of state-listed species
	Osprey Nest Disturbance Authorization	Pending submittal	Not initiated	Allows removal of a known osprey nest
	Eagle Nest Removal Permit	Pending submittal	Not initiated	Allows removal of a known eagle nest
	Gully 30 Fen Management Plan	Pending submittal	Not initiated	Authorizes construction across the Gully 30 fen
Minnesota PCA	Clearbrook Terminal Air Quality Permit – Synthetic –Minor Individual State Operating Permit	Pending submittal	Not initiated	Authorizes construction and operation at the modified Clearbrook terminal
	Any aboveground overpressure relief storage tanks (ASTs) (usually 100,000- to 200,00-gallon capacity) will need to meet applicable standards	Pending submittal	Not initiated	All ASTs must meet American Petroleum Institute Standards 620, 650, 651, and 653.
	Clean Water Act Section 401 Certification	Pending submittal	Not initiated	Section 401 of the Clean Water Act requires this certification for a federal license or permit (in this case, a Section 404 wetland permit) to conduct an activity that may result in a discharge of a pollutant into waters of the United States.

Table 6.8-1. Status of Required Permits and Approvals

Unit of Government	Type of Application	Status: Applicant's Preferred Route	Status: Route Alternatives	Reason Required
	National Pollutant Discharge Elimination System (NPDES) Individual Construction Stormwater, Hydrostatic Test, and Trench Dewatering Permit – Pipeline Construction	Pending submittal	Not initiated	Authorizes ground disturbance with approved protection measures to manage soil erosion and stormwater discharge on a construction site, discharge of water from hydrotesting activities, and removal of water that may accumulate in the pipeline trench
	NPDES General Construction Stormwater Coverage – Facilities	Pending submittal	Not initiated	Authorizes ground disturbance with approved protection measures to manage soil erosion and stormwater discharge on a construction site
	NPDES General Construction Stormwater Coverage – Pipeyards and Contractor Yards	Pipe yard permits received and stormwater monitoring ongoing	Not initiated	Authorizes ground disturbance with approved protection measures to manage soil erosion and stormwater discharge on a construction site
Minnesota State Historic Preservation Office	Cultural Resources consultation, NHPA Section 106 clearance	Consultation ongoing	Not initiated	Ensures adequate consideration of impacts on significant cultural resources
Minnesota Department of Agriculture	Agricultural Protection Plan	Consultation initiated	Not initiated	Establishes measures for agricultural protection
Minnesota Department of Transportation	Road crossing permits	Pending submittal	Not initiated	Authorizes crossings of state jurisdictional roadways
	Temporary access/entrance permits	Pending submittal	Not initiated	Authorizes access to private lands during construction from state highway right-of-way
Minnesota Department of Health and Wrenshall and Sundsrud Court drinking water supply management areas	Drinking Water Supply Management Area/Wellhead Protection Area consultation	Consultation only (in progress)	Not initiated	Ensures that pipeline construction and operation are compatible with goals of relevant plans
Mississippi Headwaters Board	Local land use review	Consultation only (in progress)	Not initiated	Ensures compatibility with land use plan
Red Lake, Wild Rice, Two Rivers, and Middle-Snake watershed districts	Watershed District Permit	Pending submittal	Not initiated	Authorizes crossing of legal drains and ditches within watershed

Table 6.8-1. Status of Required Permits and Approvals

Unit of Government	Type of Application	Status: Applicant's Preferred Route	Status: Route Alternatives	Reason Required
Minnesota Board of Water and Soil Resources/ Wetland Conservation Act Local Governmental Units	Notice of Intent to Utilize Federal Approvals for Utilities Project Exemption	Notice submitted	Not initiated	Notice of use of exemption required
Local/County	Permits pertaining to off-right-of-way yard use	Pending submittal	Not initiated	Ensures compatibility with relevant land use plans
	Road crossing permits	Pending submittal	Not initiated	Authorizes crossing of local and county jurisdictional roadways
	Construction haul road agreements	Pending submittal	Not initiated	Authorizes use of local and county roads to haul oversized loads
	Temporary access/entrance permits	Pending submittal	Not initiated	Authorizes access to private lands from local and county road rights-of-way
	Short- to long-term leases – access roads	Pending submittal	Not initiated	Authorizes use of temporary roads on locally and county-owned lands