Figure 6-20: **God's Lake First** Nation and Narrows Northern Affairs Community businesses, services, infrastructure and utilities

Table 6.32: **Select Local Businesses in God's Lake First Nation**

Business Type	Business
Food, Lodging, Construction, Communications and Transportation	▪ Mantosakahigan (God's Lake Narrows Restaurant)
Retail and other	▪ Smoke Shop

6.1.9.1.3.4 Infrastructure, Utilities and Services

The community of God's Lake First Nation predominately has modern water and wastewater services. Drinking water is sourced from God's Lake and is treated at a community water treatment plant and piped to 193 houses, the remaining residences have no water service and rely on water tanks supplied via water truck. Sewage is generally piped from houses and community buildings or stored in septic tanks to be trucked to the community's wastewater treatment plant. Approximately 159 residences in the community use septic tanks. The other infrastructure and utilities in God's Lake First Nation are summarized in **Table 6.33** and shown in **Figure 6-20.**

Table 6.33: Overview of Infrastructure and Utilities **– God's Lake First Nation**

Infrastructure and Utilities	
Water	Water is obtained from God's Lake, then treated and distributed via watermains to 193 houses; the remaining houses have water tanks that are serviced by a water truck.
Sewer	The community has a sewage treatment plant connected to approximately 159 houses and public facilities; approximately 119 houses utilize septic tanks.
Waste Management	One landfill site located west of the community.
Roads	No permanent access route to the community; access is provided by winter road; the community has a small network of internal gravel roads.
Electricity	Manitoba Hydro – 138 kV transmission line from Oxford House.
Telephone/Internet	MTS – Landline with internet by satellite as there is no cellular service.

The God's Lake First Nation provides education for students up to Grade 9. A nursing station provides health care services to the community. A new school (Kindergarten to Grade 12) and nursing station are under construction in the community. Police services are provided by the RCMP detachment stationed in God's Lake Narrows Northern Affairs Community. Recreational amenities in God's Lake First Nation include a youth centre. Fire protection is provided via a fire truck. These local services are summarized in **Table 6.34**.

Table 6.34: Summary of Services in **God's Lake First** Nation

Services	
Postal Service	▪ Mail service is provided by air on weekdays.
Recreation	▪ Facilities include a youth centre and an arena.
Health Care	▪ God's Lake Health Centre. ▪ A new nursing station is being constructed in the community.
Education	▪ God's Lake Narrows First Nation School (up to Grade 9). ▪ A new school (Kindergarten to Grade 12) is being constructed in the community
Government	▪ God's Lake First Nation Band Office.
Police	▪ RCMP detachment based in God's Lake Narrows Northern Affairs Community.
Fire	▪ The First Nation has a Fire Hall and fire truck.

6.1.9.1.3.5 Transportation

Roads

God's Lake First Nation has no year round road access to a service centre. The majority of goods are delivered to the community via the winter road network that is operational for approximately two months each year. The network of gravel roads in the communities are maintained locally.

Airport

God's Lake First Nation is serviced by a regional airport (shared with God's Lake Narrows Northern Affairs Community) with a 1,044 m gravel runway. The airport is operated by the Northern Airports & Marine Operations Division of MI. Aircraft movements (number of planes) for the 2015/2016 period were 2,846 and passenger traffic (number of people) for the same period was 17,122 (Manitoba Infrastructure 2017a). Scheduled service to the community is provided by Perimeter Airlines.

6.1.9.1.3.6 Resource Use

Indigenous people from God's Lake First Nation use the Indigenous LAA and RAA for traditional activities including fishing, hunting, trapping, camping, harvesting plants and berries, recreation activities and sacred/ceremonial use. During the TK workshops and interviews, members indicated that traditional activities and the environment that supports those activities are important to members. Traditional activities provide a connection to the past, reinforce social connections among community members and are central to maintaining culturally appropriate relationships with the land. Some traditional activities that are currently practiced, primarily by elders, include beading, leatherwork and smoking meat and hides. Activities such as trapping, hunting and fishing continue to be passed on and are widely practiced by younger generations (HTFC Planning & Design 2017b). Traditional activities occur on God's Lake and lakes and waterbodies close to the community. Locations of areas where traditional activities are conducted which were identified in the TK report cannot be reported publicly.

Travel routes in the Indigenous RAA are important to God's Lake First Nation as they provide seasonal access for traditional activities of cultural importance including hunting, trapping, fishing and gathering.

Travel routes in the Indigenous LAA and RAA include walking, ATV and snowmobile trails, as well as open-water and frozen waterways. The majority of travel routes documented through the TK study were associated with the major waterways in including God's Lake. The winter roads operated by the Province of Manitoba also provide an important travel route. Members indicated that canoeing, walking, snowmobiling and dogsled were the traditional methods of travel. Currently, the most common methods of travel are by boat and snowmobile. Travel by boat occurs on God's Lake to access fishing, hunting and trapping areas.

Community members identified a number of sites important to the community. These include beaches, youth camps, family gathering sites, a sweat lodge and a retreat area. Historic sites of cultural importance include the Hudson's Bay Company Trading Post, the old settlement site and the site where Treaty 5 was signed.

During the TK interviews, members described traveling and staying overnight on the traditional lands surrounding God's Lake First Nation. In addition, there are tenting sites in many locations around God's Lake. Members also indicated that they often set up tents at their current trapping location, which varies depending on the time of year and decisions made while trapping. Hence, these locations change. Cabins are common in the area and are used for fishing, hunting and trapping and are sometimes shared by families and trappers. Cabin types include family cabins, lodges, fishing lodges, hunting lodges, trapper's cabins and youth camps. Cabins are often built by families in their trapping or hunting area and are open for use by other families and trappers. Cabin and tenting sites are in the vicinity of God's Lake and waterways in the Indigenous LAA.

Members of God's Lake First Nation indicated that moose hunting is common around God's Lake and is often done in the fall, but that moose is also hunted opportunistically at other times of the year. Moose hunting also occurs to the northwest, southeast and east of the community. Moose is a valuable food source and its meat is often shared with other members, making moose hunting a valuable social/cultural practice. Moose hunting also provides a significant dietary component for members. Moose hunting is often done by boat around the shorelines of water so that the moose can be transported back to the community. Sometimes, hunters will fly in to moose hunting areas near more remote lakes. Caribou is not commonly hunted or consumed by community members.

Many workshop and interview participants noted that the entire God's Lake is used for fishing throughout the entire year. Fishing is an important activity for harvesting food and fish represents a main dietary component of God's Lake First Nation members. Sharing catch is common in God's Lake. Fishing serves a social and cultural function by bringing families and friends together, connecting community members to the land and providing an opportunity for passing on knowledge. The species identified for fishing and fishing guiding were brook trout, northern pike, lake trout, sturgeon, walleye and whitefish. The fish most commonly caught for consumption are northern pike, walleye and whitefish. Members conduct fishing guiding through lodges in the area.

Trapping is practiced by God's Lake First Nation members and is valued as a source of income and a connection to traditional practices. God's Lake First Nation shares a RTL section with Manto Sipi Cree Nation. Trappers from the community trapped on registered traplines 1, 2, 3, 4, 6, 10, 27 44, 48 and 49. Trapline 44 is a community trapline which is used by elders and others. Members indicated that beaver, fisher, fox, lynx, marten, mink, muskrat, otter, wolf and wolverine are trapped. Trapping primarily occurs in the winter and spring and coincides with other activities such as fishing, hunting and plant harvesting, so many of the trapline areas are also common areas for these other activities. Traplines within the God's Lake RTL District that are at least partially located within the Indigenous LAA are 4 to 12 and 44 (**Figure 6-17**).

Waterfowl hunting occurs on lakes and rivers in the God's Lake area. Waterfowl and game birds are an important food source to community members. Hunted species include ducks, geese, grouse, ptarmigan, spruce grouse, merganser, black ducks (scoter) and fall ducks (ring necked ducks). During the TK interviews, members indicated that they hunt small game such as rabbits, squirrels, muskrat and beaver both for food or domestic use of fur.

Berry picking is an important traditional activity for God's Lake Nation members. Some members continue to harvest berries in the summer and fall. Berries picked include blackberries, blueberries, cherries, cranberries, gooseberries, muskeg berries, raspberries, strawberries, cloudberries and swamp gooseberries. In terms of medicinal plants, members indicated that juniper, Labrador tea, pinecones, root (not specified), water calla, water lily, weekays (sweet flag) and willow tree are harvested in the spring and summer for medicinal purposes. Harvesting of plants occurs in the vicinity of God's Lake and the community, as well as along the winter road. Members indicated in the TK workshop that firewood is harvested in many locations in the Indigenous RAA.

Through the TK study, God's Lake First Nation members indicated that they place great value on traditional activities and the environment that supports those activities. Traditional activities represent a connection to the past, reinforce social connections and are key to maintaining the community's cultural relationships with the land (HTFC Planning & Design 2017b).

6.1.9.1.4 God's Lake Narrows Northern Affairs Community

God's Lake Narrows Northern Affairs Community is located along the lakeshore of the narrow portion of God's Lake, in the southern part of the Indigenous LAA (**Figure 6-17**). The community became a Northern Affairs Community in June 1976 and is governed by a Mayor and Council under *The Northern Affairs Act* (Indigenous and Northern Relations 2016). God's Lake Northern Affairs Community is located adjacent to God's Lake First Nation.

God's Lake Narrows Northern Affairs Community is located approximately 224 km (by air) southeast of Thompson and 547 km (by air) northeast of Winnipeg. The community is currently serviced by a winter road extending from PTH 6 and PR 373. The community is also serviced by a regional airport with a 1,044 m runway. A 138 kV transmission line from Oxford House to God's Lake provides power to the community.

6.1.9.1.4.1 Demographics

Demographic data is available for the God's Lake Narrows Affairs Community, but data on other socio-economic indicators (ex. education, income) is not available from Statistics Canada (ex: it has been suppressed because of the small size of the community).

God's Lake Narrows Northern Affairs Community's total population in 2016 was 89 (Statistics Canada 2017c). The population has decreased overall by 20.5% from 1985 to 2016 (**Table 6.35**) (Statistics Canada 2017c; Indigenous and Northern Relations 2016). However, the community population increased by 4.7% between 2011 and 2016, comparable to the population growth of 5.8% in the Province of Manitoba over the same period.

Table 6.35: **God's Lake Narrows Northern Affairs Community Population, 1985 to 2016**

Year	Population
2016	89
2011	85
2006	88
2001	113
1996	101
1991	105
1985	112

Source: 2011 and 2016 data from Statistics Canada 2017c; 1985 to 2006 data from Indigenous and Northern Relations 2016

The total population median age in God's Lake Narrows Northern Affairs Community in 2016 was 34.1 years (**Table 6.36**). This is younger than the provincial total median age of 37.9 years. In 2016, there were approximately 11% of residents in the community over the age of 65, comparable to approximately 13% for the Province of Manitoba. There were slightly more males than females in God's Lake Narrows Northern Affairs Community, while the opposite was true for the province as a whole. In 2016, the average household size for the community was 2.4 persons compared to 2.5 persons for the Province of Manitoba (Statistics Canada 2017c).

Table 6.36: Population Demographics for **God's Lake Narrows Northern Affairs** Community, 2016

Age Characteristics	Population		
	Total	Male	Female
Total All Persons	90	45	40
Age 0 to 19	30	25	15
Age 20 to 64	50	15	20
Age 65 and over	10	0	5
Average Age	34.1 years	30.8 years	37.8 years

Note: Data in the table is randomly rounded (either up or down) to a multiple of 5 and in some cases 10. This provides protection against direct residual or negative disclosure of individuals without adding significant error to the census data. Minor differences will occur in totals and cell values among census tabulations.

Source: Statistics Canada 2017c

6.1.9.1.4.2 Economy

The economy of God's Lake Narrows Northern Affairs Community includes a mix of wage, cash and traditional economic activities. The wage economy is largely derived from public sector employment including health care and education. The cash economy accounts for the delivery of goods and services outside of registered businesses or companies. The traditional economy includes subsistence activities such as non-commercial hunting, gathering and fishing, as well as other resource-based activities. Local businesses established in God's Lake Narrows Northern Affairs Community are listed in **Table 6.37**. The locations of a number of these businesses are shown in **Figure 6-20**.

Table 6.37: **Select Local Businesses in God's Lake Narrows Northern Affairs** Community

Business Type	Business
Food, Lodging, Construction, Communications and Transportation	▪ Healy's God's Lake Narrows Lodge
Retail and other	▪ The Northern Store

6.1.9.1.4.3 Infrastructure, Utilities and Services

The God's Lake Narrows Northern Affairs Community has modern water and wastewater services. Drinking water is sourced from God's Lake, treated at a community water treatment plant and distributed through a piped water system. Sewage is piped to a community waste water treatment plant. The other infrastructure and utilities in Manto Sipi Cree Nation are summarized in **Table 6.38** and shown in **Figure 6-20.**

Table 6.38: Overview of Infrastructure and Utilities – God's Lake Narrows Northern Affairs Community

Infrastructure and Utilities	
Water	Water is obtained from God's Lake, filtered and chlorinated and distributed by a piped system.
Sewer	Sewage collection is piped and pumped to a wastewater treatment plant.
Waste Management	Garbage pick-up is provided three times a week and disposed of in the solid waste disposal site near the community (God's Lake First Nation).
Roads	No permanent access route to the community; access is provided by winter road; the community has a small network of internal gravel roads.
Electricity	Manitoba Hydro – 138 kV transmission line from Oxford House.
Telephone/Internet	MTS – Landline with internet by satellite as there is no cellular service.

Source: Indigenous and Northern Relations 2016

The Ministic School provides education to the community for students up to Grade 9, while a nursing station provides health care services. The nearest hospitals are in Norway House Cree Nation and the City of Thompson. The RCMP operates a detachment at God's Lake Narrows Northern Affairs Community. Recreational amenities include a community hall and an arena. Fire protection is provided via a tanker truck. These local services are summarized in **Table 6.39**.

Table 6.39: Summary of Services in **God's Lake Narrows Northern Affairs Community**

Services	
Postal Service	▪ Mail service is provided by air on weekdays.
Recreation	▪ Facilities include a community hall and the God's Lake First Nation arena
Health Care	▪ God's Lake Narrows Nursing Station. ▪ God' Lake Narrows Personal Care Home.
Education	▪ Ministic School (Frontier School Division, Nursery to Grade 9).
Government	▪ God's Lake Narrows Northern Affairs Administration office.
Police	▪ Police response is from the Gods Lake Narrows detachment, RCMP.
Fire	▪ The community has a tanker truck for fire protection.

Source: Indigenous and Northern Relations 2016

6.1.9.1.4.4 Transportation

Roads

God's Lake Narrows Northern Affairs Community has no year-round road access to a service centre. The majority of goods are delivered to the community via the winter road network that is operational for approximately two months each year. The network of gravel roads in the communities are maintained locally.

Airport

God's Lake Narrows Northern Affairs Community is serviced by a regional airport (shared with God's Lake First Nation) with 1,044 m gravel runway. The airport is operated by the Northern Airports & Marine Operations Division of MI. Aircraft movements (number of planes) for the 2015/2016 period were 2,846 and passenger traffic (number of people) for the same period was 17,122 (Manitoba Infrastructure 2017a). Scheduled service to the community is provided by Perimeter Airlines.

6.1.9.1.4.5 Resource Use

Indigenous people from God's Lake Narrows Northern Affairs Community use the Indigenous LAA and RAA for traditional activities. During the TK workshop and interviews, participants noted that they actively partake in hunting, fishing, trapping, berry picking and medicinal plant harvesting (HTFC Planning & Design 2017c). Locations of areas where traditional activities were and are being conducted which were identified in the TK report cannot be reported publicly.

Travel routes in the Indigenous RAA are important to God's Lake Narrows Northern Affairs Community as they provide seasonal access for traditional activities of cultural importance including hunting, trapping, fishing and gathering. Travel routes include walking, ATV and snowmobile trails, frozen waterways and boats on open-water. The winter roads operated by the Province of Manitoba also provide an important travel route.

Trapping is practiced by people from God's Lake Narrows Northern Affairs Community and is valued as a source of income and a connection to traditional practices. People from the community trap on registered traplines 2, 4, 7, 8, 9, 44, 45 and 47 (within the God's Lake RTL District). Trapline 44 is a community trapline and is also used by members of Manto Sipi Cree Nation and God's Lake First Nation. Trapline 44 is important for elders and youth because of its proximity to God's Lake Narrows. Traplines within the God's Lake RTL District that are at least partially located within the Indigenous LAA are 4 to 12 and 44 (**Figure 6-17**).

Animals commonly trapped in the area include mink, otter, beaver and marten. Wolverines are sometimes trapped but they are more difficult to trap. Marten are currently the most commonly trapped animal due to the price of their fur. Community members have indicated that most trapping is done on day trips from the community. Historically, trappers would have stayed in cabins on their traplines through most of the trapping season. Because most trapping takes place during the winter months, snowmobiles are the most common method of transportation that trappers use to access their traplines.

Fishing is an important activity for many people in God's Lake Narrows Northern Affairs Community. According to the TK study, fish species most commonly caught for consumption in the community are walleye, northern pike, lake trout and whitefish. God's Lake and other lakes in the Indigenous RAA are important for fishing.

Moose and waterfowl (duck and goose) hunting are common activities for God's Lake Narrows community members. Moose hunting mainly occurs in fall, while waterfowl hunting takes place in the spring. The TK study indicated that these activities are currently conducted now for food. Moose hunting occurs around God's Lake and primarily outside of the Indigenous LAA. Caribou is not actively hunted by community members.

The TK study indicated that a number of wild food plants (especially berries) were harvested in the area, including blueberries, cranberries and saskatoons. God's Lake Narrows community members still have knowledge of medicinal plants and their harvesting locations. Labrador tea is harvested near the community. Other traditional uses of medicinal plants include using sap from poplar trees to heal open wounds. Weekays (sweet flag) is harvested from marshy areas and is used to treat all types of ailments. Areas around God's Lake and close to the community are important for plant harvesting.

6.1.9.2 Overview of Other Communities in Proximity to the Indigenous RAA

Norway House Cree Nation, Cross Lake Band of Indians/Pimicikamak Okimawin, Garden Hill First Nation, Red Sucker Lake First Nation, St. Theresa Point First Nation and Wasagamack First Nation are located outside of the Indigenous RAA but are in situated north-eastern Manitoba. None of these communities have Reserve Lands or TLEs in the Indigenous RAA and conversely the Indigenous RAA is not within the RTL Districts of these communities (**Figure 6-21**). RTLs provide an indication of regions of significant resource use for a particular community as of the date when they were established in the 1940s. When an RTL District was created by the Chief and Council of the First Nations and their trappers, it usually also represented the traditional lands used by a community and defined those boundaries legally for the first time (Manitoba Sustainable Development 2017c). Garden Hill, Wasagamack, St. Theresa Point and Red Sucker Lake comprised one First Nation until 1969 (Four Arrows Regional Health Authority Inc. 2017) and therefore they all share the Island Lake RTL District.

While these communities and their resource use areas are located outside of the Indigenous RAA, in accordance with the Guidelines for the Preparation of an Environmental Impact Statement pursuant to the *Canadian Environmental Assessment Act*, 2012 (Canadian Environmental Assessment Agency 2017a) an overview of these communities, as well as the Manitoba Metis Federation (MMF), is provided in the following sections.

6.1.9.2.1 Norway House Cree Nation

Norway House Cree Nation (No. 278) is located at Playgreen Lake along the Nelson River approximately 450 km by air north of Winnipeg and approximately 190 km by air south of Thompson. The First Nation signed Treaty 5 in 1875 at Norway House. The community has all weather road access from PR 373, but a cable ferry connects the mainland to the community across a channel of the Nelson River just north of the community. The ferry operates during open water season and an ice road is built for winter service. PR 373 leads north from Norway House past PR 374 (which provides access to Cross Lake) and joins PTH 6. In addition, the community has an airport.

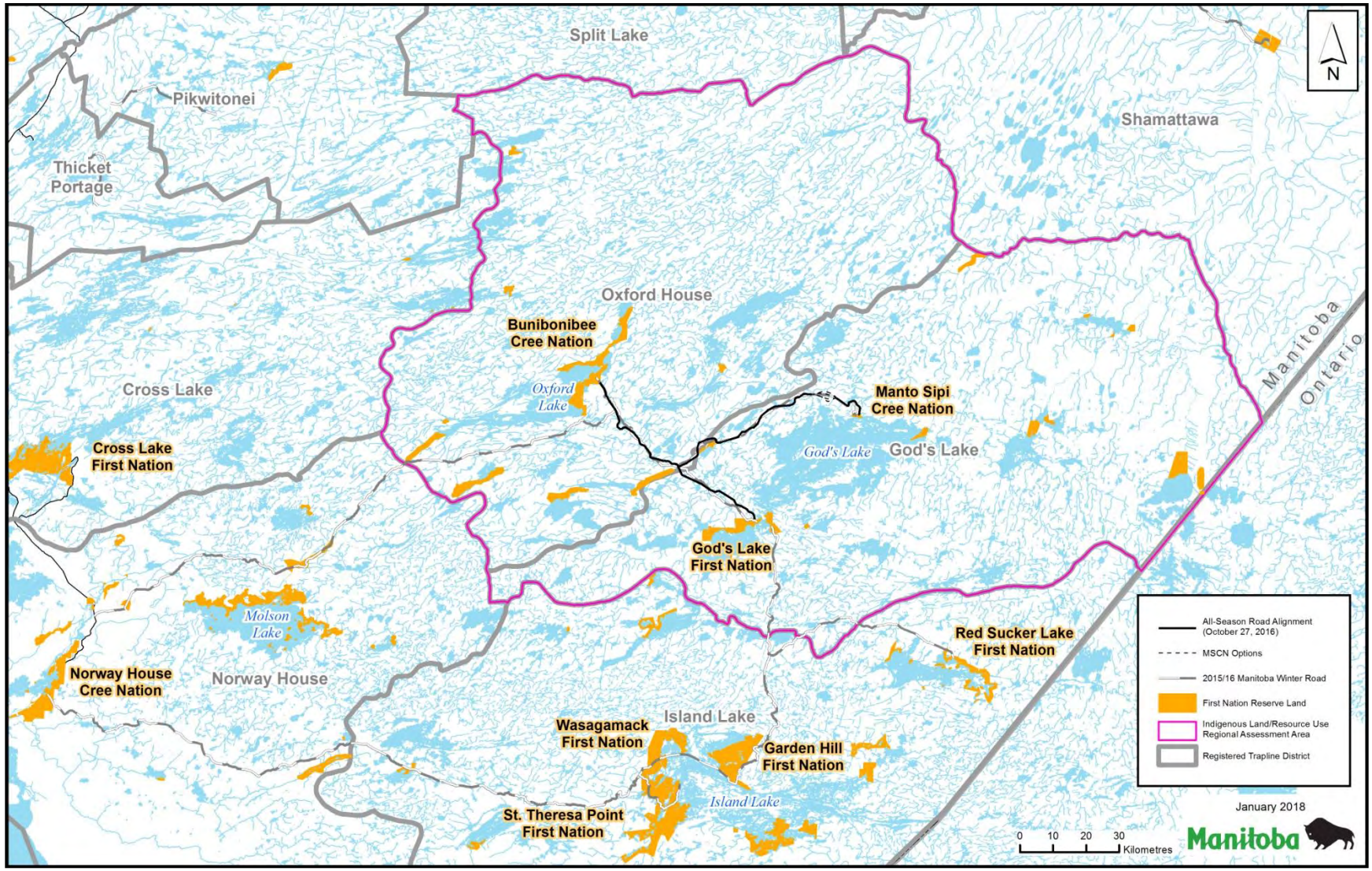

Figure 6-21: Registered Trapline Districts in relation to the Indigenous Land/Resource Use RAA

Norway House is comprised of two communities: the on-reserve community of Norway House Cree Nation and an adjacent Northern Affairs Community along the Nelson River. Norway House Cree Nation has a Resource Management Area that was established in 1998 via their Master Implementation Agreement (under the 1977 Northern Flood Agreement) as a result of flooding from hydroelectric development. In 2016, it had an on-reserve population of 6,918 and approximately 600 people in the Northern Affairs Community (Norway House Cree Nation 2017). Chief and Council are elected through a Custom Electoral System. The Northern Affairs Community is governed by a Mayor and Council under *The Northern Affairs Act*.

6.1.9.2.2 Cross Lake Band of Indians/Pimicikamak Okimawin

The Cross Lake Band of Indians/Pimicikamak Okimawin (No. 276) is located along the shore of the Nelson River where it enters Cross Lake, approximately 520 km by air north of Winnipeg and 190 km by air south of Thompson. The First Nation signed Treaty 5 in 1875 at Norway House. The community has all weather road access via PRs 373 and 374 to PTH 6. In addition, Cross Lake has an airport.

Cross Lake is comprised of two communities: the on-reserve community and Incorporated Community of Cross Lake which is located on provincial Crown Land. The Cross Lake Band of Indians/Pimicikamak Okimawin was one of five First Nations that was signatory to the 1977 Northern Flood Agreement. It has an on-reserve population of 6,047 and an off-reserve population of 2,399 for a total of 8,446 (Cross Lake Band 2017). The Incorporated Community of Cross Lake had a population of 238 in 2016 (Statistics Canada 2017a). Chief and Council are elected through a Custom Electoral System. The Northern Affairs Community is governed by a Mayor and Council under *The Northern Affairs Act.*

6.1.9.2.3 Garden Hill First Nation

Garden Hill First Nation (No. 297) is located on the north shore of Island Lake approximately 475 km by air northeast of Winnipeg and approximately 290 km by air southeast of Thompson. The community is only accessible by winter ice roads via Wasagamack or God's Lake and by air. Garden Hill First Nation had a population of 2,591 in 2016 (Statistics Canada 2017b). The First Nation is a signatory to the 1909 adhesion to Treaty 5. Chief and Council are elected through a Custom Electoral System.

6.1.9.2.4 Red Sucker Lake First Nation

Red Sucker Lake First Nation (No. 300) is located on a peninsula on the northeast shore of Red Sucker Lake close to the Ontario border, approximately 530 km by air northeast of Winnipeg and 325 km by air southeast of Thompson. The First Nation is signatory to the 1909 adhesion to Treaty 5. Red Sucker Lake First Nation is accessible by winter road from Garden Hill or God's lake and by air. In 2016, Red Sucker First Nation had a population of approximately 675 (Statistics Canada 2017h). Chief and Council are elected through a Custom Electoral System.

The Red Sucker Lake Northern Affairs Community is located on two nearby islands. The population of the Northern Affairs Community in 2016 was 229 (Statistics Canada 2017g). The Red Sucker Lake Northern

Affairs Community does not have a mayor and is represented by a designated contact person (Indigenous and Northern Relations 2016).

6.1.9.2.5 St. Theresa Point First Nation

St Theresa Point First Nation (No. 298) is located on the southwestern shore of Island Lake immediately south of Wasagamack First Nation. The community is located approximately 465 km by air to the northeast of Winnipeg and approximately 285 km by air southeast of Thompson. St. Theresa Point is accessible by winter roads from Wasagamack/Norway house and Berens River during the winter season and also has an airport. The First Nation is signatory to the 1909 adhesion to Treaty 5. In 2016, St. Theresa Point had a population of 3,262 (Statistics Canada 2017i). Chief and Council are elected through a Custom Electoral System.

6.1.9.2.6 Wasagamack First Nation

Wasagamack First Nation (No. 299) is located on the western shore of Island Lake. The community is located approximately 12 km to the north of St. Theresa Point, 275 km southeast of Thompson and 470 km northeast of Winnipeg. Wasagamack is accessible by winter road from Norway House to the west, by winter road from Berens River to the south and uses the airport at St. Theresa Point. The First Nation is a signatory of the 1909 adhesion to Treaty 5. In 2016, Wasagamack First Nation had a population of 1,403 (Statistics Canada 2017j).

6.1.9.2.7 Manitoba Metis Federation

The MMF was founded in 1967. It promotes the interests and rights of its members in the province and delivers programs and services including child and family services, justice, housing, youth, education, human resources, economic development and natural resources (MMF 2017). Métis in the Province of Manitoba have constitutional rights to hunt for food and for domestic use. In 2012, the Government of Manitoba and the MMF signed a Métis Harvesting Agreement that designated a Métis Natural Resource Harvesting Zone (**Figure 6-22**). The Indigenous RAA for the proposed Project is well removed from the Métis resource harvesting area although the agreement does commit to collaborative processes for examining harvesting right claims in areas outside of the designated Métis Natural Resource Harvesting Zone.

6.1.9.3 Health and Socio-Economic Conditions

There are no commercial fishing or forestry activities in the Indigenous RAA. Commercial hunting and outfitting are discussed under the Human Environment, **Section 6.1.11**. The following provides baseline health information on the communities in the Indigenous RAA.

6.1.9.3.1 Manto Sipi Cree Nation

There are no known residences or cabins in close proximity to the proposed all-season road alignment. The nearest residence in Manto Sipi Cree Nation is approximately 250 m from the alignment. During the TK interviews, members indicated that many cabins are located on the land surrounding the community,

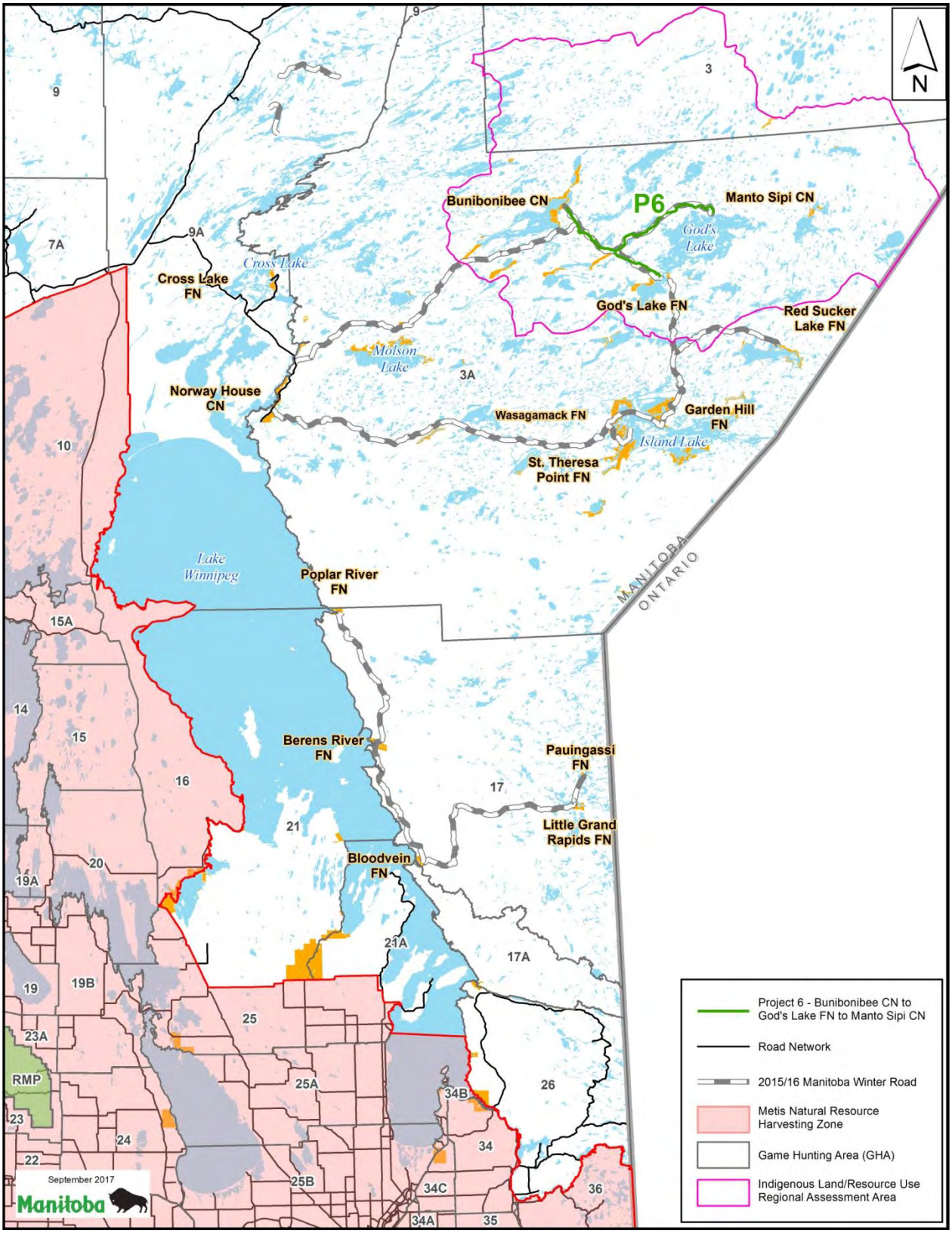

Figure 6-22: Métis Natural Resource Harvesting Zone

in particular on God's Lake, Semmens Lake and other waterways in the area, however specific locations were not provided (HTFC Planning & Design 2017d). In many instances, cabin owners let members know that anyone from the community can stay in their cabins when they are out on the land, as such there is no information available on the number of people using these cabins each year.

Potable water in Manto Sipi Cree Nation is sourced from surface water and therefore surface water quality throughout the Indigenous RAA can influence human health. The community's permanent drinking water is sourced from God's Lake and is treated at a community water treatment plant and piped to houses and community buildings. During the TK interviews there was no indication of other seasonal, periodic or temporary water sources. There are no groundwater wells in the vicinity of Manto Sipi Cree Nation.

Moose is an extremely important food source for Manto Sipi Cree Nation members. Community members often travel large distances to preferred moose hunting areas and while hunting, members opportunistically hunt and fish for other species. Moose hunting primarily occurs in the fall along the shoreline of lakes and river in the Indigenous RAA that extends east to the Ontario border. Moose are known to move around between the transmission line and the winter road.

Trapping used to be a main source of income for the community. Members used to sell furs at the Hudson's Bay Company posts at the east end of God's Lake and at God's Lake Narrows. Trapping is still an important traditional activity and still provides a source of income to members. A variety of furbearers are trapped within Manto Sipi Cree Nation's traditional territory. This includes fox, lynx, marten, muskrat, rabbit, wolf, wolverine during the winter and beaver, otter and mink during the spring. Marten are the primary furbearer targeted as they are easy to trap and process and provide the best fur price for harvest effort. Beaver are abundant and trapping occurs along rivers and creeks in the area. Lynx is often harvest not only for fur but also for food. Manto Sipi shares the RTL District with neighbouring God's Lake First Nation. Trapping occurs throughout sections of RTLs in the Manto Sipi Cree Nation area north and east of God's Lake (RTLs 10 to 13, 15, 18, 20, 33 and 50).

Waterfowl hunting takes place in the spring and early summer months. Grouse, or chickens as they are known to members, are hunted, as well as duck and geese.

Community members conduct gill netting, ice fishing, angling and fly fishing, both for recreation and when guiding for the God's River Lodge. The community has relied upon fish as a main source of food both historically and currently. Members also fish year round with target species including walleye, northern pike, trout and sturgeon.

As a result of TK workshops and interviews, members from Manto Sipi, identified at least 10 plant species used for food, medicine and other uses. Food berries include blueberries, raspberries, strawberries, saskatoons, cherries and cloudberries. Medicinal plants include plant parts (ex: leaves, roots) of several plants including Labrador tea, spruce and weekays (sweet flag). Plant harvesting occurs in the spring and summer with berry picking primarily in the summer and early fall.

There are several gathering and educational areas that are important to the Manto Sipi Cree Nation that were identified in the TK workshops and interviews. Every fall, the community has a traditional week with youth camps. During this week, members take boats with youth age 13 and up on a camping trip. They camp for two weeks and show the youth how to portage, fish and conduct other traditional activities. The community also has places around Johnson Bay for swimming and areas on the shore for cookouts. Manto Sipi Cree Nation hosts an annual Traditional Feast in the fall where they eat fish, blueberries, geese and ducks that have been locally harvested.

6.1.9.3.2 Bunibonibee Cree Nation

There are no known residences or cabins in close proximity to the proposed all-season road alignment. The nearest residence in Bunibonibee Cree Nation is approximately 1.5 km from the alignment. Bunibonibee Cree Nation members use the Indigenous LAA and RAA for traditional activities including fishing, hunting, trapping, camping, harvesting plants and berries, recreation activities and sacred/ceremonial use. Members identified a number of tenting sites and camping areas in the Indigenous RAA, as well as hunting and trapping cabins. Resource users construct cabins on their traplines and family resource areas for trapping, fishing and hunting purposes. The cabins accommodate between 4 and 10 people overnight. There are cabins on Oxford Lake and other waterways around the community (HTFC Planning & Design 2017a).

Potable water in Bunibonibee Cree Nation is sourced from surface water and therefore surface water quality throughout the Indigenous RAA can influence human health. The community's permanent drinking water is sourced from Oxford Lake and is treated at a community water treatment plant and piped to houses and community buildings. Approximately half of the residences do not have piped water service; water is trucked from the treatment plant to those households. During the TK interviews there was no indication of other seasonal, periodic or temporary water sources. There are no groundwater wells in the vicinity of Bunibonibee Cree Nation.

Members have stated that moose and geese are the most important species hunted by community members. Community members identified moose hunting areas as spanning entire watersheds and along the winter roads. Moose hunting primarily occurs in the fall. Migratory caribou are harvested by community members. Caribou hunting has historically occurred north of the community. Caribou migration routes often come right through the community of Bunibonibee Cree Nation which provides opportunistic hunting opportunities.

Trapping is still widely practiced by Bunibonibee Cree Nation members and is valued as a source of income and a connection to traditional practices. Trapping occurs in the winter and early spring. A variety of furbearers are trapped in the Oxford House area. Species noted include snowshoe hare, muskrat, marten, mink, fox, otter, fisher, wolf, wolverine, lynx and beaver. Trapping occurs throughout sections of RTLs within the Oxford House area.

Waterfowl hunting occurs on lakes and rivers in the Oxford House area during the spring and the fall. Hunted species include ducks, geese, mallards, blue bills (or scaup) and ring-necked ducks. Game bird hunting occurs south of the community in the general Oxford House area and includes spruce grouse and ptarmigan. Birds not typically consumed by community members include loons, gulls, pelicans, herons, bitterns and swans.

Fishing occurs year round both with gillnets and fishing rods. Walleye, whitefish and northern pike are fished in the spring, summer and fall. Trout are fished in the summer and fall. Ice fishing takes place in winter. During the TK interviews, members indicated that fishing occurs for food as well as recreation.

Berry picking is an important traditional activity for Bunibonibee Cree Nation members. Some members continue to harvest berries in the summer and fall. Berries picked include strawberries, gooseberries, bog cranberry, raspberries and blueberries. Plant medicine harvesting is not as common as it was prior to the establishment of the Oxford House Reserve and the introduction of the biomedical system in the 1940s. However, during the TK interviews members indicate that medicinal plants such as Labrador tea and weekays (sweet flag) are harvested in the spring and summer.

6.1.9.3.3 God's Lake First Nation

There are no known residences or cabins in close proximity to the proposed all-season road alignment. The nearest residence in God's Lake First Nation is approximately 1.5 km from the alignment. God's Lake First Nation members use the Indigenous LAA and RAA for traditional activities including fishing, hunting, trapping, camping, harvesting plants and berries, recreation activities and sacred/ceremonial use. During the TK interviews, members described travelling and staying overnight on the traditional lands surrounding the God's Lake First Nation. In addition, there are tenting sites in many locations around God's Lake. Members also indicated that they often set up tents at their current trapping location, which varies depending on the time of year and decisions made while trapping and hence, the locations change. Cabins are common in the area and are used for fishing, hunting, trapping and are sometimes shared by families and trappers. Cabin types include family cabins, lodges, fishing lodges, hunting lodges, trapper's cabins and youth camps. Cabins are often built by families in their trapping or hunting area and are open for use by other families and trappers (HTFC Planning & Design 2017b) as such there is no information available on the number of people using these cabins each year.

Potable water in the God's Lake First Nation is sourced from surface water and therefore surface water quality throughout the Indigenous RAA can influence human health. The community's permanent drinking water is sourced from God's Lake and is treated at a community water treatment plant and piped to most houses and community buildings. There are 193 residences that have piped water service. God's Lake First Nation has been under an ongoing "Do Not Consume" advisory since 2005 (Indigenous and Northern Affairs Canada 2017a). During the TK interviews there was no indication of other seasonal, periodic or temporary water sources. There are no groundwater wells in the vicinity of God's Lake First Nation.

Members of God's Lake First Nation indicated that moose hunting is common in God's Lake and is often done in the fall but that moose is also hunted opportunistically at other times of the year. Moose is a valuable food source and its meat is often shared with other members, making moose hunting a valuable social/cultural practice. Moose hunting also provides a significant dietary component for members. Moose hunting is often done by boat around the shorelines of water so that the moose can be transported back to the community. Sometimes, hunters will fly in to moose hunting areas near more remote lakes. Caribou is not commonly hunted or consumed by community members.

Trapping is still practiced by God's Lake First Nation members and is valued as a source of income and a connection to traditional practices. God's Lake First Nation shares a RTL District with Manto Sipi Cree Nation. Trappers from the community trapped on registered traplines 1 to 4, 6, 10, 27, 44, 48 and 49. Trapline 44 is a community trapline that is used by elders and others. Members indicated that beaver, fisher, fox, lynx, marten, mink, muskrat, otter, wolf and wolverine are trapped. Trapping primarily occurs in the winter and spring and coincides with other activities such as fishing, hunting and plant harvesting, so many of the trapline areas are also common areas for these other activities.

Waterfowl hunting occurs on lakes and rivers in the God's Lake area. Waterfowl and game birds are an important food source to community members. Hunted species include ducks, geese, grouse, ptarmigan, spruce grouse, merganser, black ducks (scoter) and fall ducks (ring necked ducks).

Many TK workshop and interview participants noted that the entirety of God's Lake is used for fishing on a year round basis. Fishing is an important activity for harvesting food and fish represents a main dietary component of God's Lake First Nation members. Sharing catch is common in God's Lake. Fishing serves a social and cultural function by bringing families and friends together, connecting community members to the land and providing an opportunity for passing on knowledge. The species identified for fishing and fishing guiding were brook trout, northern pike, lake trout, sturgeon, walleye and whitefish. The fish most commonly caught for consumption are northern pike, walleye and whitefish.

Berry picking is an important traditional activity for God's Lake First Nation members. Some members continue to harvest berries in the summer and fall. Berries picked include blackberries, blueberries, cherries, cranberries, gooseberries, muskeg berries, raspberries, strawberries, cloudberries and swamp gooseberries. In terms of medicinal plants, members indicated that juniper, Labrador tea, pinecones, root (not specified), water calla, water lily, weekays (sweet flag) and willow tree are harvested for medicinal purposes. Harvesting occurs in the spring and summer.

During the TK workshops and interviews, community members identified locations where families used to gather and areas where groups gather today. This includes sand beaches, youth camps, family gathering sites and fishing tournament sites. Youth from the community participate in the annual "Canoe Quest" in which they portage and canoe to and from Norway House. It is held in July and follows the historic route to take children to residential schools (HFTC Planning & Design 2017b).

6.1.9.3.4 God's Lake Narrows Northern Affairs Community

There are no known residences or cabins in close proximity to the proposed all-season road alignment. The nearest residence in God's Lake Narrows Northern Affairs Community is approximately 3 km from the alignment. Indigenous people from God's Lake Narrows Northern Affairs Community use the Indigenous LAA and RAA for traditional activities. During the TK workshop, members indicated that most trapping is presently done on day trips from the community, whereas, historically trappers would have stayed in cabins on their traplines. It was indicated that there are a couple of cabins located on God's Lake and another cabin on an unnamed lake south of God's Lake, however there is no information available on the number of people using these cabins each year (HTFC Planning & Design 2017c).

Potable water in God's Lake Narrows Northern Affairs Community is sourced from surface water and therefore surface water quality throughout the Indigenous RAA can influence human health. The community's permanent drinking water is sourced from God's Lake and is treated at a community water treatment plant and distributed through a piped water system. During the TK workshop there was no indication of other seasonal, periodic or temporary water sources. There are no groundwater wells in the vicinity of God's Lake Narrows Northern Affairs Community.

Moose and waterfowl (duck and goose) hunting are common activities for God's Lake Narrows community members. Moose hunting mainly occurs in fall, while waterfowl hunting takes place in the spring. The TK study indicated that these activities are currently conducted now for food. Caribou is not actively hunted by community members.

Trapping is practiced by people from God's Lake Narrows Northern Affairs Community and is valued as a source of income and a connection to traditional practices. People from the community trap on RTLs 2, 4, 7, 8, 9, 44, 45 and 47 (within the God's Lake RTL District). Trapline 44 is a community trapline and is also used by members of Manto Sipi Cree Nation and God's Lake First Nation. Trapline 44 is important for elders and youth because of its proximity to God's Lake Narrows. Animals most commonly trapped in the area include mink, otter, beaver and marten. Wolverines are sometimes trapped but they are more difficult to trap. Marten are currently the most commonly trapped animal, due to the price of their fur. Because most trapping takes place during the winter months, snowmobiles are the most common method of transportation that trappers use to access their traplines.

Fishing is an important activity for many people in God's Lake Narrows Northern Affairs Community. Fish species most commonly caught for consumption in the community are walleye, northern pike, lake trout and whitefish.

During the TK workshops a number of wild food plants (especially berries) were noted as being harvested in the area, including blueberries, cranberries and saskatoons. God's Lake Narrows community members still have knowledge of medicinal plants and their harvesting locations. Labrador tea is harvested near the community. Other traditional uses of medicinal plants include using sap from poplar trees to heal open wounds. Weekays (sweet flag) is harvested from marshy areas and is used to treat all types of ailments.

During the TK workshop, the community identified locations where they used to gather and areas where groups gather today. The workshop participants suggested that community gatherings are not as frequent as they used to be. Community members indicated that socials are held in the community hall. The community also participates in a local Sundance Festival. The youth camp for the community was abandoned over 20 years ago.

6.1.9.4 Culture, Heritage and Archaeological Resources

Through the TK studies, members from the First Nations situated in the Heritage RAA (**Figure 6-2**) indicated that culture is part of all community activities. The First Nations indicated that in the past, family members would be buried wherever a family was in their seasonal travel if a member passed away (HTFC Planning & Design 2017a; b; and d).

During interviews, community members from Manto Sipi Cree Nation indicated that there are sites that are considered special or sacred. Special areas include areas to pray and the old Hudson's Bay Company posts in the area. Members from Bunibonibee Cree Nation stated that sites that are special or sacred include pictograph/rock painting sites and the old settlement where Treaty 5 was signed. Members from God's Lake First Nation indicated that special areas include former mine sites, a trading outpost, old settlement sites, a dam, a former fish plant, the site of treaty signing and locations where artefacts were found. None of these areas are in the vicinity of the proposed all-season road alignment.

In support of the proposed Project, a Heritage Resources Impact Assessment (HRIA) was conducted. A flyover of the alignment was conducted in May 2016, a baseline desktop study was completed in July 2016 and a HRIA report was completed to identify archaeological sites potentially affected by the proposed road alignment (AMEC Foster Wheeler Environment and Infrastructure 2016 a; b; and c).

A total of 79 archaeological/heritage sites were recorded during previous HRIAs conducted within the Heritage RAA, none of which are located within the Heritage LAA. This included thirty-three campsites, one hunting/fishing site, eight lithic workshops, seven pictograph sites, seven isolated finds, 14 historic sites (structural, industrial, burial, townsite and fur trade post) and eight sites listed as un-interpreted that were provided in the database from Manitoba HRB (AMEC Foster Wheeler Environment and Infrastructure 2016a). The sites were assessed for geographic location and overall placement on the landscape. It was found that locations near major navigable watercourses feature the highest heritage/archaeological potential.

The conclusions of the baseline study, specifically the identification of moderate and high heritage potential target areas where field investigations would be completed, were refined during the overview flight in the God's Lake and Oxford Lake areas. Based on the overflight the all-season road alignment was changed and the field assessment locations modified with 77 locations assessed within the Heritage LAA (AMEC Foster Wheeler Environment and Infrastructure 2016a).

Twelve previously unrecorded sites were identified within the Heritage LAA during the HRIA. These include two historic portages, one isolated find, seven campsite/workshops (lithic scatter) and two quartzite quarries. Four of these newly recorded sites (GeKp-1, GeKs-5, GfKm-3 and GfKm-4) are within the 100 m ROW for the all-season road and potentially affected. A total of 149 artifacts including ten stone tools and three pieces of animal bone were found at ten of the twelve heritage sites. All stone tools and debitage were made from locally available materials. The twelve newly recorded heritage sites within the Heritage LAA are summarized in the following sections with additional details provided in the HRIA (AMEC Foster Wheeler Environment and Infrastructure 2016a).

6.1.9.4.1 GdKp-6

GdKp-6 is a small precontact lithic scatter located on a point of land that juts into God's Lake. Based on the route alignment, GdKp-6 would not be affected by construction or operation of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.9.4.2 GdKp-7

GdKp-7 is a small precontact lithic scatter located on a point of land that juts into God's Lake. Based on the route alignment, GdKp-7 would not be affected by construction or operation of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.9.4.3 GdKp-8

Misty Lake Quartz Quarry (GdKp-8) is a small precontact quartz quarry located on the eastern shore of an unnamed lake. Based on the route alignment, GdKp-8 would not be affected by construction or operation of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.9.4.4 GdKq-6

GdKq-6 is an isolated artifact find located on the western shore of an unnamed lake. Based on the route alignment, GdKq-6 would not be affected by construction or operation of the proposed Project. GdKq-6 is considered to have low heritage significance and avoidance is not recommended.

6.1.9.4.5 GeKp-1

GeKp-1 is a historic portage connecting God's Lake to Bayly Lake. The level of heritage significance of GeKp-1 is considered to be high. The portage crosses the all-season road and may need crossing signage and approaches to the all-season road for current users of the portage. No further investigation is recommended at site GeKp-1.

6.1.9.4.6 GeKp-2

GeKp-2 is a lithic scatter located near the shoreline of Bayly Bay on God's Lake. Based on the route alignment, GeKp-2 would not be affected by construction or operation of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.9.4.7 GeKs-5

GeKs-5 is a small precontact quartz quarry located on the crest of a high bedrock outcrop overlooking Magill Creek to the north near the proposed water crossing. GeKs-5 has high heritage significance. Based on the route alignment, GeKs-5 would be affected by construction of the proposed Project. Avoidance is recommended but if not possible then additional systematic salvage work should be conducted to collect and map the entirety of the site.

6.1.9.4.8 GfKm-2

GfKm-2 is a small precontact lithic scatter located on the north bank of God's River. Based on the route alignment, GfKm-2 would not be affected by construction of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.9.4.9 GfKm-3

GfKm-3 is a historic portage route and trail connecting two segments of God's River in order to bypass the God's River Rapids. The level of heritage significance of GfKm-3 is considered to be high. The portage crosses the all-season road and may need crossing signage and approaches to the all-season road for current users of the portage. No further investigation is recommended at GfKm-3.

6.1.9.4.10 GfKm-4

GfKm-4 is a small precontact lithic scatter located northwest of an unnamed tributary of God's River. GfKm-4 is bisected by the proposed all-season road alignment and northwest of a proposed water crossing and therefore would be affected by construction of the proposed Project. The site has high heritage significance and avoidance is recommended. If avoidance is not possible then additional systematic salvage work should be conducted to collect and map the entirety of the site

6.1.9.4.11 GfKt-12

GfKt-12 is a precontact workshop located on the western bank of the Hayes River. Based on the route alignment, GfKt-12 would not be affected by construction or operation of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.9.4.12 GfKt-13

GfKt-13 is a small precontact lithic scatter located on a high hill west of the Hayes River. Based on the route alignment, GfKt-13 would not be affected by construction or operation of the proposed Project. This site is considered to have high heritage significance and avoidance is recommended.

6.1.10 Federal Decisions and Transboundary Effects

There are no expected changes to the environment on federal lands and lands in another province or outside of Canada. If DFO determines that Authorization is required under the *Fisheries Act*, there is the

potential that the required offsetting plan may have an effect on the environment. The potential effects, however, would be no different than what is assessed in **Section 6.2** and **Section 6.3**. As such no specific additional baseline information is provided.

6.1.11 Human Environment

6.1.11.1 Project Setting

The proposed Project is located almost entirely within the God's Lake Ecodistrict, within the Hayes River Upland Ecoregion of the Boreal Shield Ecozone, except a small portion near Manto Sipi Cree Nation that falls within the Knee Lake Ecodistrict (Smith *et al.* 1998). The Indigenous RAA is largely undeveloped except for the three First Nation and one Northern Affairs Community and the transmission lines and winter road corridors which service the communities. There are no industrial facilities in the region with the only commercial development consisting of a few lodges and outfitters.

Land use in the Indigenous RAA consists mainly of traditional activities by the communities including hunting, trapping, fishing, camping, recreation activities and food and medicine gathering. The City of Thompson is the closest urban center to the Project, located approximately 186, 224 and 255 km (by air) from Bunibonibee Cree Nation, God's Lake First Nation and Manto Sipi Cree Nation, respectively. Access by road from these communities to the City of Thompson is restricted to the operation of the winter road.

6.1.11.2 Federal Lands and Protected Lands

No lands outside of the Province of Manitoba or Canada would be affected by the proposed Project. Other than the Reserve lands for the three First Nations in the area, there are no federal lands or National Historic Sites in the vicinity of the project (**Figure 6-7**). The proposed all-season road would connect to existing and future access roads at the Reserve boundaries and would not cross through Reserve lands. There are no designated protected areas or other lands protected under the Manitoba Protected Areas Initiative (PAI) in the vicinity of the project (**Figure 6-7**). The latter would include National Parks, Ecological Reserves, Provincial Forests and Park Reserves and could include Provincial Parks and Wildlife Management Areas.

Areas of Special Interest (ASI) are candidate sites selected to represent enduring features found within a natural region that capture landforms and unique sites to achieve adequate representation as a part of the Manitoba PAI. The goal of the Initiative is to permanently protect a representative sample of each of the province's 18 natural regions and sub-regions thereby conserving the biodiversity of the Province of Manitoba. Areas supporting rare or endangered plant and animal species, unusually high biodiversity, extremely sensitive sites and unique landscapes are taken into account. The proposed Project is located partially within the Knee Lake ASI (**Figure 6-7**).

The Hayes River, which flows through the area, was designated as a Heritage River under the Canadian Heritage Rivers System in 2006. The proposed all-season road does not cross the Hayes River. A portion

of The Middle Track and Hayes River designated canoe route, along the Hayes River, crosses through the area, although outside of the Indigenous LAA.

6.1.11.3 Land Use in the Indigenous RAA

The current land use in the Indigenous RAA primarily includes hunting, fishing, trapping, gathering, outdoor recreation, uses of seasonal cabins and outfitters as described in the following sections. A description of the use of the RAA by Indigenous Peoples was previously provided in **Section 6.1.9**.

6.1.11.3.1 Hunting

MSD is responsible for the allocation and regulation of wildlife resources for recreational hunting purposes. Regulations are reviewed annually and include the establishment of season dates, bag limits and vehicle restrictions. There is annual review of non-resident big game hunting quotas and area allocations for lodges and outfitters as non-residents of Canada must utilize the services of a lodge or outfitter. MSD also restricts lodge and outfitter big game allocations to specific areas where no conflicts with First Nations or resident hunters exist. All non-Indigenous/licensed hunters must obtain a Province of Manitoba hunting license for the GHA and species under *The Wildlife Act* (Manitoba) in order to harvest animals (Manitoba Sustainable Development 2017b). The bag limits for resident and non-resident hunters have remained relatively constant from year to year. Licensed moose hunters typically use the same areas from year to year and their camps are found mainly on float plane accessible lakes and rivers outside and east of the Indigenous LAA.

The Indigenous LAA is entirely located within Game Hunting Area (GHA) 3A and approximately two thirds of the RAA is also within GHA 3A, with the northern third in GHA 3 (**Figure 6-22**). GHAs are provincially designated zones under which certain hunting conditions apply (ex: hunting seasons, bags limits and other restrictions and regulations). These restrictions do not apply to Indigenous Peoples under their Treaty and Constitutional rights. Hunting of moose, black bear, grey wolf and coyote is allowed in GHA 3A. Licensed moose hunting occurs between late August and late December. Black bear hunting occurs from late April to late June and again from late August to early October. Licensed hunting of wolf occurs between late August and late March. Non-resident big game hunters require the services of a guide or outfitter.

The Indigenous LAA is located within Game Bird Hunting Zone 2. Birds that can be hunted include geese, ducks, grouse, coots and snipe. The hunting of upland game birds by licenced hunters is limited due to the remoteness of the area. Non-resident bird hunters do not require the services of a guide or outfitter.

6.1.11.3.2 Recreational and Commercial Fishing

Fishing is an important year-round traditional activity for the members of the local communities. Fishing takes place on the lakes and rivers throughout the Indigenous RAA. There is currently no commercial fishing as summer fishing ended on God's Lake over 18 years ago and winter fishing ended 30 years ago (HTFC Planning & Design 2017d). In the past, commercial fishing occurred on Oxford Lake, Colon Lake, Chattaway Lake, Touchwood Lake, Bear Lake and Knee Lake. Fish that were caught commercially in the

1960s were taken to Ilford (HFTC Planning & Design 2017b). Commercial fishing stopped in 1991 on Oxford Lake. In addition, there was a commercial fishery on Edmund Lake which closed in the 1980s and on Elk Island in God's Lake which operated from 1955 to 1975 (HTFC Planning & Design 2017d). Recreational fishing in the Indigenous RAA is described under Resource Use for each of the communities (**Sections 6.1.9.1.1** to **6.1.9.1.4**).

6.1.11.3.3 Trapping

Trapping is a traditional activity that is actively practiced in the Indigenous RAA by many community members. In addition to the cultural connection that trapping provides to the land within the traditional territories of Indigenous Peoples, commercial trapping also occurs as a source of employment and income and, in some cases, country foods (traditional diets of Indigenous peoples).

There are two RTL Districts (God's Lake and Oxford House) in the Indigenous RAA and the proposed all-season road alignment crosses ten RTLs in the two Districts. Three RTLs are crossed in the Oxford House RTL District (52, 54 and 55) and seven RTLs are crossed in the God's Lake RTL District (04 to 06, 08 to 10 and 12) as shown in **Figure 6-17**. Traplines within the God's Lake RTL District that are at least partially located within the Indigenous LAA are 4 to 12 and 44, while traplines within the Oxford House RTL District that are at least partially within the Indigenous LAA are 50, 52 to 54, 67 and 68 (**Figure 6-17**).

Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Narrows Northern Affairs Community use traplines in the RTLs for income. Manto Sipi Cree Nation shares the God's Lake RTL District with God's Lake First Nation and God's Lake Narrows Northern Affairs Community. Bunibonibee Cree Nation uses the Oxford House RTL District. Trapping in the Indigenous RAA is described under Resource Use for each of the communities (**Sections 6.1.9.1.1 to 6.1.9.1.4**).

6.1.11.3.4 Gathering

Gathering of food (ex: berries) and medicinal plants is a traditional activity that provides a cultural connection to the land, which is practiced in the Indigenous RAA by many community members (**Section 6.1.9**). TK studies conducted for the proposed Project, as previously described, identified several species of trees, shrubs and herbs as being important to the communities of Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Narrows Northern Affairs Community. As a result of workshops and interviews as part of the TK studies, more than 17 plants, plus wood and firewood resources were identified by the communities as important for sustenance and cultural practices. Common food plants include blueberry, raspberry, strawberry, cloudberry, cranberry, cherry and saskatoon. Over six medicinal plants were identified, including black spruce, sweet flag and Labrador tea. Firewood and willow stick collection and wood cutting was also valued. Gathering in the Indigenous RAA is described under Resource Use for each of the communities (**Section 6.1.9.1**).

Through the TK studies, local Indigenous communities identified the areas where plants of sustenance and cultural value are harvested within the Project Footprint and the Vegetation LAA. There was no overlap among the communities for the areas that were harvested and the total areas accounted for

31.6% (8.9 km^2), 31.9% (90.5 km^2) and 25.7% (367.6 km^2) of the Project Footprint, Vegetation LAA and Vegetation RAA, respectively. The harvested area and percentage of the spatial boundaries, specific for Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Northern Affairs Community, is summarized in **Table 6.40** (Szwaluk Environmental Consulting Ltd. *et al.* 2017b).

Table 6.40: Harvesting Areas for Plants of Sustenance and Cultural Value Identified by Community Members.

Community	Project Footprint		Local Assessment Area		Regional Assessment Area	
	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
Manto Sipi Cree Nation	2.7	9.7	27.3	9.6	100.8	7.0
Bunibonibee Cree Nation	0.2	0.7	4.5	1.6	27.6	1.9
God's Lake First Nation	6.0	21.3	58.5	20.6	235.5	16.5
God's Lake Northern Affairs Community	0.0	0.0	0.2	0.1	3.8	0.3
Total	8.9	31.6	90.5	31.9	367.6	25.7

Source: Szwaluk Environmental Consulting Ltd. *et al.* 2017b

6.1.11.3.5 Outdoor Recreation

A portion of The Middle Track and Hayes River designated canoe route, along the Hayes River, crosses through the area, as previously noted. The proposed all-season road, however, does not cross The Middle Track and Hayes River canoe route and the route is not located within the Indigenous LAA. Youth from the community of God's Lake First Nation participate in an annual "Canoe Quest" in which they portage and canoe to and from Norway House (HFTC Planning & Design 2017b). There are no designated snowmobile trails in the Indigenous RAA, but the communities in the area do have trails (ex: snowmobile trails).

6.1.11.3.6 Use of Seasonal Cabins

The local communities in the Indigenous RAA use seasonal cabins to undertake traditional activities. During the TK interviews, Manto Sipi Cree Nation members indicated that cabins are located on lands surrounding the community on God's Lake and God's River and on small lakes close to the community (HFTC Planning & Design 2017d). Some of the cabins are private cabins but in many instances, cabin owners let members know that anyone from the community can stay in the cabins when they are out on the land.

During the TK interviews, Bunibonibee Cree Nation members indicated that travelling and staying overnight on the traditional lands surrounding the community is common. Members identified a number of hunting and trapping cabins. Resource users construct cabins on their traplines and family resource areas for trapping, fishing and hunting purposes (HFTC Planning & Design 2017a).

During the TK interviews, God's Lake First Nation members described travelling and staying overnight on the traditional lands surrounding God's Lake. Cabins are common in the area and are used for fishing, hunting and trapping and are sometimes shared by families and trappers. Cabin types include family

cabins, lodges, fishing lodges, hunting lodges, trapper's cabins and youth camps. Cabins are often built by families in their trapping or hunting area and are open for use by other families and trappers. Cabins are in the vicinity of God's Lake and other waterways in the Indigenous LAA (HTFC Planning & Design 2017b).

6.1.11.3.7 Lodges and Outfitters

There are eight lodges in the Indigenous RAA including the Edmund Lake Lodge, Elk Island Lodge, God's Lake Haven, God's River Lodge, Healy's God's Lake Narrows Lodge, North Haven Resort (Bear Lake Lodge and Utik Lake Lodge) and North Star Knee Lake Lodge (**Figure 6-16**). God's River Lodge offers daily fishing trips to Semmons Lake and fly-in fishing to two wilderness outpost river camps at Allen Rapids and Pine Rapids which are also in the Indigenous RAA. North Star Knee Lake Lodge is located on Knee Lake and offers fishing on the lake. Elk Island Lodge is located on God's Lake and is a remote fly-in fishing resort which has outcamps on Edmund Lake and Kistigun Lake which are also in the Indigenous RAA. Healey's Gods Lake Narrows Lodge is located at God's Lake Narrows Northern Affairs Community and offers fishing on God's Lake as well as at Red Cross Lake. North Haven Resort offers fly-in fishing at lodges on Bear Lake and Utik Lake. There is a boat cache on Magill Lake used by the outfitters. There are no dedicated hunting lodges in the Indigenous RAA (HFTC Planning & Design 2017b).

6.1.11.3.8 Mineral and Aggregate Resources

While there are no mineral leases, patent mining claims, potash withdrawals, private quarry permits or quarry and surface leases, there are various mines, mining claims, quarry withdrawals and casual quarry permits (annually-issued) in the vicinity of the proposed Project (**Figure 6-6**). There are 8 mine sites within the Indigenous RAA with the closest approximately 18.3 km from the all-season road alignment well outside the Indigenous LAA. There are four and 103 mining claims within the Indigenous LAA and RAA, respectively, with the closest approximately 1 km from the alignment. Previously, there was a gold mine at Knee Lake which is closed and fenced. In addition, there is a former gold mine site on Elk Island (HTFC Planning & Design 2017a). Puma Exploration currently has mining exploration sites around Edmund Lake.

There are eight quarry withdrawals and eight active casual quarry permits within the Indigenous LAA with a total of 14 and 9 of each, respectively within the Indigenous RAA. Four of the quarry withdrawals (two held by MI and two held by Northern Affairs) and five of the casual quarry permits overlap the proposed all-season road alignment.

6.1.11.3.9 Forestry

There are currently no active commercial forestry operations in the Indigenous RAA, however parts of the Hayes River and Boreal Shield Forest Management Sections are within the area. In the Hayes River Forest Management Section, parts of Forest Management Units 95, 96, 97 and 98 are in the Indigenous LAA (Manitoba Conservation and Water Stewardship 2013).

6.1.11.4 Current Use of Waterways and Water Bodies

Travel routes are important to the local communities for providing seasonal access to allow traditional activities of cultural importance including hunting, trapping, fishing and gathering. Travel routes in the vicinity of the Project include open-water and frozen waterways. The majority of travel routes documented during the TK studies were associated with the major waterways such as God's River, God's Lake, Oxford Lake, Semmens Lake and Edmund Lake.

6.1.11.5 Residences and Camps

There are no known residences, cabins or camps in close proximity to the proposed all-season road alignment. As previously described in **Sections 6.1.9.3.1 to 6.1.9.3.4**, the nearest residences to the alignment are approximately 250 m in Manto Sipi Cree Nation, 1.5 km in Bunibonibee Cree Nation and God's Lake First Nation and 3 km in God's Lake Narrows Northern Affairs Community.

6.1.11.6 Health and Socio-Economic Conditions

A description of health and socio-economic conditions for the Indigenous RAA is provided in **Section 6.1.9.3**. In addition to what was previously described the God's River Lodge, located within Manto Sipi Cree Nation, has also been under a long-term boil water advisory since 2013 (Manitoba Sustainable Development 2018).

6.1.11.7 Culture, Heritage and Archaeological Resources

A description of culture, heritage and archaeological resources within the Heritage RAA and LAA is provided in **Section 6.1.9.4**.

6.2 Predicted Changes to the Physical Environment

The assessment of potential effects of the Project on the physical environment was conducted as described in **Chapter 4** and summarized as follows.

- Identification of the interactions among VCs and the Project construction, operations and maintenance activities.
- Identification of the potential environmental effects of the Project prior to the implementation of mitigation measures.
- Initial screening of the potential environmental effects prior to the implementation of mitigation measures, using the criteria identified in **Chapter 4, Section 4.5.5** (ex: duration, magnitude, timing, geographic extent, frequency, reversibility and ecological and social context).

Appropriate mitigation measures were then identified for potential adverse effects as outlined in **Section 6.4**. Following the application of mitigation potential environmental effects were again screened using the

criteria identified in **Chapter 4, Section 4.5.5** to assess and determine the significance of the residual adverse environmental effects remaining after mitigation as discussed in **Section 6.5**.

Various desktop and *in situ* studies were conducted to collect, record and analyse information on the physical environment of the Project Footprint, LAA and RAA. This information was used to quantify the potential effects of Project activities on the selected VCs where quantification was possible and to qualify the potential effects where quantitative data were unavailable. Additional details regarding sources of information used to identify and assess potential environmental effects are provided in **Chapter 4, Section 4.4**.

In consideration of the existing physical environment of the LAA and RAA, the assessment of potential environmental effects of the proposed Project focuses on those components that are particularly valued by local communities and are linked to valued ecological and cultural resources of the area. The VCs identified for the physical environment and the rationale for selection are provided in **Appendix 4-1**. A summary of the interaction between the physical environment VCs and key activities associated with the construction, operations and maintenance phases of the proposed Project is provided in **Appendix 6-3**.

A discussion of the potential Project effects on the physical environment VCs, prior to the implementation of mitigation measures, is detailed in the following sections. A summary of these effects as well as the assessed level of the potential effect, for each of the criteria (ex: duration, magnitude, timing, geographic extent, frequency, reversibility and ecological and social context) is provided in **Appendix 6-4**.

6.2.1 Changes to Atmospheric Environment

6.2.1.1 Predicted Effect on Air Quality

Air quality contaminants such as particulates (ex: total suspended particulates, PM2.5, PM10) and vehicle emissions (ex: SOx, NOx, diesel particulates) can affect receptors in the vicinity of the proposed Project. Existing air quality in the Indigenous Land/Resource Use LAA and RAA, as described in **Section 6.1.1.2**, is expected to be very good and typically below the Manitoba Ambient Air Quality Criteria (Government of Manitoba 2005) and Canadian Air Quality Standards (CCME 2012), because the area is remote and has no industrial emission sources and limited commercial and domestic sources emission sources (ex: year round aircraft, personal vehicles, seasonal home generators, small boats, commercial transport truck) in the RAA.

6.2.1.1.1 Increase in Particulates

6.2.1.1.1.1 Construction

Road construction activities and construction vehicle and equipment operation have the potential to increase particulates (dust) in the atmosphere from blasting, rock crushing, stockpiling, roadbed construction and hauling. Potential effects of construction on air quality, prior to the implementation of

mitigation measures, are negligible. The potential effect would be limited to the construction phase of the project and is therefore short-term.

There is a possibility of the dust being contaminated by accidents and malfunctions causing the release of petroleum products during quarry operations and road construction. The resulting contaminants would be non-detectable to trace levels of benzene, toluene, ethylene, xylene, petroleum hydrocarbon fractions 1 to 4. MI's Environmental Protection Procedures (EPs) and Environmental Specifications (ES 130s) provide numerous best practices to reduce the possibility of accidents and malfunctions (**Appendix 8-2**). There is an additional possibility of the dust containing non-detectable to trace levels of ANFO (Ammonium Nitrate (NH_4No_3) and fuel oil) resulting from incomplete burning during the blasting process.

While the increase in particulates may have the potential to exceed the Manitoba Ambient Air Quality Criteria (Government of Manitoba 2005) and Canadian Air Quality Standards (CCME 2012) at the active construction site, there would be no increase in particulates in the communities, as the road does not enter federal reserve lands and the communities (receptors) are located at least 250 m from the reserve boundary. In a year-long study of a road widening project with similar construction methods, equipment, and environmental mitigations, the Arizona Department of Transportation measured a maximum PM_{10} (24hr average) of 72 µg/m^3, with a median measurement of 11.3 µg/m^3, and an average of 12.5 µg/m^3 (Roberts et.al. 2010). $PM_{2.5}$ measurements produced a maximum (24hr average) of 10 µg/m^3, with a median measurement of 1.0 µg/m^3, and an average of 1.0 µg/m^3 (Roberts et al. 2010). Roberts et.al. (2010) found the majority of the dust is produced during the excavation phase and results were localized and dependent on the speed and direction of the wind.

The extent would be limited to the immediate vicinity of portions of the Project under active construction and the active quarry areas within the Project Footprint and would only occur sporadically during construction. The effect is readily reversible as any dust settles soon after the discrete activity is stopped. As dust is expected to settle rapidly and be and localized to active construction there is not expected to be a change in relation to the $PM_{2.5}$ or PM_{10} 24hr Average / Annual Mean for the project area as a whole and especially for the area beyond the footprint of the project. No adverse ecosystem or social effects are anticipated. The quality of country food and medicinal plants collected from within areas where dust has settled is not expected to be affected if foods are thoroughly rinsed prior to ingestion. Communications of the risk of dust settling on country foods will be communicated to the community through the IPEP program.

6.2.1.1.1.2 Maintenance

Road maintenance activities and maintenance equipment operation have the potential to increase particulates (dust) in the atmosphere from stockpiling aggregate, roadbed/surface repair and hauling, as well as blasting and rock crushing when additional aggregate materials are required. Potential effects of maintenance activities on air quality, prior to the implementation of mitigation measures, are considered

negative. Maintenance would occur throughout the life of the Project and therefore the potential effect is considered long term.

Similar to during construction, the increase in particulates during maintenance may have the potential to exceed the Manitoba Ambient Air Quality Criteria (Government of Manitoba 2005) and Canadian Air Quality Standards (CCME 2012), however, there would be no increase in particulates in the communities as the road does not enter Federal Reserve lands or reach the communities (receptors) within. The extent would be limited to the immediate vicinity of portions of the Project being maintained within the Project Footprint and would occur sporadically during maintenance activities. The effect is readily reversible as any dust settles soon after the maintenance activity has ended. Potential social effects include an increased risk of collisions due to the reduction of driver visibility when passing maintenance equipment and potential decreases in the quality of country foods and medicinal plants collected within the project footprint if not thoroughly rinsed before ingestion.

6.2.1.1.1.3 Operation

Public and commercial vehicle traffic during operation of the all-season road also has the potential to increase particulates (dust) in the atmosphere. Potential effects of vehicle traffic on particulates, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project.

The increase in particulates would be the same as that for any other gravel road in the Province and are expected to be less than the levels noted in section 6.2.1.1.1., but have the potential to exceed the Manitoba Ambient Air Quality Criteria (Government of Manitoba 2005) and Canadian Air Quality Standards (CCME 2012). The extent would be limited to the Project Footprint, with no increase in particulates in the communities as the road does not enter Federal Reserve lands or reach the communities (receptors) within. The effect would occur on a regular and frequent basis when there is vehicle travel, primarily during summer and fall when the roads are dry and not frozen. The effect is readily reversible as any dust settles soon after a vehicle has passed. Potential social effects include an increased risk of collisions due to the reduction of driver visibility when following or passing other vehicles and potential decreases in the quality of country foods and medicinal plants collected within the project footprint if not thoroughly rinsed before ingestion.

6.2.1.1.2 Increase in Vehicle Emissions

Vehicle and equipment use during construction, maintenance and operation would increase vehicle emissions to the atmosphere (ex: SO_x, NO_x, diesel particulates) that may adversely affect air quality. Other emissions include volatile organic compounds (VOCs) used during road construction (ex: gasoline, diesel) that may have potential adverse effects to human health and the environment if not stored and handled properly. Emissions of GHGs (CO_2, CH_4, N_2O) are discussed in **Section 6.2.1.2**. As there are no current industrial activities in the region, the potential increase in concentrations of SO_x, NO_x and diesel

particulates are not expected to measurably affect air quality in the RAA. Additionally, emissions of NO_x and SO_x are mitigated at the fuel production stage.

The effect of increased emissions on air quality, prior to the implementation of mitigation measures, from vehicle and equipment use during construction, maintenance and operation are considered negative. Vehicle emissions during construction and discrete maintenance activities would only occur for a short time, however, emission from public and commercial vehicle traffic during operation would occur throughout the life of the Project. Emissions have the potential to exceed the Manitoba Ambient Air Quality Criteria (Government of Manitoba 2005) and Canadian Ambient Air Quality Standards (CCME 2012) prior to the implementation of mitigation measures. The emission sources would be limited to the Project Footprint and given the lack of other emission sources in the area it is expected that a change in parameter concentrations would not be measurable beyond the Project Footprint. Active construction would be spread out over 1 to 4 km at any given time therefore emissions do not have a localized point source. Vehicle emissions would be regular and frequent during construction, maintenance and operation as all construction vehicles and equipment, maintenance equipment and public vehicles have emissions. The effect is readily reversible. No adverse ecosystem and social effects are anticipated.

6.2.1.2 Predicted Effect on Greenhouse Gas Emissions

6.2.1.2.1 Construction

Construction vehicles and equipment would increase GHG emissions to the atmospheric environment. GHG emissions for the current, undeveloped state of the Project are estimated at 1,953 tonnes of CO_2, 20 tonnes of CH_4 and 0.1 tonnes of N_20, which equates to a total of 2,481 tonnes CO_2e per year (**Appendix A**; Dillon Consulting Limited 2017). This value includes the estimated GHG emissions associated with the existing winter road (construction and vehicular use), area air travel and forest processes (land cover and forest sequestration). Construction of the Project is expected to increase annual GHG emissions to 16,548 tonnes of CO_2, 21 tonnes of CH_4 and 0.8 tonnes of N_20, which equate to a total of 17,288 tonnes CO_2e during the construction phase of the project (**Appendix A**; Dillon Consulting Limited 2017). This is an increase of 14,807 tonnes CO_2e each year above existing conditions. Detailed methods, calculations and assumptions are provided in **Appendix A, Section 4.0 and Appendices** (Dillon Consulting Limited 2017). Perfluorocarbons, hydrofluorocarbons, sulphur hexafluoride and nitrogen trifluoride are not expected to be a significant source of emissions from the Project (**Appendix A**; Dillon Consulting Limited 2017).

The potential effects of increased GHG emissions from construction activities, prior to the implementation of mitigation measures, are considered negative. The potential increase of 14,807 tonnes CO_2e per year would occur for the duration of Project construction and is therefore considered medium-term. The magnitude of increase in GHG emissions would be less than 0.003% of Canada's 2030 target CO_2 emission rate of 523 Mt/year. The emission sources would be limited to the Project Footprint although the emissions would occur regularly and frequently as construction vehicles and equipment would be operating for the duration of the road construction. Considering the magnitude of the effect is so small it

would be reversible over a long period by the anticipated reduction in GHG emissions during the life of the Project. No adverse ecosystem or social effects are anticipated.

6.2.1.2.2 Operation

Public and commercial vehicle traffic during operation of the all-season road and the loss of the carbon sink due to ROW clearing would increase GHG emissions to the atmospheric environment. The all-season road traverses both wetlands and forested areas which can act as carbon sinks and sources depending on specific environmental conditions (**Appendix A;** Dillon Consulting Limited 2017). This increase in GHG emissions would however be offset by a reduction in GHG emissions with the change in mode of transportation during operation. The existing emissions, as previously noted, are estimated at 2,481 tonnes CO_2e per year, whereas during operation total GHG emissions are estimated to be 2,369 tonnes CO_2e per year which is a slight decrease (positive change). The decrease in emissions relates to the improved road surface on the all-season road relative to the winter road and subsequent improvements in fuel efficiency.

The magnitude of change in GHG emissions during operation would be negligible or slightly positive and is therefore less than 0.1% of Canada's 2030 target CO_2 emission rate of 523 Mt/year. The change in GHG emissions would occur for the duration of Project as vehicles would be continually used and the ROW clearing would be maintained. Similar to during construction, the emission sources would be limited to the Project Footprint although the emissions would be regular and frequent as from public and commercial vehicle usage. As the effect is negligible or slightly positive it would be offsetting the construction related increase in GHG emissions. Additionally, the natural revegetation of the segments of the winter road corridors not used for the all-season road would help reverse the effects from GHG emissions over a long period. No adverse ecosystem or social effects are anticipated.

6.2.1.3 Predicted Effect on Noise

Ambient noise levels may increase from vehicle and equipment use during construction, maintenance and operation of the all-season road. In addition, rock blasting represents a source of noise during construction. Environmental noise from anthropogenic sources such as construction activities, blasting and road traffic is unwanted and potentially adverse. Air-borne noise may potentially affect local receptors (ex: people), depending on magnitude and duration, causing hearing loss, sleep disturbance, interference with speech comprehension and increased risk of health effects (Health Canada 2017a). Potential effects of noise on wildlife (sensory disturbance) are discussed in **Section 6.2.5.5** and **Section 6.3.2**. The social disturbance to local communities due to noise is discussed further in **Section 6.3.4.5**.

As discussed in **Section 6.1.1.4**, with the exception of local communities and a few hunting lodges, noise is limited and restricted to local sources such as airplanes, vehicles on First Nation reserve roads, vehicular traffic along the winter road and snowmobile and ATV traffic on trails. While no ambient noise survey was conducted in the RAA, baseline ambient noise levels measured between April and June 2015 as part of the P4 Project ranged from 43.7 dB during the morning to 46.2 dB at night (overall average of 45.0 dB).

Noise levels associated with all-season road construction, measured during Project 1 as part of safety and health audits, ranged from 80 to 110 dB. Specifically, drilling was the highest at 110 dB, rock crushing was as high as 103 dB, while most heavy equipment (ex: excavator, dozer, rock truck, grader, bobcat) ranged from 83 to 100 dB, with the generator the lowest at 80 dB.

Noise, including construction noise, is attenuated with distance from source and further attenuated with terrain and other existing natural features such as forest cover. Loud construction noise dissipates by approximately 6 decibels every 30 m and is further attenuated by surrounding forest conditions that have been calculated to attenuate at a rate of 10 dBA[8] for 60 m.

The East Side Road Authority assessed the effect of construction noise on receptors, during the P4 Project and determined that based on Project 1 measured noise levels, noise disturbance is not expected to occur beyond 300 meters of construction activities and beyond 500 meters of blast sites. With the exception of drilling, sound levels would be below 70 dB approximately 50 m away.

Few human receptors are present within the Project Footprint as there are no known residences or cabins in immediate proximity to the proposed all-season road alignment. Construction activities for the project are located approximately 250 m from the nearest known residence in Manto Sipi Cree Nation, 1.5 km in Bunibonibee Cree Nation and God's Lake First Nation and 3 km in God's Lake Narrows Northern Affairs Community.

The minimum distance from a potential quarry site to the closest residence is 1.5 km. At this distance the sound level from construction activities at the quarry, based on measured attenuation outside the dwelling, would be much less than 70 decibels as measured using the "A"-weighting network and slow meter response on a sound level meter that meets the requirements for a Type 2 meter as specified by ANSI Standard ANSI S1.4-2003. Taking into account the dense forest between the quarries and the dwellings, the sound level would drop further. Additionally, with the exception of possible blasting for more materials when required during maintenance, conditions are anticipated to return to baseline once construction in the area has ceased. Therefore, the effect to surrounding communities is considered to be negligible as a result of distance to human and other receptors and in conjunction with natural attenuation of dense forest. Additional mitigation measures are discussed in **Section 6.4.1.3**.

No adverse effects of noise on local communities related to the construction phase are expected due to landscape buffering features and distance of Project components from local buildings.

While there is no known risk of hearing loss associated with sound levels below 70 dBA, the duration of daily exposure becomes an important risk factor for hearing loss (Berglund et. al., 1999). Generally, the

[8] **"dBA"** means the sound level in decibels as measured using the "A"-weighting network and slow meter response on a sound level meter that meets the requirements for a Type 2 meter as specified by ANSI Standard ANSI S1.4-2003, *Specifications For Sound Level Meters*.

louder the noise, the shorter the exposure time before hearing protection is required. Road construction site noise typically ranges from 85 to 100 dBA when heavy equipment is operating or blasting is occurring (Eaton 2000). For environments where a worker is likely to be exposed to a noise that exceeds 85 dBA L_{ex}[9], standard construction practices would mitigate risk to workers (see **Section 6.4.1.3**).

The increase in ambient noise levels is primarily from blasting and equipment use during construction but would also occur during maintenance activities and public and commercial vehicle traffic during operation and is therefore a long-term effect. As noted because of the distance from receptors, noise levels are expected to remain below guidelines. Noise would be regular and frequent during construction, maintenance and operation of the Project. While typically below the 70 dB increased noise levels from construction activities are expected to extend beyond the Project Footprint into the LAA. No ecosystem or social effects are anticipated.

6.2.1.4 Predicted Effect on Ambient Light Levels

Outside of the communities of Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Northern Affairs Community and the lodges there are no existing permanent light sources within the RAA, as previously discussed in **Section 6.1.1.5**. There is no lighting proposed associated with construction, maintenance and operation of the all-season road and therefore the Project would not change the current day-time or night-time light levels.

6.2.2 Changes to Geology and Geochemistry

There would be little to no potential change to geology and geochemistry as a result of the Project. The effects of construction activities would generally be limited to surface and subsurface soils in areas that are physically disturbed within the construction footprint as discussed in **Section 6.2.3.** Soil and rock materials would be removed from within quarry and borrow pit locations for use in road construction and maintenance. A preliminary estimate of the soil and rock volumes to be excavated and placed for Project construction and maintenance are provided in **Chapter 3**, while the proposed quarry site locations are shown in **Figure 6-6**. More detailed location information of ancillary facilities (ex: quarries, temporary access roads) would be defined during the detailed design phase. At that time, geochemical analysis of the materials would be completed and a more accurate estimate would be provided of the quantity of soil and rock materials to be removed in some locations (cut) and to be placed or added in other areas (fill).

[9] **"L_{ex}"** means the level of a worker's total exposure to noise in dBA, averaged over the entire work day based on a 3 decibel exchange rate as measured by a noise dosimeter meeting the requirements of a Type 2 instrument, as specified by ANSI Standard S1.25-1991 (R2002), *Specification for Personal Noise Dosimeters*.

6.2.3 Changes to Topography and Soil

6.2.3.1 Predicted Effect on Physiography

There would be little potential change to local physiography as a result of the Project. Construction of quarries and borrows pits for road construction would result in removal of soil and subsequent terrain alteration. Physical disturbance to soils along the road alignment would generally be limited to the removal of soils (where required to achieve desired grade/elevation), surface grading of soils directly within the construction footprint and the placement of non-native materials in places where soils are not suitable for road construction. Soil and rock materials would also be removed from within identified quarries and borrow pits.

Potential effects prior to implementation of mitigation measures were assessed to be negligible. The removal of materials from quarries and borrow pits would be limited to initial road construction and would therefore be short-term in nature. The magnitude of effects is considered minor relative to availability of materials and would be limited to the Project Footprint. The effect would occur during initial road construction, however, the terrain alteration would be permanent and is considered irreversible. No adverse ecosystem or social effects are anticipated. Indirect effects such as noise and dust from blasting and grading and alteration of drainage patterns are discussed in **Section 6.2.1** and **Section 6.2.5** respectively.

6.2.3.2 Predicted Effect on Soils

Soil may be adversely affected from possible spills or releases of fuel (ex: hydrocarbons) or other hazardous materials from construction equipment and vehicles as well as vehicular accidents. The associated changes to groundwater and surface water are discussed in **Section 6.2.4** and the predicted effects on Indigenous people and human environment are discussed in **Section 6.3.4**. The potential effects on soil quality, prior to implementation of mitigation measures, are considered negative.

Fuel or hazardous material spills could occur throughout the life of the Project and result in soils having contaminant concentrations that exceed applicable regulations. Potential spills would be localized to where hazardous materials are used and stored within the Project Footprint. During road construction there is the potential for spills to occur sporadically due to the number of construction equipment and vehicles present. Whereas spills would likely occur infrequently during road maintenance activities as there would be much less equipment. Likewise, spills would occur infrequently and be limited to vehicular accidents and other vehicle malfunctions associated with public and commercial vehicle traffic during operation. Assuming the spill or release is appropriately cleaned up and remediated the contaminant concentrations would be readily reversible. No adverse ecosystem or social effects are anticipated.

Road construction and maintenance would result in the loss of granular/lacustrine soil (sand and gravel) resources as it would be used as construction material to fill low-lying areas and to build the road to appropriate grade. Sand and gravel would also be required for routine maintenance throughout

operation. The fill, as previously described, would be obtained from quarry and borrow sites. The potential effect of soil resource loss due to road construction is negative and long-term prior to implementation of mitigation measures.

The amount of soil resources to be used during construction would be minor relative to available materials in the vicinity of the Project and would be restricted to being obtained from the Project Footprint. Soil resource loss for road construction would only occur infrequently during the construction phase of the Project, however, once used the effect is irreversible. No adverse ecosystem or social effects are anticipated. Similarly, the potential effect of soil resource loss due to road maintenance during operation prior to implementation of mitigation measures is considered negative and long-term. The amount of soil resources to be used during maintenance would be less than during construction so again is considered minor relative to available materials in the vicinity of the Project and would be restricted to being obtained from the Project Footprint. Road maintenance would occur sporadically during operation of the road and again the effect is irreversible. No adverse ecosystem or social effects are anticipated.

6.2.3.3 Predicted Effect on Permafrost and Thaw Settlement

The Project is located within an area of sporadic discontinuous permafrost and low ground ice content, as discussed in **Section 6.1.3.3**, with permafrost being most widespread in peatlands and poorly drained clayey soils in the northern half of the ecoregion (Heginbottom *et al*. 1995; Smith *et al.* 1995). In regions of discontinuous permafrost, thawing may produce thickening of the active layer, settlement and terrain instability (Batenipour 2012).

Further geotechnical investigations would be completed during detailed design of the road, as previously noted, to identify areas, degree and the extent of permafrost along the proposed alignment and the risk of thaw settlement. Based on results of the detailed geotechnical investigations, appropriate construction strategies would be implemented to minimize the potential for ground thawing such as removing the layer of permafrost (if shallow), limiting the removal of peat moss from the subgrade, timing of construction (building permafrost affected areas in winter), air-convection/ventilated embankment and other methods. The proper design and mitigation measures are dependent on the degree and extent of the permafrost in each area identified. If following construction there are areas that thaw and settle these would be addressed with road maintenance.

6.2.4 Changes to Groundwater and Surface Water

6.2.4.1 Predicted Effect on Surface Water

6.2.4.1.1 Drainage and Flow Patterns

Constructions of the all-season road, quarries, borrow pits, access roads, watercourse crossings and road drainage could result in the alteration of surface water drainage and flows. A substantial base of literature

exists regarding the effects of road development on hydrological systems (Burns 1972; Findlay and Houlahan 1997; Forman and Alexander 1998). These studies indicate that modifications to the hydrological environment due to road development may affect surface water flow and quality. Depending on local conditions, modification of natural surface water flow by road construction can concentrate flow at certain points potentially resulting in localized flooding, soil erosion, channel and bank modification and siltation of watercourses. As all watercourse crossings would be designed to accommodate 1:50 year flood events it is unlikely that the project would alter flow patterns sufficiently to alter the existing ice freeze-up dynamics.

The potential effect of the Project on surface water drainage and flows, prior to the implementation of mitigation measures, was assessed to be negative and would occur throughout the life of the Project. Without appropriately sized culverts at watercourse crossings and drainage equalization, changes in flows could be outside the range of natural variation and greater than 25% of baseline conditions. The timing of flow disruptions has the potential to negatively affect fish and fish spawning activities, with potential flow changes extending beyond the Project Footprint within the LAA. Potential changes in drainage and flows would be continuous while the road is in place but would be readily reversible. Disruption of surface water drainage was assessed to have a moderate ecosystem effect on environment components (ex: fish) that are important to local communities.

6.2.4.1.2 Erosion and Sedimentation

Surface water quality may be reduced due to erosion and sedimentation from the all-season road, quarries, borrow pits, access roads, watercourse crossings and associated work areas during construction and throughout maintenance and operation. Vegetation removal and improper construction practices near watercourses can result in increased erosion leading to sedimentation of streams. Clearing streamside vegetation may result in decreased bank stability and exposure of bare soils that are susceptible to erosion. Heavy machinery and equipment working near the watercourse can damage vegetative cover and cause rutting and erosion of floodplains and channel banks. Soil compaction occurring during construction can reduce infiltration potentially leading to an increase in runoff that can initiate and promote erosion and the transport of sediment to the aquatic environment. Sediment transport and deposition in the aquatic environment can reduce water quality and it can also have adverse effects to aquatic life as discussed further in **Section 6.3.1.5**.

Road maintenance activities such as grading and repair of the road surface and shoulders would be on-going during operation of the all-season road and have the potential to generate sediment in runoff from the road surface. Minor and temporary increases of suspended sediments may also occur during maintenance with the removal of debris from watercourse crossing and culverts. The majority of watercourses along the alignment are low-gradient channels with dense vegetation in the channel and/or on the banks, as described in the Aquatic Environment – Existing Environment Report (**Appendix C-1, Appendix 4 and 5**; North/South Consultants Inc. 2017a). In these watercourses, suspended sediments tend to settle out in close proximity to the source such that the effect would largely be localized to the

Project Footprint but in larger rivers effects may extend downstream into the LAA. The potential for a measurable increase in suspended sediment concentrations, however, is expected to be low due to the dilution provided by the higher flows in larger rivers.

The potential effect of erosion and sedimentation on water quality, prior to the implementation of mitigation measures, was considered negative and and would occur throughout the life of the Project. The increase in suspended sediment in waterbodies may result in concentrations which exceed applicable regulations and guidelines and may adversely affect fish and aquatic life. The timing of erosion and sedimentation has the potential to negatively affect fish and fish spawning activities. Effects would occur sporadically as erosion and sedimentation would occur primarily during precipitation events, spring runoff and prior to the re-establishment of vegetation on disturbed soils. While the erosion would occur within the Project Footprint, without any controls the resulting sedimentation could extend into the LAA. When the source of erosion and sedimentation is controlled the effect to water quality would readily return to existing conditions. Reduced surface water quality as a result of erosion and sedimentation was assessed to have a moderate ecosystem effect on environment components (ex: fish) that are important to local communities.

6.2.4.1.3 Spills and Hazardous Materials

Surface water quality may be reduced due to the accidental introduction of deleterious substances such as oil, fuel (diesel and gasoline), hydraulic fluids or other hazardous materials (ex: herbicides) into waterways during construction, maintenance and operation. This would be primarily associated with use of construction and maintenance equipment or vehicles near watercourses but could also occur from vehicular accidents during operation.

The potential effect of spills or release of hazardous materials on water quality, prior to the implementation of mitigation measures, was considered negative and would occur throughout the life of the Project. Spills could potentially result in contaminant concentrations that exceed applicable federal and provincial guidelines and may affect water quality beyond the Project Footprint within the LAA. The timing of decreased water quality has the potential to negatively affect fish and fish spawning activities at sensitive life stages. The frequency of spills occurring during construction would likely be sporadic due to the amount of heavy machinery that would be working on road construction. During operation however, the frequency of spills would be infrequent as they would be associated with maintenance activities or vehicular accidents near watercourses. Reduced surface water quality as a result of spills or release of hazardous materials is reversible over and long period and was assessed to have a moderate ecosystem and social effect because of the associated potential effect to fish and human health, as discussed in **Section 6.3.1.1** and **Section 6.3.4.5**, respectively.

6.2.4.1.4 Acid Rock Drainage

Surface water quality may be reduced due to geochemical leachate run-off (acid rock drainage) generated by the blasting and excavation of bedrock during construction. The fracturing and exposure of granitoid

and gneiss bedrock types at quarry sites and along the proposed all-season road could, through natural chemical processes, generate acidic runoff that potentially leaches metals if the rock contains sulphide minerals and concentrations of metals. The risk and degree of adverse environmental effects due to acid rock drainage and/or metal leaching is dependent on many factors such as the amount of sulphide mineralization compositions present in the exposed bedrock and the structure and mineral composition of the rock.

There are no records of lithologies within the Project Footprint or LAA that are known to contain sulphide-bearing minerals and/or high metal content, as discussed in **Section 6.1.2.1**. The potential for local bedrock formations to generate acid rock drainage would be assessed in the future during project design. Quarry and borrow pits would not be developed at locations where there is potential for acid rock generation and therefore there is little to no likelihood of significant adverse effects due to acid rock generation resulting from the Project.

Given the lack of geological and geochemical data for the east side of Lake Winnipeg and the low likelihood of adverse effects, properties and rates of acid generation and metal leaching were not tested. Similarly, volume estimates of excavated materials with potential for acid rock drainage and metal leaching as well as quality and quantity of potential leachate, effluent and seepage is not available. Measures implemented to avoid acid rock drainage and metal leaching potential are discussed in **Section 6.4.4.1**.

6.2.4.2 Predicted Effect on Groundwater

6.2.4.2.1 Groundwater Availability

The development of quarries and borrow pits for the road construction has the potential to reduce the groundwater table in localized areas immediately surrounding the excavated areas, in particular if any dewatering of the excavated area is required. The potential to lower the localized groundwater table, prior to the implementation of mitigation measures, is considered a negative effect although it would be short-term associated with establishing the quarry or pit.

The potential change in the groundwater levels is anticipated to be small (less than 15% of seasonal variation) and localized to the area immediately surrounding the quarries and borrow pits within the Project Footprint. The effect is expected to occur sporadically, associated with establishing quarry areas and borrow pits during construction and potentially during maintenance if additional quarries and borrow pits are required. The effect is considered readily reversible and no adverse ecosystem or social effects are anticipated due to the lack of groundwater users throughout the Indigenous RAA.

6.2.4.2.2 Groundwater Quality

Groundwater quality may be reduced due to the accidental spill or release of deleterious substances such as oil, fuel (diesel and gasoline), hydraulic fluids or other hazardous materials (ex: herbicides) during construction, maintenance and operation. This would be primarily associated with use of construction and maintenance equipment or vehicles but could also occur from vehicular accidents during operation.

Spills of deleterious substances could potentially infiltrate into the groundwater if not cleaned up, in particular on porous soil materials, thereby reducing groundwater quality. The potential effect of reduced groundwater quality from spills, prior to the implementation of mitigation measures, was considered negative and would occur throughout the life of the Project.

Depending on the quantity and type of spill the contaminant concentration may exceed applicable federal and provincial groundwater guidelines and potentially affect water quality beyond the Project Footprint within the LAA. The frequency of spills occurring during construction would likely be sporadic due to the amount of heavy machinery that would be working on road construction. During operation however, the frequency of spills would be infrequent as they would be associated with maintenance activities or vehicular accidents. If groundwater quality is reduced because of spills it would take a long time to reverse the effect. While potable water in the region is from surface water sources reduced groundwater quality as a result of spills or release of hazardous materials was assessed to have a moderate social effect for the potential to be used for drinking water.

6.2.5 Changes to Riparian, Wetland and Terrestrial Environments

6.2.5.1 Predicted Effect on Vegetation

Potential environmental effects from construction, maintenance and operation of the Project include the loss and disturbance of vegetation and wetlands due to clearing, increased risk of invasive species spread, impairment of vegetation due to spills and hazardous materials and increased risk of forest fire. These potential effects are discussed in the following sub-sections while additional potential effects related to vegetation including the loss of species at risk as well as disturbance or removal of key community harvest areas of plant species of interest are discussed in **Section 6.3.3** and **Section 6.3.4**, respectively.

6.2.5.1.1 Disturbance and Loss of Plant Communities

Vegetation clearing for the all-season road ROW, temporary access roads, quarries, borrow pits, work areas and camps during construction and maintenance would result in the loss of plant communities, alteration of the composition, diversity and structure as well as fragmentation. The footprint of cleared areas required for permanent Project components (ex: all-season road ROW, bridges, culverts, maintenance quarries) would be approximately 924 ha (9.24 km^2) and for temporary Project components and activities during Project construction (ex: construction camps, equipment laydown areas, borrow areas, construction quarries) is estimated to be less than 545 ha (5.45 km^2).

In total, the Project would result in a permanent and temporary footprint of approximately 1,469 ha (14.7 km^2). Vegetation to be cleared consists primarily of coniferous forest vegetation cover (dense, open and sparse), as described in **Section 6.1.4.1**. Additional detail regarding forest types to be cleared is available in the Vegetation Characterization and Effects Assessment of the Proposed All-Season Road Project 6 (**Appendix B-2**, **Section 4.4.1**; Szwaluk Environmental Consulting Ltd. *et al.* 2017b).

The vegetation composition, diversity and structure may be modified immediately adjacent to the areas disturbed by clearing during construction. The removal of native vegetation and the creation of new forest edges would increase solar radiation exposure and change the microclimate along these edges, which may cause changes in species composition, diversity and structure (Ecological Land Surveys Ltd. 1999). Along newly created forest edges, windfall may result due to extreme weather events (ex: high winds) (**Appendix B-2**; Szwaluk Environmental Consulting Ltd. *et al.* 2017b).

Vegetation clearing during construction for the all-season road, quarries and access roads would result in discontinuity in the spatial distribution of native vegetation, resulting in fragments and ecosystem patches. A consequence of fragmentation can be the isolation of vegetation communities that may result in reduced pollen quantity and reproduction. The continued fragmentation of an area can cause long-term reduction in species diversity and suitable habitat (Public Service Commission of Wisconsin 2009; **Appendix B-2**; Szwaluk Environmental Consulting Ltd. *et al.* 2017b).

The loss, disturbance, reduced diversity and fragmentation of plant communities due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps, prior to the implementation of mitigation measures, is considered negative. Vegetation clearing would likely result in measurable negative effects to vegetation species and composition that would occur throughout the life of the Project. The timing of clearing could occur during critical life stages. Clearing would be restricted to the Project Footprint, however potential changes in species structure and composition related to edge effects may occur beyond the Project Footprint and into the LAA. Clearing would occur initially during construction and infrequently during maintenance. The effect of clearing is reversible over a long period as native vegetation would grow back in areas not maintained for sightlines. No adverse ecosystem or social effects are anticipated.

6.2.5.1.2 Disturbance and Loss of Wetlands

The Project would result in the disturbance and loss of wetlands (ex: bog, fen, marsh, swamp, shallow water) due to clearing and construction of the all-season road. Wetlands in the boreal forest are highly connected systems that transport water and nutrients across the landscape. Water balances that have been altered in wetlands may result in increased drainage (drier moisture regime) or flooding that could affect species abundance and composition (Ecological Land Surveys Ltd. 1999). Road development has the potential to impede water flow resulting in long-term vegetation changes (Ducks Unlimited Canada *et al.* 2014). Only approximately 3.6 km^2 of the Project Footprint consists of wetland vegetation with nearly half of the wetland types being bog-fen complexes, as previously described in **Section 6.1.4.1** and **Table 6.3**. Additional discussion regarding effects of potential changes to surface water drainage is provided in **Section 6.2.4.1.1**.

The disturbance and loss of wetlands due to clearing and construction of the all-season road, prior to the implementation of mitigation measures, is considered negative. The disturbance and loss of wetlands could measurably affect vegetation species or communities that would occur throughout the life of the

Project. The timing of wetland loss or disturbance could occur during critical life stages of several species that inhabit these environments. The clearing and construction activities and resulting effects would be restricted to the Project Footprint and would only occur during initial road construction. Wetland disturbance and loss is reversible over a long period. The effect is considered to have moderate ecosystem effects.

6.2.5.1.3 Introduced Species

Granular material used for construction and equipment used for construction and maintenance activities can be a source of non-native and invasive plant species which can displace native plant communities and modify vegetation composition and structure in the area. Where road development occurs, a change in plant composition adjacent to the road is generally a result non-native and invasive species introduction. A large number of invasive species have the potential to be introduced during project activities (**Appendix B-2**; Szwaluk Environmental Consulting Ltd. *et al.* 2017b).

The increased risk to introduce invasive and non-native plant species during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. Introduction of invasive and non-native species would likely measurably affect native plant communities and vegetation composition structure. Introduced invasive species can out-compete native species preventing native species from flowering and spreading seed. Once introduced, if not controlled, invasive and non-native plant species could spread beyond the Project Footprint into the vegetation LAA. Given that the area to be cleared is only 60 m of the 100 m ROW, the 20 m of undisturbed vegetation on each side of the cleared area would make it unlikely that many invasive or non-native plants spread beyond the Project Footprint.

The effect is continuous as vehicle use during operation and maintenance carries a risk of introducing invasive and non-native species throughout the life of the Project. Displaced native plant communities and modified vegetation composition and structure in the area is considered reversible over a long period with control of the invasive species. No adverse ecosystem or social effects are anticipated.

6.2.5.1.4 Spills and Herbicide Use

Vegetation may be lost or impaired due to the accidental spills or releases of deleterious substances such as oil, fuel (diesel and gasoline) or hydraulic fluids during construction, maintenance and operation. This would be primarily associated with use of construction and maintenance equipment or vehicles near watercourses but could also occur from vehicular accidents during operation. The release of fuels or other hazardous substances can result in the loss or impairment of vegetation due to toxicity. It is difficult for plants and plant communities to recover after an oil spill (Walker *et al.* 1978).

The application of herbicides during maintenance activities may also result in the loss or impairment of desirable plant species in the Project Footprint. Unfortunately, herbicides not only inhibit the growth of undesirable species but can also negatively affect desirable species by causing stress and possible

mortality of vegetation that may be considered important for wildlife, traditional uses, or botanical value (**Appendix B-2**; Szwaluk Environmental Consulting Ltd. *et al.* 2017b).

The loss or impairment of vegetation due to spills and non-targeted herbicide application during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. A spill or release of deleterious substances may measurably affect vegetation species or communities and could occur when vegetation is trying to establish or flower. The potential for spills would, however, be limited to the Project Footprint where construction and maintenance activities are occurring. The potential impairment to vegetation may occur sporadically during discrete spills, accidents and herbicide application. Vegetation loss and impairment is reversible over a long period. No adverse ecosystem or social effects are anticipated.

6.2.5.1.5 Wildfires

Project construction, maintenance and operation may increase the risk of wildfires from fires and explosions. Wildfires have the potential to develop from the accumulation of slash during clearing and construction activities and from human related causes as a result of new access during road operation (**Appendix B-2**; Szwaluk Environmental Consulting Ltd. *et al.* 2017b). The boreal forest fire season is April through October. Lightning fires occur generally in late spring/summer, while human caused fires tend to occur in early spring and fall (Stocks *et al.* 2003). In the boreal forest, lightning strikes account for about 35% of fires, although they are responsible for about 85% of the total area burned (Brandt *et al.* 2013).

The increased risk of wildfires from fires and explosions during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. A wildfire would measurably affect vegetation species or communities, although the boreal forest is adapted to wildfire succession. Wildfires occur sporadically and have the potential to cover large areas and therefore extend beyond the LAA into the RAA. Wildfires are an important natural disturbance that drives vegetation dynamics at the landscape, stand and species level and is therefore reversible over a long period (**Appendix B-2;** Szwaluk Environmental Consulting Ltd. *et al.* 2017b). No adverse ecosystem or social effects are anticipated.

6.2.5.2 Predicted Effect on Topography, Drainage, Geology and Hydrogeology

Potential effects of the Project on these topics were previously discussed in the EIS as follows.

- topography, **Section 6.2.3**
- drainage, **Section 6.2.4.1.1**
- geology, **Section 6.2.2**
- hydrogeology, **Section 6.2.4.2**

6.2.5.3 Predicted Effect on Wetlands

Potential effects of the Project on wetlands were previously discussed in **Section 6.2.5.1.2**.

6.2.5.4 Predicted Effect on Riparian Areas

Potential effects of the Project on riparian areas are discussed in **Section 6.3.1.6**.

6.2.5.5 Predicted Effect on Mammals

Potential environmental effects from construction, maintenance and operation of the Project include the alteration, fragmentation or loss of habitat, sensory disturbance, increased hunting pressure, increased vehicular collisions, increased predation and the introduction of disease. These potential effects are discussed in the following sub-sections while additional potential effects related to mammals including the loss of species at risk as well as Indigenous land and resource uses are discussed in **Section 6.3.3** and **Section 6.3.4**, respectively.

6.2.5.5.1 Ungulates

Ungulates considered in this EA include woodland caribou and moose (**Chapter 4**). The Pen Islands (Eastern Migratory) and Norway House (Boreal Woodland) caribou were assessed as one VC and collectively referred to as woodland caribou or caribou. Woodland caribou were selected as a VC due to local harvest, their ecological importance, the Threatened status of boreal woodland caribou under SARA and ESEA and the designation of Eastern Migratory caribou as Endangered by COSEWIC. Moose are also considered a VC due to their importance for local harvesting, their ecological importance and as a habitat indicator generalist. Within each of the potential effects detailed in the following sub-section, moose and woodland caribou are typically assessed together due to similarity of effects however; details for each species are discussed separately. The species have been assessed individually in the Wildlife Characterization and Effects Assessment Report (**Appendix D-2**, **Sections 7.1 and 7.2**; Joro Consultants 2018b).

6.2.5.5.1.1 Habitat Alteration, Fragmentation and/or Loss

Clearing of native vegetation during construction and maintenance would result in the alteration, fragmentation and loss of moose and caribou habitat within the ROW, temporary access roads, quarries, borrow pits, work areas and camps.

Habitat fragmentation due to clearing of native vegetation can result in moose avoidance of roads. Research has shown that moose avoid highways at a coarse scale but use them at a finer scale (Laurian *et al*. 2008). In some cases, moose use roads to acquire road-side salts (Laurian *et al*. 2008), however salts would not be used during construction or operation of the Project. While habitat fragmentation may result to some degree from road avoidance, there is evidence that moose cross roads regularly (Laurian *et al*. 2008). Moose are also known to be attracted to linear feature ROWs due to improved forage opportunities resulting from vegetation disturbance and increased forage (Ballard *et al.* 1988; Ricard and Doucet 1999).

Moose densities estimated through aerial surveys were 0.02 moose/km^2 in 2016 and 0.04 moose/km^2 in 2017 within the Wildlife LAA, which are relatively low compared to more southerly moose populations (**Appendix D-1**; Joro Consultants 2018a). The results of moose habitat modelling estimate that approximately 5.5 km^2 of winter habitat would be removed due to clearing which represents 0.4% of winter habitat within the Wildlife LAA and 0.1% within the Wildlife RAA. The results indicate that habitat is not limiting and is distributed across the Wildlife RAA (**Appendix D-2**; Joro Consultants 2018b).

Overall road densities in the RAA are very low (0.04 km/km^2) and well below published suggested thresholds of access density for moose (**Appendix D-2**; Joro Consultants 2018b). Habitat loss and fragmentation affecting the moose population is not expected. Based on the overall low population density combined with the low density of roads, moose would adapt to the presence of the road, likely avoiding or moving across the road to avoid vehicles (**Appendix D-2**; Joro Consultants 2018b).

Based on the wildlife surveys, the Wildlife RAA is on the fringe of both the Pen Islands (Eastern Migratory) and Norway House (Boreal Woodland) caribou range. The location of seasonal core areas indicates that approximately 1.4% to 6.24% of the total area of use for the Pen Islands range overlaps the Wildlife RAA (**Appendix D-2**; Joro Consultants 2018b). The Norway House range, as identified by MSD, does not overlap with the Wildlife RAA (**Appendix D-2**; Joro Consultants 2018b).

Based on the results of telemetry, trail camera and TK information, a small number of woodland caribou have been observed in the Wildlife RAA during summer. These data indicate primarily winter use by the Pen Islands animals in the northeast corner of the Wildlife RAA and winter occupation of the Norway House animals in a small fraction of the north-west portion of the Wildlife RAA (**Appendix D-2**; Joro Consultants 2018b). Based on the results of the calving and winter habitat modelling, high quality habitat is not limiting in the Wildlife RAA or across the larger region including the Molson Boreal Woodland Caribou MU and the Hayes River Upland Ecoregion. The Molson MU overlaps with the western portion of the Wildlife RAA and 20 km corridor LAA, with 594 km^2 of high quality caribou winter habitat occurring in the area of overlap with the Wildlife RAA and 102 km^2 of high quality winter habitat occurring in the overlap with the Wildlife LAA (**Appendix D-2**; Joro Consultants 2018b). Of the high quality caribou calving habitat, 466 km^2 overlaps with the Wildlife RAA and 119 km^2 of high quality caribou calving habitat occurs in the overlap with the Wildlife LAA (**Appendix D-2**; Joro Consultants 2018b).

Habitat disturbance in the Molson MU and Pen Islands caribou range of those that were proximate to the Project are both below the 35% disturbed habitat threshold for boreal woodland caribou identified by Environment Canada (2012). As there is currently no disturbance threshold defined for Eastern Migratory caribou, the boreal woodland caribou disturbance threshold was used for Pen Islands habitat disturbance analysis. The Pen Islands range has a total disturbance of 23% and the Molson MU has a total disturbance of 28%, with natural disturbance from fires being the greatest contributors to overall disturbance (**Appendix D-2**; Joro Consultants 2018b).

Alteration, fragmentation and loss of moose and caribou habitat due to clearing of native vegetation during construction and maintenance within the ROW, temporary access roads, quarries, borrow pits, work areas and camps, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. Moose and caribou populations may be measurably affected by the alteration, fragmentation and loss, although the amount of habitat potentially affected is small relative to habitat availability. The effect could occur during a critical life stage (ex: calving) and could affect ungulates beyond the Project Footprint within the LAA. The changes to habitat would occur sporadically, primarily associated with initial clearing but are considered irreversible as long as the all-season road remains. Moderate ecosystem effects were assessed due to the importance of ungulates to local communities.

6.2.5.5.1.2 Sensory Disturbance

Vehicle and equipment noise and vibration during construction, maintenance and operation would result in increased sensory disturbance to and displacement of moose and caribou. Given that the existing winter road has been part of the Wildlife LAA landscape for several decades, moose are likely accustomed to the present level of activities associated with traffic and hunting during winter. Sensory effects would include moose avoidance of high quality habitats near the ROW during construction and to a lesser extent during operation. Clearing during winter could result in limited displacement of moose, however, as described in **Section 6.2.5.5.1.1**, the low densities of moose observed during winter would suggest that a low number of individual animals would potentially be affected.

During operation, access normally restricted to winter would result in year-round traffic, however, traffic levels are anticipated to be low. Typically, winter traffic volumes are higher due to the linkage with other winter roads when much of the larger truck traffic hauling goods would occur. Other activities such as increased ATV traffic or access to lakes or rivers for fishing may result in higher rates of disturbance in proximal moose habitat that are accessed from the all-season road (**Appendix D-2**; Joro Consultants 2018b).

Caribou behaviour strategies and avoidance of anthropogenic disturbance, including sensory disturbance, are known to be associated with predator avoidance. Leclerc *et al.* (2014) found that female caribou that calved near cutovers with associated high road densities had fewer calves than those that calved away from these features. However, results of fidelity analysis also illustrates that female caribou exhibit large movements between calving site selection from year to year and if present, would select other potential high quality calving habitat available throughout the Wildlife LAA and RAA.

Modelled caribou calving habitat is not limiting as described in **Section 6.2.5.5.1.1** and only one female Pen Islands caribou was suspected of calving in the Wildlife RAA in 2011, approximately 22 km south-east of the Wildlife LAA, well separated from the all-season road (**Appendix D-2**; Joro Consultants 2018b). Results of the Path Trajectory Analysis (annual movement) illustrate that the Pen Islands caribou travel on average more than 3,500 km per year, which is approximately 2.3 times the annual movements calculated

for the Norway House boreal woodland caribou population. This is consistent with recorded movement data for the Pen Islands caribou, indicating the migratory nature of this herd (Abraham *et al*. 2012; Berglund *et al*. 2014). The large distances travelled, in combination with the analysis of time spent in the Wildlife RAA by all collared Pen Islands caribou (27.1 days), provides rationale for the low predicted effect for sensory disturbance and displacement. As no Norway House animals calved within the Wildlife RAA, the effect of sensory disturbance and displacement is predicted to be low.

The potential increase in sensory disturbance to moose and caribou due to vehicle and equipment noise and vibration during construction and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. Moose and caribou populations may be measurably affected by the sensory disturbance, although the amount of habitat potentially affected is small relative to habitat availability. The sensory disturbance would be continuous during construction, maintenance and operation of the all-season road and could occur during critical life stages (ex: calving). Given the mobility of ungulates and the degree to which sound travels, effects would be likely extend beyond the Project Footprint within the Wildlife LAA. As long as the all-season road remains the sensory disturbance would continue and potential effects to moose and caribou are considered irreversible. The ecological and social contexts are considered high as boreal woodland caribou are listed by SARA and ESEA and Eastern Migratory caribou are assessed by COSEWIC.

6.2.5.5.1.3 Increase in Hunting Pressure

The Project has the potential to increase hunting pressure on moose and caribou resulting in increased mortality because of the increased number of hunters during construction and the increased access along the all-season road during operation.

Mortality to moose because of increased hunting access has been well documented and has resulted in high rates of overharvest in some areas. Considering the large geographic area in GHA 3 there is a low likelihood of a major increase in moose harvest resulting in a decline in moose populations. The existing winter road has provided ongoing access for decades to locals to hunt moose for traditional and domestic use. During summer and fall, there would be opportunities for local resource users to gain better access to rivers and lakes which may provide additional hunting opportunities away from the Project (**Appendix D-2**; Joro Consultants 2018b). There is little licensed harvesting of moose in the area currently and due to the remoteness of the area and the fact that the Project is not linking to year-round all-weather access outside the wildlife RAA, it is not expected that there would be an increase of hunters from other areas. The limited licensed harvest in combination with the low moose densities and overall low fragmentation as described in **Section 6.2.5.5.1.1** is not expected to result in a measurable increase of moose harvest in the Wildlife RAA. While moose populations in the Wildlife RAA are not likely to be affected by an increase in moose harvest by Indigenous and licences hunters, the degree to which moose numbers in the Wildlife LAA respond to long term harvest near the all-season road is unknown.

The potential increased hunting pressure on moose during construction and along the all-season road during operation resulting in increased moose mortality, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The worst case scenario would see increased hunting pressure that could result in easily observable or measurable population changes. Moose hunting occurs year-round therefore is considered continuous and could occur during critical life stages (ex: calving). The increased access along the all-season road could provide access to watercourses that would enable hunting beyond Wildlife LAA into the RAA. Once the new access has been constructed it is considered irreversible. The risk of moose mortality from increased hunting pressure is considered to have a moderate ecosystem effect that is important to local communities.

Results of baseline surveys and TK workshops indicate that caribou are used as a seasonal domestic food source and are culturally important to First Nations communities throughout the Wildlife RAA. Caribou hunting occurs in fall and winter and currently in proximity to existing winter roads and therefore the Project would not likely have a measurable increase in caribou harvest. Caribou are known to migrate through the area, however, there are years when the Pen Island caribou do not occupy areas near Gods Lake (**Appendix D-2**; Joro Consultants 2018b). Given the limited time herds spend in the Wildlife RAA the potential increase in mortality from hunting would be small relative to the population of the Pen Islands caribou, which is estimated at greater than 16,000 animals (COSEWIC 2017).

The potential increased hunting pressure on caribou during construction and along the all-season road during operation resulting in increased caribou mortality, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The worst case scenario would see increased hunting pressure that could result in a measurable effect to populations. As caribou are seasonally hunted, typically in the winter, critical life stages (ex: calving) are avoided and the effects would occur sporadically. The potential effect would likely extend beyond the Project Footprint within the LAA. Once the new access has been constructed it is considered irreversible. The ecological and social contexts are considered high as boreal woodland caribou are listed by SARA and ESEA and Eastern Migratory caribou are assessed by COSEWIC

6.2.5.5.1.4 Mortality Due to Vehicular Collisions

There may be an increase in moose and caribou mortality due to vehicle collisions with the increased traffic during construction and maintenance activities as well as public and commercial vehicle traffic during operation of the all-season road. Moose may avoid roads at a course scale, as described in **Section 6.2.5.5.1.1**, but do cross roads resulting in potential for vehicle collisions. Laurian *et al.* (2008) show that both forestry roads and highways were crossed by a small fraction of collared moose, mostly between May and July indicating that moose tend to avoid road corridors, which in the long term likely reduces their chance of mortality by wolves, hunters and vehicles (Laurian *et al.* 2008; Shanley and Pyare 2011). The predicted effect of increased vehicle collisions with moose is low for this area due to the combination of low moose densities and overall low road density in the Wildlife LAA (**Appendix D-2**; Joro Consultants 2018b).

Likewise, there is potential for increased vehicular collisions resulting in mortality to caribou, although, as described in **Section 6.2.5.5.1.1**, the Project is only on the fringe of woodland caribou ranges and caribou densities in the Wildlife RAA are low. While Pen Islands caribou occur within the Wildlife RAA during all seasons, as noted in **Section 6.1.4.5.1.3**, the largest portion of seasonal core use in the Wildlife RAA occurs in late winter, when the existing winter road is in operation.

The potential increase in moose and caribou mortality due to vehicular collisions during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The effect is limited to the Project Footprint where vehicle usage occurs and would occur at the individual animal level, not likely to have a measurable effect on ungulate populations in the Wildlife RAA. With all-season road traffic occurring throughout the year there is potential for collisions to occur during critical life stages (ex: calving). Given the anticipated low traffic volumes and relatively low ungulate densities, ungulate collisions with vehicles are only expected occasionally during the life of the Project. The potential effect is considered irreversible as long as the all-season road remains. The risk of increased ungulate mortality due to vehicle collisions is considered to have a moderate social and ecosystem effect due to the importance of moose and caribou to local communities.

6.2.5.5.1.5 Mortality Due to Increased Predation

There may be an increase in moose and caribou mortality due to increased predation by wolves from increased access beyond that provided by the existing winter road and transmission lines. Some literature has suggested that wolves move along constructed linear corridors such as roads (Kunkel and Pletscher 2000; Stein 2000). An increase in linear features, such as the proposed all-season road, may therefore allow predators (wolves) to access new areas that may affect existing predator-prey dynamics.

Various studies have illustrated that linear corridors can increase a wolf's travel speed, increasing their distribution and travel routes and therefore increasing interactions with prey species such as ungulates (Thomas 1995; James and Stuart-Smith 2000; Courbin *et al*. 2009). This change in landscape can result in decreased search times for prey, increased predation efficiency and increase access to areas where prey were previously safe due to low access (Thomas 1995). The threat of mortality to wolves from vehicles, human shooting and trapping can, however, reduce wolf use of roads (Mech *et al*. 1998) which could counteract the potential increase in wolf activity along the road. James and Stuart-Smith (2000) found that increases in linear disturbance, resulting in an increase in predation by wolves caused an increase in caribou mortality, however, this was observed in a highly fragmented landscape.

Based on wolf collaring and telemetry studies conducted from 2013 to 2015 as part of the P4 Project, wolves were shown to use anthropogenic features far less than natural linear features. Monitoring activities conducted as part of the P4 Project did not identify a significant change in wolf predation on moose and showed that wolf kill sites were not correlated with anthropogenic linear features (East Side Road Authority 2016a). During field investigations conducted for the proposed Project, moose, caribou

and wolves were observed at low frequencies in the Wildlife LAA and RAA and therefore increased predation as a result of wolves utilizing the new all-season road is predicted to be minimal (**Appendix D-2**; Joro Consultants 2018b).

The potential increase in ungulate mortality as a result of increased predation from wolves, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The potential increase in mortality is not likely to have a measurable effect on the population for the reasons discussed above. The effect would likely be beyond the Project Footprint within the Wildlife LAA and could occur during critical ungulate life stages as wolves hunt year-round. Predation was assessed to be sporadic and is considered reversible over a long period. The risk of increased ungulate mortality due to increased predation is considered to have a moderate ecosystem effect due to the importance of moose and caribou to local communities.

6.2.5.5.1.6 Mortality Due to Introduction of Disease

There may be an increase in moose and caribou mortality due to introduction of disease from white-tailed deer. The occurrence of brainworm (*Parelaphostrongylus tenuis*) and giant liver fluke (*Fascioloides magna*) are associated with the sympatric presence of white tailed deer. White-tailed deer are common carriers of parasites such as brainworm that can be transmitted to other ungulate species such as moose and caribou which have a lower resistance and therefore higher mortality if infected. No white-tailed deer were observed during any field surveys, on trail cameras, or reported by local resource users. Longer winters and deeper snow compared to conditions found in southern Manitoba make it unlikely for the northern extent of white-tailed deer persistence to extend near the Wildlife RAA in any foreseeable future. Potential for increased populations of white tailed deer and exposure of moose and caribou to parasites and disease are extremely low and not expected. There is a high degree of confidence in this assessment because the northern limit of white-tailed deer persistence is currently greater than 350 km south of the Wildlife RAA (**Appendix D-2**; Joro Consultants 2018b).

The potential for increased moose and caribou mortality due to introduction of disease from white-tailed deer, prior to the implementation of mitigation measures, is considered negligible due to the distance between the Project and the range of white-tailed deer. If disease were to be introduced to ungulates in the Wildlife RAA, the effect would be long-term and could extend throughout the Wildlife RAA. Effects would likely occur at the individual level and would not measurably affect the population. The effect is considered reversible over a long period. The risk of increased ungulate mortality due to introduction of disease from white-tailed deer is considered to have a moderate ecosystem effect due to the importance of moose and caribou to local communities.

6.2.5.5.2 Aquatic and Terrestrial Furbearers

Baseline data were gathered for a number of furbearer species of interest, including those important to local resource users within the Indigenous RAA. For the purpose of this assessment, beaver (*Castor canadensis*) was selected as the representative aquatic furbearer VC and marten (*Martes americana*) was

selected as the representative terrestrial furbearer VC. To facilitate assessing potential Project effects information is provided in this section on the life history and habitat characterization of these two species. While potential environmental effects to selected VCs are generally representative of other aquatic and terrestrial furbearers respectively, some potential effects may not be pertinent to all species. Information on other furbearers is found in **Section 6.1.4.5**.

Data on beaver and marten were gathered using a combination of sources including aerial multispecies winter track surveys, trail camera studies and from observations provided by trappers and other local resource users.

Beaver is a semi-aquatic furbearer species commonly found throughout Manitoba in aquatic and riparian areas of lakes, ponds, creeks, rivers and other waterbodies. Beaver was selected as a VC to represent aquatic furbearers as its habitat requirements represent the habitat requirements for other aquatic furbearer species such as muskrat, mink and otter. The beaver and other aquatic furbearers are important for trapping as discussed throughout **Section 6.1.9**.

Beaver habitat is dependent on water situated in close proximity to preferred food sources (Vincent 2010). Beavers can exploit habitats where their preferred food is lacking, but they cannot survive in areas where the water supply fluctuates or is fast moving (Novak 1987). Beavers will colonize aquatic habitats where water depth and stability can be controlled and where the water supply is permanent, but where these factors cannot be controlled (ex: large rivers or lakes), beavers can only find refuge in isolated protected bays and islands adjacent to suitable riparian or deciduous forest stands (Allen 1982). Stream gradient is the principal factor governing occupation of riverine habitats and gradients greater than 15% render streams unsuitable for beaver (Retzer *et al.* 1956). Allen (1982) also suggested that a minimum area of 0.8 km of stream length or 1.3 km^2 of either lakes or marshland were prerequisites for their consideration as beaver habitat.

Preferred food resources for beaver include trembling aspen (*Populus tremuloides*), paper birch (*Betula papyifera*), a variety of willows (*Salix* spp.) and numerous other woody shrubs (Jenkins 1980; Gallant *et al.* 2004). However, during the growing season, more than 55% of their annual diet is comprised of aquatic vegetation (floating and emergent). The foraging requirements of beaver extends beyond requirements for food in that beaver also must process woody vegetation for construction of lodges, dams and winter food storage. As a Central Place Forager, an animal that gathers food and bring it to a central place for later consumption or use, they must balance the benefit of foraging in any particular area against the costs of energy expenditure and increased risks of predation (Severud *et al.* 2013).

Marten is an economically important furbearer species for commercial trapping due to a relatively desirable coat and ease in capture and was selected as a VC to represent terrestrial furbearers such as fox, fisher, lynx, red squirrel and wolverine. The marten and other terrestrial furbearers are important for trapping as discussed throughout **Section 6.1.9.**

Marten are frequently associated with dense coniferous forests with more than 60% crown cover. Other studies have shown that while they have an obvious preference for mature coniferous stands and avoidance of non-forested habitats, marten utilized all mature forest types regardless of the tree species mixture (Hodson *et al.* 2004; Poole *et al.* 2004). Mature coniferous forests provide access to subnivean habitat for winter food, thermal cover and refugia from predators. In summer, marten tend to exploit the forest canopies that provide resting sites safe from most terrestrial predators. Conversely, open and disturbed areas are generally avoided despite the availability of food and debris, particularly during the winter months (Steventon and Major 1982). The Wildlife RAA is typical of boreal shield forest with a mix of mature forest, regenerating forests and open wetlands, as such a relatively low proportion of area is suitable habitat for Marten.

Marten, as opportunistic foragers of small mammals, amphibians and insects, are dependent on the coarse woody debris that creates hunting habitat below the snow layer. It accrues from broken tree limbs, logs and stumps; the amount of which is related to both cover type and age of the forest. Small mammal prey adaptation to predator avoidance is another factor important to governing habitat selection by martens.

6.2.5.5.2.1 Habitat Alteration, Fragmentation and/or Loss

Clearing of native vegetation would result in the alteration, fragmentation and loss of aquatic and terrestrial furbearer habitat within the ROW, temporary access roads, quarries, borrow pits, work areas and camps. The results of beaver and marten habitat modelling illustrate that the amount of habitat lost as a result of the Project is a very small percentage of the overall habitat availability within the 10 km corridor Wildlife LAA and RAA. Approximately 0.23 km^2 and 0.20 km^2 of primary[10] (high-quality) beaver and marten habitat, respectively, would be lost or altered within the Project Footprint. This represents approximately 0.02% of available habitat within the Wildlife LAA (1,327 km^2) and 0.002% of overall habitat contained in the Wildlife RAA (9,005 km^2) (**Appendix D-2**; Joro Consultants 2018b).

Fryxell *et al.* (2004) observed that the abundance of marten harvested by trappers remained unchanged, despite a 50-year landscape scale habitat change due to industrial logging throughout much of the marten trapping area in Ontario. The study demonstrated significant post-logging use of regenerating stands by marten and that such post-logged areas met life requisites for sustainable marten populations. This evidence challenges the long-standing observation (Novak 1987) that marten are habitat specialists that require mature forest to survive and reproduce successfully. A low amount of ancillary access and lack of other intensive industrial activities, such as forestry, within the Wildlife RAA leaves the landscape relatively intact for marten habitat (**Appendix D-2**; Joro Consultants 2018b).

Results of multispecies surveys and information obtained through the trapper program, as well as information from resource users, illustrates that marten are widespread and abundant across the Wildlife

[10] Primary and secondary habitat, as they relate to modelling, is defined in the Wildlife Characterization and Effects Assessment report (**Appendix D-2**; Joro Consultants 2018b).

RAA. Although results of density analysis indicate areas of relative high occupancy compared to other areas, annual variation in marten distribution is likely related to snow conditions and prey distribution (Wiebe *et al.* 2014). Marten populations are also known to be cyclic, which would also contribute to annual variation (Fryxell *et al.* 2004). Considering that such a small percentage of available habitat would be affected it is not anticipated that marten populations would decline due to construction of the proposed Project (**Appendix D-2**; Joro Consultants 2018b).

Alteration, fragmentation and loss of terrestrial and aquatic furbearer habitat due to clearing of native vegetation during construction and maintenance within the ROW, temporary access roads, quarries, borrow pits, work areas and camps, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The overall habitat loss or alteration in the Wildlife LAA would decrease over time due to the decommissioning of temporary access routes and the natural regeneration of the winter road segments beyond the Project's ROW. Aquatic and terrestrial furbearer populations are not likely to be measurably affected by the alteration, fragmentation and loss. The effect could occur during a critical life stage (ex: denning, rearing times) and could affect furbearers beyond the Project Footprint within the Wildlife LAA. The changes to habitat would occur sporadically, primarily associated with initial clearing but are considered irreversible as long as the all-season road remains. No adverse ecosystem effects are anticipated as a result of habitat alteration, fragmentation and loss on terrestrial and aquatic furbearers.

6.2.5.5.2.2 Sensory Disturbance

Vehicle and equipment noise and vibration during construction, maintenance and operation would result in increased sensory disturbance to and displacement of aquatic and terrestrial furbearers. Use of heavy equipment and machinery and blasting during construction of the proposed Project would result in increased noise, vibration and activity levels. Maintenance activities such as snow clearing, grading, addition of aggregate, vegetation management and bridge and culvert maintenance (ex: debris removal, structural repairs) would also result in noise and vibration.

Noise and vibration may alter the potential use of areas by furbearers, although, given that the existing winter road has been part of the Wildlife LAA landscape for several decades, species are likely accustomed to the present level of activities associated with traffic and hunting during winter. During operation, access normally restricted to winter would result in year-round traffic, however, traffic levels are anticipated to be low. These effects would influence an area within close proximity to the ROW and associated facilities (quarries, borrow pits, access roads).

The potential increase in sensory disturbance to and displacement of aquatic and terrestrial furbearers due to vehicle and equipment noise and vibration during construction and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. Effects to furbearers would be limited to the Project Footprint and would likely only occur at the individual level not measurably affecting the population. The sensory disturbance would be

continuous during construction and operation of the all-season road and could occur during critical life stages (ex: denning and rearing period). As long as the all-season road remains the sensory disturbance would continue and potential effects to the furbearers are considered irreversible. While noise and vibration may result in short-term and localized changes to furbearers use of areas near the road, no adverse ecosystem effects are anticipated.

6.2.5.5.2.3 Mortality Due to Vehicular Collisions and Nuisance Wildlife Management

There may be an increase in aquatic and terrestrial furbearer mortality due to vehicle collisions with the increased traffic during construction and maintenance activities as well as public and commercial vehicle traffic during operation of the all-season road. The Nuisance Beaver Management Program (**Chapter 3, Appendix 3-6**), which is part of the maintenance program when standard beaver control structures are ineffective, includes measures for removal of nuisance beaver as well as for the removal of beaver dams. As such, this would result in direct mortality of beavers.

The potential increase in mortality due to vehicular collisions and nuisance wildlife management during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The effect is limited to the Project Footprint where vehicle usage and culvert maintenance occurs and would occur at the individual animal level, not likely to have a measurable effect on furbearer populations in the Wildlife RAA. With all-season road traffic occurring throughout the year there is potential that collisions happen during critical life stages (ex: denning and rearing period). Given the anticipated low traffic volumes collisions with vehicles are only expected occasionally during the life of the Project. The potential effect is considered irreversible as long as the all-season road remains. No adverse ecosystem effects are anticipated as a result of increased mortality of terrestrial and aquatic furbearers.

6.2.5.6 Predicted Effect on Reptiles and Amphibians

The only reptile species potentially present in the Wildlife RAA is the red-sided garter snake, however, as noted in **Section 6.1.4.6**, none were recorded during field investigations and no reptile Species at Risk are expected in the Wildlife RAA. Likewise no reptile species of local interest were identified as part of community wildlife workshops and therefore no reptile VCs were assessed.

Baseline data were gathered for a number of amphibians within the RAA, as noted in **Section 6.1.4.6**, including the wood frog, boreal chorus frog and the eastern American toad. For the purpose of this assessment, the northern spring peeper was selected as the representative amphibian VC. The northern spring peeper was selected due to their characteristic presence in woodland ponds and their food web function. Northern spring peeper is located primarily in regions east of Lake Winnipeg, with the Project area near the northern extremity of their range (**Appendix D-2**; Joro Consultants 2018b). While potential environmental effects to selected VCs are generally representative of other amphibians, some potential effects may not be pertinent to all species.

6.2.5.6.1 Habitat Alteration, Fragmentation and/or Loss

Clearing of native vegetation would result in the alteration, fragmentation and loss of amphibian habitat within the ROW, temporary access roads, quarries, borrow pits, work areas and camps. The results of habitat modelling indicate that habitat loss due to the Project would be small relative to the amount of habitat available within the Wildlife LAA and RAA. Approximately 8.1 km^2 of primary or high-quality habitat would be lost or altered within the Project Footprint (**Appendix D-2**; Joro Consultants 2018b). This represents approximately 0.6% of available habitat within the Wildlife LAA (1,327 km^2) and 0.09% of overall habitat contained in the Wildlife RAA (9,005 km^2). Amphibians habitat use patterns in the Project Footprint are not anticipated to change substantially although, ditching along the roadway may create preferred habitat for some.

Alteration, fragmentation and loss of amphibian habitat due to clearing of native vegetation during construction and maintenance within the ROW, temporary access roads, quarries, borrow pits, work areas and camps, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The overall habitat loss or alteration in the Wildlife LAA would decrease over time due to the decommissioning of temporary access routes and the natural regeneration of segments of winter road not within the Project ROW. The effect could occur during a critical life stage but is limited to the Project Footprint and amphibian populations are not likely to be measurably affected by the alteration, fragmentation and loss. The changes to habitat would occur infrequently, primarily associated with initial clearing. The changes to habitat are considered irreversible as long as the all-season road remains. No adverse ecosystem effects are anticipated as a result of habitat alteration, fragmentation and loss on amphibians.

6.2.5.6.2 Increased Winter Mortality by Soil Compaction and Freezing

Compaction and freezing of soils due to Project activities may result in amphibian mortality where amphibians may be over-wintering (ex: in the ground, in leaf litter, under logs, behind tree bark, in tree knots) (**Appendix D-2**; Joro Consultants 2018b). Soils can become compacted from the operation of heavy equipment while the clearing of snow (and loss of insulation it provides) during construction and maintenance can result in soil freezing. The effect of compaction and freezing of soils on amphibians, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The effect is limited to the Project Footprint and is not expected to have a detectable or measurable effect on populations or habitat availability. Project activities could occur during a critical life stage for amphibians. The effect would be sporadic as it would occur during initial construction as well as during road maintenance activities. The effect is irreversible but no adverse ecosystem effects are anticipated.

6.3 Predicted Effects on Valued Components

Based on the predicted changes to the physical environment identified in **Section 6.2**, the environmental effects of the Project on VCs were assessed. The assessment of potential effects was conducted, as

described in **Chapter 4** and summarized in **Section 6.2**, by identifying interactions and potential effects prior to the implementation of mitigation measures. Appropriate mitigation measures, as outlined in **Section 6.4**, were then identified for potential adverse effects. Following the application of mitigation the potential effects were again screened using the criteria identified in **Chapter 4, Section 4.5.5** to assess and determine the significance of the residual adverse effects remaining after mitigation, as discussed in **Section 6.5**.

Various desktop and *in situ* studies were conducted to collect, record and analyse information on the VCs within the Project Footprint, LAA and RAA. This information was used to quantify the potential effects of the Project on the selected VCs where quantification was possible and to qualify the potential effects where quantitative data were unavailable. Additional details regarding sources of information used to identify and assess potential environmental effects are provided in **Chapter 4, Section 4.4**.

In consideration of the existing environment of the LAA and RAA, the assessment of potential environmental effects of the proposed Project focuses on those components that are particularly valued by local communities and are linked to valued ecological and cultural resources of the area. The VCs identified and the rationale for selection is provided in **Appendix 4-1**. A summary of the interaction between the VCs and key activities associated with the construction, operations and maintenance phases of the proposed Project is provided in **Appendix 6-3**.

A discussion of the potential Project effects on the VCs, prior to the implementation of mitigation measures, is detailed in the following sections. A summary of these effects as well as the assessed level of the potential effect, for each of the criteria (ex: magnitude, geographic extent, timing, duration, frequency, reversibility and social and ecological context) is provided in **Appendix 6-4**.

6.3.1 Fish and Fish Habitat

Key potential effects of all-season road construction and operation to fish and fish habitat include erosion and sedimentation, introduction of deleterious substances, altered flow regimes and habitat loss. These and other potential effects of the Project on fish and fish habitat are discussed in the following sub-sections.

6.3.1.1 Predicted Effect on Fish Populations due to Spills or Hazardous Materials

Introduction of deleterious substances into watercourses from spills or releases of fuel or hazardous materials associated with construction equipment or vehicles and vehicular accidents can reduce surface water quality, resulting in toxic effects to aquatic organisms, including fish. Hydrocarbons (ex: oil, fuel, gasoline, lubricants, or hydraulic fluids) can enter watercourses during the use, maintenance and fuelling of construction vehicles and machinery near watercourses. Deleterious substances may kill fish or other aquatic biota directly, or may result in impaired health, vigour, or productive capacity (**Appendix C-2**; North/South Consultants Inc. 2017b). Polycyclic aromatic hydrocarbons (PAHs) can persist in stream

sediments resulting in chronic exposure through direct contact or indirectly through food chain interaction (Collier *et al.* 2002). Effects of PAHs to fish include fin erosion, liver abnormalities, cataracts and compromised immune systems (Fabacher *et al.* 1991; Weeks and Warinner 1984 and 1986; O'Conner and Huggett 1988). In benthic invertebrates, PAH exposure can inhibit reproduction, delay emergence and cause sediment avoidance and mortality.

Construction of cast-in-place concrete structures such as bridge abutments, footings and bridge decks may result in accidental releases of concrete or concrete wash water into the watercourse. Uncured or partly cured concrete and other lime containing materials (ex: Portland cement, mortar, grout) have a high pH and are toxic to many aquatic organisms, including fish. Accidental discharges into an aquatic environment may result in an increase in the pH of the water. Elevated pH can damage fish tissue and increase the toxicity of other substances in the water, such as ammonia. Concrete and concrete wash water can also contain sediments and spills can result in increased turbidity and sedimentation of the stream (**Appendix C-2**; North/South Consultants Inc. 2017b).

Explosives used in blasting use oxidizing agents such as ammonium nitrate, calcium nitrate and sodium nitrate. Nitrates from these materials may enter the watercourse due to accidental spills, leaching from wet blast holes or in run off from undetonated explosives in blast rock. Increased nitrate levels can have toxic effects on aquatic organisms and cause eutrophication of surface waters. In addition, if ammonium nitrate is introduced into water, it dissociates to form ammonia which can have both lethal and sub-lethal effects on fish (**Appendix C-2**; North/South Consultants Inc. 2017b).

The potential reduced fish populations, as a result of decreased water quality, prior to the implementation of mitigation measures, is considered to be negative and would occur throughout the life of the Project. Effects could include the net loss of the productive capacity of fish habitat which could subsequently affect fish communities and populations. As spills could occur at any time of the year, the timing of potential effects could overlap with periods of high sensitivity to fish (ex: spawning). If a spill were to occur in surface water, effects could extend beyond the Project Footprint within the LAA. The frequency of spills occurring during construction would likely be sporadic due to the amount of heavy machinery that would be working on road construction. During operation however, the frequency of spills would be infrequent as they would be associated with maintenance activities or vehicular accidents near watercourses. The effects to fish populations as a result of decreased water quality are considered reversible over a long period. Overall ecosystem and social effects were assessed to be moderate due to the importance of fish to local communities.

6.3.1.2 Disruption of Fish due to Blasting

The compressive shock wave resulting from the detonation of explosives near watercourses can cause serious harm to fish. Shock waves with overpressure levels greater than 100 kPa can rupture the swim bladder and vital organs such as the liver and kidney (Wright and Hopky 1998). The vibrations generated by a blast can also damage incubating eggs (**Appendix C-2**; North/South Consultants Inc. 2017b).

The potential effect of blasting activities to cause injury or death to fish, prior to the implementation of mitigation measures, is considered negative. Effects would be short-term as they would be associated with discrete activities (ex: blasting) occurring mostly during the construction phase of the project, although they may also occur as part of maintenance. Effects from blasting could have negative effects on fish during periods of high sensitivity (ex: spawning) resulting in the loss of productive capacity of fish habitat affecting fish communities and populations. The compressive shock wave would be limited to the immediate vicinity of blasting within the Project Footprint. The effects to fish populations as a result of injury of death from blasting are considered reversible over a long period. The effects of blasting on fish were assessed to have moderate ecosystem effects due to the importance of fish to local communities.

6.3.1.3 Increased Fishing Pressure due to Improved Access

Road construction may result in improved access by both work crews and the public to habitats where fish may be sensitive or vulnerable to exploitation or disturbance. Improved access could also result in increased fishing opportunities in waterbodies at watercourse crossing sites along the proposed route where fishing currently occurs and in waterbodies not previously or conveniently accessible for fishing.

The potential effect of increased fishing pressure as a result of improved access, prior to the implementation of mitigation measures, is considered negative, long-term and irreversible. Increased fishing pressure could affect fish communities and populations, in particular if increased fishing occurs during critical life stages of fish. Increased fishing would most likely occur within the Project Footprint however the improved access may increase fishing pressure beyond the Project Footprint within the Indigenous LAA. The frequency of increase fishing is considered sporadic as it could occur occasionally throughout the life of the Project. The potential effect of increased fishing pressure on local fish populations was assessed to have moderate ecosystem effect due to the importance of fish to local communities.

6.3.1.4 Blockage or Reduction in Fish Passage

The construction and use of temporary and permanent watercourse crossings can block migratory corridors used to access spawning habitats. Structures installed at watercourse crossings, particularly culverts, have the potential to create barriers to fish passage. Constricting flows at culverts can result in a corresponding increase in water velocities that exceed the swimming capabilities of some fish species.

Blocked or reduced fish passage and disruption of spawning, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. These effects to fish passage may result in the net loss of the productive capacity of fish habitat affecting local fish communities and populations. Disruption of fish spawning is affecting a critical life stage. The changes in fish passage would be limited to temporary and permanent crossing locations within the Project Footprint. The reduction or blockage of fish passage would occur when the culvert or watercourse crossings are installed,

with the potential population changes reversible over a long period when the impairment is removed. Effects on fish passage are considered to have a moderate ecosystem effect.

6.3.1.5 Effects of Suspended/Deposited Sediments

Erosion and sedimentation from construction, maintenance and operation activities causing suspension and deposition of sediments may decrease surface water quality, as described in **Section 6.2.4.1.2**. Vegetation removal and improper construction practices near watercourses can result in increased erosion leading to sedimentation of streams. Clearing streamside vegetation may result in decreased bank stability and exposure of bare soils that are susceptible to erosion. Heavy machinery and equipment working near the watercourse can damage vegetative cover and cause rutting and erosion of floodplains and channel banks (**Appendix C-2**; North/South Consultants Inc. 2017b). Road maintenance activities such as grading and repair of the road surface and shoulders would be on-going during operation of the all-season road and have the potential to generate sediment in runoff from the road surface.

There are multiple negative effects associated with increased levels of suspended and deposited sediment, including effects to primary producers, invertebrates and fish. A decrease in light penetration due to higher turbidity (suspended sediment) can lead to decreased photosynthesis by primary producers. Since primary producers form the base of the food chain, decreases in photosynthesis can affect higher trophic levels, such as invertebrates and fish. Large influxes of deposited sediment can bury aquatic invertebrates, an important food item for many fish species, resulting in reduced invertebrate species diversity and abundances. Fine sediment deposition over existing larger substrates may result in habitat loss for invertebrate species that anchor to coarse substrates (**Appendix C-2**; North/South Consultants Inc. 2017b). Sedimentation may also result in the loss of spawning habitats and/or decreased spawning success for some fish species. Infilling of existing coarse or rocky substrates with finer materials may create unsuitable spawning habitat for some fish species, smother deposited eggs or inhibit larval emergence from spawning substrates (Kondolf 2000).

The potential decreased quality of fish habitat and the effects to fish due to an increase in suspended/deposited solids, prior to the implementation of mitigation measures, is considered to be negative. Changes in suspended sediments from the Project are primarily associated with construction activities and would continue until disturbed areas are restored. The effects could result in net loss of the productive capacity of fish habitat affecting fish communities and population. The timing of an increase in sediment suspension/deposition could occur during a period of high sensitivity to fish (ex: spawning). As suspended sediment can move with flowing water the effect to fish and fish habitat could extend downstream beyond the Project Footprint within the LAA. Effects of erosion and sedimentation would be sporadic in nature as they would occur primarily during precipitation events, spring runoff and prior to the re-establishment of vegetation on disturbed soils. The effect is readily reversible. The decrease in fish habitat quality due to an increase in suspended sediments was assessed to have a moderate ecosystem effect due to the importance of fish to local communities.

6.3.1.6 Alteration and Loss of Riparian and In-Stream Habitat

The rivers and streams within the P6 study area and typical to the Canadian Shield in this region are characterized as either being pool drop waterways or low gradient wetland streams. Pool drop waterways have bedrock/boulders controls or rapids separated by wider, deeper and flatter gradient river sections with lower velocities, which are not prone to erosion or channel migration. The rock controls are typically hard features that erode very slowly requiring thousands of years to have noticeable change. These types of rivers are typically straighter with negligible change in the alignment/migration of the river from year to year, even following a large flood event. The larger rivers, such as the Hayes, Laidlaw and Gods are pool drop waterways. The geomorphology for these types of waterways are largely unaffected with careful selection of the crossing alignment, typically at a narrow location near a control point, and ensuring that best practices are followed for the sizing of the hydraulic opening, limiting constriction of the river (North/South Consultants Inc. personal communication, October 24, 2018)

Low gradient wetland streams have a small incised channel passing through wide low marshy flood plains. This is typical for the small creeks and streams in the area. These waterways have very flat gradients passing through the low marshy wetland/marshes. These waterways typically have a small main channel; however, multiple channels throughout the floodplain are also common, making it difficult to discern the primary flow path. During large flood events, the water levels rise, wetting the floodplain although the floodplain itself does not add significantly to the channel conveyance (North/South Consultants Inc. personal communication, October 24, 2018).

Beaver dams across the creek/stream channels are common, with resultant impoundments backwatering large areas of the floodplain. The existence of beaver dams and subsequent failures affects the channel location and channel morphology as breaches scour and create new channels. The geomorphology for these types of waterways can be affected by the installation of a culvert crossing, as the culvert and road create a fixed location for the main channel. The influence can be minimized by ensuring the proper sizing of the culvert to ensure velocities are not excessive and that the crossing does not excessively constrict the waterway (North/South Consultants Inc. personal communication, October 24, 2018). Preference is given to locating the crossing in a narrowing within the floodplain where lateral movement of the channel would be naturally constrained, while also limiting the infilling required for the road embankment within the sensitive floodplain.

The Project would result in the alteration and loss of riparian and in-stream habitats at water crossings. Riparian vegetation contributes nutrients to streams and lakes through litter and terrestrial insect drop. The removal of riparian vegetation to accommodate temporary crossings, bridge approaches and line of sight requirements may reduce nutrient inputs into the aquatic food web. Riparian vegetation within the ROW but outside of the road bed may not need to be removed for line of sight if it is low growth vegetation. In many streams, terrestrial insects contribute to the diet of fish. Further, leaf litter and other organic matter are consumed by aquatic invertebrates, another important food source for many fish

species (Allan *et al.* 2003). Riparian vegetation also provides bank stability and slows, filters and absorbs runoff water, which helps reduce soil erosion (Government of Manitoba 2011).

In-stream habitats may be altered where riprap placement is required to reinforce bridge piers and protect channel banks. Rock placement in stream channels is expected to diversify habitats, provide cover for fish and increase productivity, as long as it does not have a harmful effect to flow patterns and does not infill the channel. The Project would also result in the loss of in-stream habitats. A crossing design that includes the placement of permanent structures below the high watermark would have direct effects to fish habitat. Infilling of stream substrates due to the installation of bridge piers would result in the permanent loss of in-stream habitat.

Habitat alteration and loss was calculated for all crossing locations that support fish habitat as part of the Aquatic Environment Report – Existing Environment (**Appendix C-1**, **Appendix 5**; North/South Consultants Inc. 2017a). The area of in-stream and riparian habitat alteration and loss is listed for each watercourse crossing in **Table 6.41** which is estimated to result in a total alteration of 1,008 m^2 of riparian habitat and 162 m^2 of in-stream habitat[11], as well as the loss of 864 m^2 of riparian habitat and 3,672 m^2 of in-stream habitat (**Appendix C-1**; North/South Consultants Inc. 2017a). Instream alteration includes the addition of riprap below the high-water mark. Where the riprap installed to armour the culvert inlets and outlets does not create a complete infill, the riprap will create a positive effect by increasing the habitat diversity and productivity of the stream. Where installation creates a complete infill, the footprint would be included as a loss of habitat.

For the EIS, the habitat alteration and loss calculations are based on a generic crossing design since the environmental impact assessment is conducted at the beginning of the project before detailed design occurs. As the project moves forward, detailed designs will be engineered and more accurate calculations of alteration and destruction can be made. Manitoba Infrastructure will supply these detailed calculations to DFO Canada for their review and approval under the Fisheries Act as required when they become available, as a part of the second tier of environmental project approvals needed before crossing construction can begin. At that stage in the project, if DFO determines that *Fisheries Act* authorizations and offsetting is required, Manitoba Infrastructure will develop offsetting plans for DFO review prior to commencement of watercourse crossing construction.

MI recognizes that DFO requires detailed project footprint calculations and site specific information to evaluate effects to fish and fish habitat under the Fisheries Act. While this information is not available at the EIS phase, omission of this information in the EIS should not limit decision making under CEAA, 2012. This EIS identifies potential effects to fish and fish habitat, includes a general idea of what habitat alteration and loss will occur and identifies the mitigations proposed to reduce the nature of the effect (duration, magnitude, timing, geographic extent, frequency of effect and/or ecological and social context).

[11] Instream alteration estimate is for proposed bridge crossing at Magill Creek. In-stream alteration due to culvert armoring cannot be estimated until detailed design phase as armouring footprints are highly variable and subject to site specific substrate conditions.

The legal requirement to develop, implement and conduct follow-up offsetting to comply with Fisheries Act Authorizations received for the project is another mitigation measure that will be implemented where required.

The alteration and loss of riparian and in-stream habitat at water crossings, prior to the implementation of mitigation measures, is considered to be negative and would persist throughout the life of the Project. There may be a net loss of the productive capacity of fish habitat affecting fish communities and populations and effects to fish could occur during periods of high sensitivity (ex: spawning). Effects would only occur at crossing locations and would therefore be limited to the Project Footprint. Habitat loss and alteration would primarily occur infrequently during the initial construction. The effect is reversible over a long period. Riparian and in-stream habitat alteration and loss is considered a moderate ecosystem effect due to the importance of fish to local communities.

Table 6.41: Total Habitat Alteration and Loss at the Proposed Watercourse Crossings.

Site	Watercourse	Instream Loss (m^2)	Instream Alteration (m^2)[1]	Riparian Loss (m^2)[2]	Riparian Alteration (m^2)[3]
P6a-X002	Unnamed Tributary of Hayes River	48.6	N/A[4]	36	0[5]
P6a-X005	Unnamed Tributary of Hayes River	930	N/A[4]	36	0[5]
P6a-X007	Unnamed Tributary of Michikanes Lake	162	N/A[4]	36	0[5]
P6a-X008	Unnamed Tributary of Michikanes Lake	300	N/A[4]	36	0[5]
P6a-X018	Unnamed Tributary of Knee Lake	270	N/A[4]	36	0[5]
P6a-X019	Magill Creek	5.8[6]	161.5[6]	36	84
P6a-X020	Unnamed Tributary of Magill Creek	21	N/A[4]	36	84
P6a-X022	Unnamed Tributary of Laird Lake	3	N/A[4]	36	0[5]
P6a-X023	Unnamed Tributary of Laird Lake	300	N/A[4]	36	0[5]
P6a-X027	Unnamed Tributary of Wanless Lake	60	N/A[4]	36	0[5]
P6a-X028	Unnamed Tributary of Wanless Lake	234	N/A[4]	36	84
P6a-X029	Unnamed Tributary of Hignell Lake	120	N/A[4]	36	84
P6a-X031	Unnamed Tributary of Hignell Lake	66	N/A[4]	36	84
P6a-X032	Unnamed Tributary of Hignell Lake	75	N/A[4]	36	0[5]
P6a-X033	Unnamed Tributary of an Unnamed Lake	30	N/A[4]	36	84
P6a-X034	Unnamed Tributary of an Unnamed Lake	90	N/A[4]	36	84
P6a-X037	Unnamed Tributary of an Unnamed Lake	-[7]	N/A[4]	36	84
P6a-X038	Unnamed Tributary of an Unnamed Lake	174	N/A[4]	36	84
P6b-X002	Unnamed Tributary of Hawkins Lake	55.8	N/A[4]	36	84
P6b-X003	Unnamed Tributary of Hawkins Lake	300	N/A[4]	36	0[5]
P6b-X006	Unnamed Tributary of Opaskaykow Lake	18.6	N/A[4]	36	0[5]
P6b-X007	Unnamed Tributary of Opaskaykow Lake	162	N/A[4]	36	84
P6b-X009	Unnamed Tributary of Tapper Lake	36	N/A[4]	36	84
P6b-X013	Unnamed Tributary of Gods River	210	N/A[4]	36	0[5]
P6b-X015	Gods River	0[8]	0[8]	0[8]	0[8]

Site	Watercourse	Instream Loss (m^2)	Instream Alteration (m^2)[1]	Riparian Loss (m^2)[2]	Riparian Alteration (m^2)[3]
Total Area (m^2)		**3,671.8**	**161.5**	**864**	**1,008**
Total Area (ha)		**0.37**	**0.02**	**0.09**	**0.10**

Notes: 1 – Instream alteration consists of the addition of rip rap below the high-water mark. Rip rap is expected to increase the diversity and productivity of the stream and is therefore not considered an adverse effect.
2 – Riparian loss calculated as the width of the roadbed on each bank.
3 – Riparian alteration calculated as the 60 m cleared right-of-way on each bank. Does not include the length of riparian destruction.
4 – Riprap calculations for armouring of culvert inlets and outlets cannot be estimated during preliminary design phase, due to the high degree of site specificity. Detailed designs are required to establish riprap requirements and calculations will be submitted in application for Fisheries Act Authorization where required.
5 – Existing riparian consists of low growing vegetation. Alteration due to clearing for line of sight safety requirements is not expected.
6 – Bridge design was unavailable at the time of assessment. Habitat loss is estimated using the area of one pier, and instream alteration calculated as the area rip rap armouring around the one pier. Estimate based on AECOM design drawings provided in Plans PR 304 to Berens River All Season Road Alignment Tender No. B5 Pigeon River Bridge, issued October 3, 2013.
7 – Instream destruction was not calculated because a discernible stream channel was not present at the crossing.
8 – Existing road and bridge at the God's River crossing has previously affected instream habitat and riparian vegetation.
Source: North/South Consultants Inc. 2017a

6.3.1.7 Introduction of Aquatic Invasive Species

The use of equipment in water during construction, maintenance and operation activities could increase the risk to introduce aquatic invasive species (ex: zebra mussels). The introduction of invasive species can reduce the diversity and populations of native species and can modify habitat (Manitoba Sustainable Development 2017a). Aquatic invasive species could be transported to the Project area on construction machinery and equipment. Because the equipment would most likely be transported to site during the winter time along the existing winter road it is anticipated that any invasive species on the equipment would not survive. No invasive species were identified during field investigations. While aquatic invasive species have been confirmed in Lake Manitoba (ex: zebra mussels, spiny water flea) they are part of the Lake Winnipeg watershed which is not directly connected to the Hayes River watershed (Invasive Species Council of Manitoba 2016). Lake Winnipeg is also located more than 200 km from the Project site. During operation, the all-season road is not connected to the provincial road network and therefore poses no additional risk of transporting aquatic invasive species to the area.

The potential reduction in diversity and population of native fish species due to the increased risk of aquatic invasive species introduction, prior to the implementation of mitigation measures, is considered negligible due to the lack of connectivity to the provincial road network and the fact that machinery and equipment would be transported to site in the winter. The increased risk to introduce aquatic invasive species would only occur for a short-term period associated primarily with use of construction equipment. If aquatic invasive species were to be introduced, there is the potential for net loss of the productive capacity of fish habitat which would affect local fish communities and populations. The timing of effects could also occur during a period of high sensitivity to fish. If introduced, aquatic invasive species could

spread to areas beyond the LAA and would be irreversible and therefore is considered to have a moderate ecosystem effect.

6.3.2 Migratory Birds

Migratory birds are protected under the *Migratory Birds Convention Act* and therefore were assessed. While raptors and upland game birds do not fall under federal jurisdiction, they have also been assessed because of their importance to local Indigenous communities. Representative VCs were selected for birds to represent a variety of habitat requirements and local and cultural interests. While potential environmental effects to selected VCs are generally representative of other bird species in the same group, some potential effects may not be pertinent to all species.

Migratory waterfowl species selected as VCs include Canada goose, ring-necked duck and mallard. The Canada goose represents waterfowl, ring-necked duck represents diving duck waterfowl and the mallard represents dabbling duck waterfowl. Each were identified as important to the local communities for hunting. These species also represent the habitat needs of many other waterbirds found in the Wildlife RAA (**Appendix D-2**; Joro Consultants 2018b).

Ruffed grouse was selected as a VC as they were identified as a species that are hunted by locals and they are representative of upland game birds. Bald eagle was selected as a VC as it is culturally important to First Nations and is representative of raptors.

Four migratory songbirds species were selected as VCs, each representing groupings of songbirds with differing habitat requirements. Magnolia warbler inhabits pure coniferous forests as well as mixed-wood forests with abundant coniferous saplings. Palm warbler breed in open habitats such as open spruce-tamarack bogs or fens and regenerating areas, where they prefer low ground-cover. Ovenbird inhabits mature forested habitats, including jack pine, mixedwood or deciduous stands with open understories. Yellow-bellied flycatcher inhabits large tracts of lowland black spruce (wetland) areas.

Each representative VC was assessed individually in the Wildlife Characterization and Effects Assessment Report (**Appendix D-2**; Joro Consultants 2018b). Raptors, waterfowl, forest birds and upland game birds are grouped, as appropriate, for the purpose of assessing potential environmental effects in this EIS. Habitat Alteration, Fragmentation and/or Loss.

Clearing of native vegetation would result in the alteration, fragmentation and loss of migratory (ex: raptors, waterfowl, forest birds) and non-migratory (ex: upland game birds) habitat within the ROW, temporary access roads, quarries, borrow pits, work areas and camps. Habitat modelling/mapping and amounts of habitat loss within the RAA for migratory bird VCs is detailed in the Wildlife Characterization and Effects Assessment of the Proposed All-Season Road Project 6 (**Appendix D-2, Section 6**; Joro Consultants 2018b).

Habitat modelling for bald eagle illustrates that the amount of habitat lost as a result of the Project is a very small percentage of the overall habitat availability within the Wildlife LAA and RAA (**Appendix D-2**;

Joro Consultants 2018b). Approximately 2.0 km^2 of primary (high-quality) habitat would be lost or altered within the Project Footprint, which represents 0.15% of available habitat within the Wildlife LAA (1,327 km^2) and 0.02% of overall habitat available within the Wildlife RAA (9,005 km^2). Eagles make seasonal movements during fall and winter and their abundance would decline during this period. Winter occupation would be sporadic and occur only if open water and a food source were available (Manitoba Avian Research Committee 2003). No bald eagles were observed during winter surveys.

Habitat modelling for migratory waterfowl shows that the loss and alteration of habitat due to the Project is very small relative to the amount of habitat available within the Wildlife LAA and RAA. Approximately 2.3 km^2, 0.05 km^2 and 4.0 km^2 of primary habitat for mallards, Canada goose and ring-necked duck, respectively, would be lost or altered within the Project Footprint. This represents 0.17%, 0.01% and 0.3%, respectively of available habitat within the Wildlife LAA (1,327 km^2) and 0.02%, 0.01% and 0.04%, respectively of overall habitat within the Wildlife RAA (9,005 km^2) (**Appendix D-2**; Joro Consultants 2018b).

Habitat modeling for ruffed grouse shows that the loss and alteration of habitat due to the Project is very small relative to the amount of habitat available within the Wildlife LAA and RAA. No primary or secondary habitat was identified within the Project Footprint. Approximately 6.7 km^2 (0.1%) of the Wildlife LAA (1,327 km^2) contains secondary habitat for ruffed grouse. Ruffed grouse are known to be cyclic in nature and are most abundant in early-succession forests (**Appendix D-2**; Joro Consultants 2018b). Roadside habitat would be created by the Project through disturbances that promote growth of aspen and other early-succession species (**Appendix D-2**; Joro Consultants 2018b).

Habitat modelling for forest birds shows that the loss and alteration of habitat due to the Project is very small relative to the amount of habitat available within the Wildlife LAA and RAA. Approximately 3.4 km^2, 11.1 km^2 and 5.3 km^2 of primary habitat for magnolia warbler, palm warbler and yellow-bellied flycatcher, respectively would be lost or altered within the Project Footprint. This represents 0.3%, 0.8% and 0.4%, respectively of available habitat within the Wildlife LAA (1,327 km^2) and 0.04%, 0.1% and 0.06%, respectively of overall habitat within the Wildlife RAA (9,005 km^2) (**Appendix D-2**; Joro Consultants 2018b).

No primary or secondary habitat was identified in the Project Footprint or the Wildlife LAA for ovenbirds. Approximately 14.5 km^2 (0.22%) of the Wildlife RAA contains secondary habitat for ovenbirds (**Appendix D-2**; Joro Consultants 2018b).

Alteration, fragmentation and loss of migratory and non-migratory bird habitat due to clearing of native vegetation during construction and maintenance within the ROW, temporary access roads, quarries, borrow pits, work areas and camps, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. While the modelling shows that habitat loss is small relative to the amount of available habitat, the magnitude of effect is considered moderate as populations may be measurably affected. The effect could occur during a critical life stage and could affect birds beyond the Project Footprint within the Wildlife LAA. The changes to habitat would occur

infrequently, primarily associated with initial clearing but are considered irreversible as long as the all-season road remains. No adverse ecosystem effects are anticipated.

6.3.2.1 Loss of Nests and Mortality to Young Birds

Project construction, maintenance and operation activities may result in the loss of nests and mortality to young migratory (ex: raptors, waterfowl, forest birds) and non-migratory (upland game birds) birds. Direct loss of bird nests and subsequent mortality to eggs or young could occur while clearing vegetation during construction and while managing (ex: mowing) vegetation during operation. The Project would require clearing approximately 1,469 ha (14.7 km^2) for temporary and permanent components, as noted in **Chapter 3, Section 3.3**. Vegetation to be cleared consists primarily of coniferous forest vegetation cover (dense, open and sparse), as described in **Section 6.1.4.1**, however watercourse crossings would affect riparian and wetland vegetation. The different types of birds have varying nesting habitat preferences (ex: on ground, in trees, wetlands, uplands) and schedules (see **Appendix D-2, Section 6.4**; Joro Consultants 2018b). Field studies identified seven bald eagle stick nests within the Wildlife RAA and one within the Project Footprint (**Appendix D-2**; Joro Consultants 2018b).

The potential for loss of migratory and non-migratory bird nests and mortality to young birds during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The loss of nest and mortality to young birds may measurably affect populations, in particular because the effect could occur during critical life stages (ex: nesting). The potential effect is primarily associated with clearing of vegetation, which is limited to the Project Footprint, however, effects could also occur sporadically during maintenance activities. Loss of nests and mortality to young birds as a result of the Project is considered reversible over a long period. No adverse ecosystem effects are anticipated.

6.3.2.2 Sensory Disturbance and Displacement

Vehicle and equipment noise and vibration during construction, maintenance and operation may result in increased sensory disturbance to and displacement of migratory (ex: raptors, waterfowl, forest birds) and non-migratory (upland game birds) birds. Use of heavy equipment and blasting during construction of the proposed Project would result in increased noise, vibration and activity levels. Maintenance activities such as snow clearing, grading, addition of aggregate, vegetation management and bridge and culvert maintenance (ex: debris removal, structural repairs) would also result in noise and vibration.

Noise and vibration may alter the potential use of areas by birds. Specifically, migratory waterfowl could be disturbed if high levels of activity occur near wetlands and waterbodies where nesting or staging occurs (spring and fall) resulting in local abandonment or avoidance of wetlands near active areas. Sensory disturbance to migratory forest birds could occur in areas of high activity in all habitat types during the breeding and nesting period, which could result in disruption to local breeding bird territories and local abandonment or avoidance nesting or feeding areas (**Appendix D-2**; Joro Consultants 2018b).

The increase in sensory disturbance and displacement of migratory and non-migratory birds due to vehicle and equipment noise and vibration during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The sensory disturbance is likely to occur at the individual level and would not measurably affect the population. While noise and vibration would be restricted to the Project Footprint, the sensory disturbance could extend into the Wildlife LAA. The sensory disturbance would be continuous during construction and operation of the all-season road and could occur during critical life stages (ex: nesting). As long as the all-season road remains, the sensory disturbance would continue and potential effects to birds are considered irreversible. No adverse ecosystem effects are anticipated.

6.3.2.3 Mortality Due to Increase in Hunting Pressure

The Project has the potential to increase hunting pressure on migratory (waterfowl) and non-migratory (upland game birds) birds resulting in increased mortality because of the increased number of hunters during construction and the increased access along the all-season road during operation.

With increased access during the spring and summer staging periods, increased local resource use of waterfowl could result in overharvesting. With the availability of habitat throughout the Wildlife LAA and RAA, any effects on waterfowl related to overharvesting are expected to be limited. As the Project is in a remote area and the alignment would avoid wetlands as much as possible, the potential for this effect is minimal (**Appendix D-2**; Joro Consultants 2018b).

The Project may result in increased hunting of upland game birds (ex: ruffed grouse). Rusch *et al*. (2000) suggest that ruffed grouse populations are not usually limited by hunting, but rather by forest succession. Habitat conditions near the Project Footprint are likely to improve and attract ruffed grouse. The cyclic nature of ruffed grouse populations is likely to result in fluctuating hunting opportunities as populations climb and decline through time, which was verified through local knowledge and resource users participating in the wildlife workshop (**Appendix D-2**; Joro Consultants 2018b).

The potential to increase hunting pressure on waterfowl and upland game birds during construction and along the all-season road during operation resulting in increased mortality, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The increased hunting pressure could result in easily observable or measurable population changes. While waterfowl hunting typically occurs in spring and fall, upland game bird hunting can occur year-round and therefore the effect is considered continuous and could occur during critical life stages (ex: nesting). The increased access along the all-season road could provide access to watercourses that would enable hunting beyond the Project Footprint into the Wildlife LAA. However, as noted, there is ample available waterfowl habitat throughout the Wildlife RAA and habitat conditions near the Project Footprint may improve for upland game birds as a result of the Project. Once the new access has been constructed the effect is considered irreversible. The risk of bird mortality from increased hunting pressure is considered to have a moderate ecosystem effect that is important to local communities.

6.3.2.4 Mortality Due to Vehicular Collisions

There may be an increase in migratory (waterfowl, forest birds) and non-migratory (upland game birds) bird mortality due to vehicle collisions with the increased traffic during construction and maintenance activities as well as public and commercial vehicle traffic during operation of the all-season road. Waterfowl mortality from collisions with vehicles, powerlines and buildings is estimated to represent 0.1% of total mortality (Stout and Cornwell 1976). The potential for waterfowl mortality from collisions is greater when concentrations of waterfowl are present within 1 km of roads (**Appendix D-2**; Joro Consultants 2018b). Ruffed grouse are frequently killed by vehicles in Manitoba as they fly low across roads (Holland and Taylor 2003). Given the low density of roads within the Wildlife LAA and RAA and the fact that no primary or secondary habitat was identified for ruffed grouse in the Project Footprint, road mortality is not expected to have any effect on local populations.

The potential increase in migratory (waterfowl, forest birds) and non-migratory (upland game birds) bird mortality due to vehicular collisions during construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negligible due to the anticipated low traffic volumes of the all-season road. While the potential increase in bird mortality would occur throughout the life of the Project, collision with vehicles would be limited to the Project Footprint. The bird mortality would occur at the individual level, not likely to have a measurable effect on bird populations in the Wildlife RAA. With all-season road traffic occurring throughout the year there is potential that collisions happen during critical life stages (ex: breeding and nesting). Given the anticipated low traffic volumes collisions with vehicles are expected to be infrequent throughout the life of the Project. As there are no anticipated changes to population the effect of bird mortality is considered reversible over a long period. The risk of increased migratory and non-migratory bird mortality due to vehicle collisions is not anticipated to have adverse ecosystem effects.

6.3.3 Species at Risk

Species at Risk have special protection status by virtue of the federal SARA (and COSEWIC) and Manitoba's ESEA. The Species at Risk that are known to potentially occur or where observed in the Wildlife RAA, as described in **Section 6.1.8**, are assessed in the following sub-sections.

6.3.3.1 Aquatic Environment

There is potential for a decrease in the population of rare fish species (ex: lake sturgeon) from construction, maintenance and operation activities. This is associated with previously identified effects including water quality (**Sections 6.3.1.1** and **6.3.1.5**), shock waves (**Section 6.3.1.2**), fishing pressure (**Section 6.3.1.3**), fish passage (**Section 6.3.1.4**), habitat alteration/loss (**Section 6.3.1.6**) and invasive species (**Section 6.3.1.7**).

The Southern Hudson Bay-James Bay population, whose distribution overlaps with the project area, is designated as Special Concern by COSEWIC (COSEWIC 2006b) and is currently under consideration for protection under SARA. Lake sturgeon were not encountered during field studies, as discussed in **Section**

6.1.8.2.1. Past biological studies have documented Lake Sturgeon populations in the God's River approximately 150 km downstream of the Project (Koga 2014). TK from local communities suggests that lake sturgeon have been found further upstream to a set of rapids 4 km downstream of the God's River crossing as well as within God's Lake and Oxford Lake (Eaton 2012; HTFC Planning & Design 2017a; HTFC Planning & Design 2017b).

The primary location where Project activities may overlap with potential lake sturgeon presence is at the God's River crossing site. The God's River crossing site provides moderate velocity run habitat with sand and rocky substrates (**Appendix C-1**; North/South Consultants Inc. 2017a). The immediate crossing area provides potential foraging habitat for adult lake sturgeon and potential spawning habitat is found at a set of large rapids 4 km downstream of the crossing (**Appendix C-1**; North/South Consultants Inc. 2017a).

Potential effects to Lake Sturgeon in the God's River would depend on which crossing option is selected. There are currently three options, as described in **Chapter 3, Section 3.3.2**, which include no change to the existing bridge, upgrade the existing clear span bridge to make it wider or replace the existing bridge with a two-span bridge having one in water pier. Clear-span bridges do not require review by DFO provided measures to avoid causing harm are implemented (Fisheries and Oceans Canada 2015b), as no temporary or permanent instream destruction or alteration is expected to occur. If the two-span bridge option is selected, DFO review would be required and depending on the footprint size of the in-water pier authorization under the *Fisheries Act* may be required.

The potential decrease in lake sturgeon population as a result of project-related effects, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The magnitude of effect is considered minor due to limited potential for in-water effects and the limited number of locations where lake sturgeon may occur. The potential effect to habitat would be at the God's River crossing which is suitable foraging habitat and considered non-limiting habitat. The source of effects could occur sporadically associated with construction and maintenance activities and could occur during critical life stages. A potential decrease in lake sturgeon population is considered reversible over a long period. As lake sturgeon is designated as Special Concern by COSEWIC a potential decrease to their population is considered to have a high ecological and social context.

6.3.3.2 Terrestrial Environment

6.3.3.2.1 Vegetation

There is potential for disturbance or loss of vegetation Species at Risk from construction and maintenance activities. This is associated with previously identified effects such as clearing for the road ROW, temporary access roads, quarries, borrow pits, work areas and camps during construction and maintenance (**Section 6.2.5.1.1**) and the resulting disturbance and loss of wetlands (**Section 6.2.5.1.2**). As noted in **Section 6.1.8.1.1** there are an estimated 14 Species at Risk that occur within the Vegetation RAA (**Appendix B-1**; Szwaluk Environmental Consulting Ltd. *et al.* 2017a), however, none of these are listed federally under COSEWIC or SARA, or provincially protected under ESEA. No plant Species at Risk were

observed in the Vegetation RAA during field investigations (**Appendix B-1**; Szwaluk Environmental Consulting Ltd. *et al.* 2017a).

The potential for disturbance or loss of vegetation Species at Risk as a result of construction and maintenance activities, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. As part of Project construction, 1,469 ha (14.7 km^2) of native vegetation would be cleared which may affect rare or protected species and could occur during critical life stages. Beyond the initial affect, clearing would also be conducted infrequently as part of on-going maintenance to retain sight lines. Clearing is limited to the Project Footprint and is considered reversible over a long period. The ecological and social context of potential disturbance or loss of vegetation Species at Risk is considered high due to the protection/designation of species listed by SARA and ESEA.

6.3.3.2.2 Mammals

6.3.3.2.2.1 Woodland Caribou

There is potential for a decrease in populations and/or habitat of woodland caribou from construction, maintenance and operation activities. This is associated with previously identified effects including clearing (**Section 6.2.5.5.1.1**), sensory disturbance (**Section 6.2.5.5.1.2**), hunting pressure (**Section 6.2.5.5.1.3**), vehicle collisions (**Section 6.2.5.5.1.4**), predation (**Section 6.2.5.5.1.5**) and disease (**Section 6.2.5.5.1.6**). The RAA is on the fringe of both the Pen Islands (Eastern Migratory) and Norway House (Boreal Woodland) caribou ranges, as discussed in **Section 6.2.5.5.1.1**.

The potential decrease in woodland caribou populations and/or habitat as a result of construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The effect is considered minor relative to habitat availability. As discussed in **Section 6.2.5.5.1.1** habitat is not limiting in the Wildlife RAA or across the larger region including the Molson Boreal Woodland Caribou MU and the Hayes River Upland Ecoregion. Potential effects to woodland caribou would likely occur beyond the Project Footprint within the Wildlife LAA and could occur during critical life stages (ex: calving). Effects would be occasional throughout the life of the Project and are considered irreversible. The risk of a decrease in woodland caribou populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as boreal woodland caribou are protected under SARA and ESEA and it is likely that Eastern Migratory caribou will become protected in the future due to its current COSEWIC designation.

6.3.3.2.2.2 Wolverine

There is potential for a decrease in populations and/or habitat of wolverine from construction, maintenance and operation activities. This is associated with previously identified effects including

clearing (**Section 6.2.5.5.2.1**), sensory disturbance (**Section 6.2.5.5.2.2**) and vehicle collisions (**Section 6.5.5.5.2.3**).

The potential decrease in wolverine populations and/or habitat as a result of construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The amount of habitat affected is minor relative to habitat availability in the Wildlife LAA and RAA. As discussed in **Section 6.1.8.1.2.2** the highest density of wolverine in Manitoba is in the north-east part of the province. The wolverine populations in Manitoba are thought to be increasing (COSEWIC 2014). While clearing, sensory disturbance and vehicle collisions would occur within the Project Footprint, any potential population change would extend into the Wildlife LAA. The effects could occur during critical life stages (ex: denning). Effects would be occasional throughout the life of the Project and are considered irreversible. The risk of a decrease in wolverine populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as wolverine are listed as a species of Special Concern under COSEWIC and under Schedule 1 of SARA.

6.3.3.2.2.3 Little Brown Bat

There is potential for a decrease in populations and/or habitat of little brown bat from construction, maintenance and operation activities. This is associated with previously identified effects to mammals including clearing (**Section 6.2.5.5.2.1**) and sensory disturbance (**Section 6.2.5.5.2.2).** Destruction or disturbance of nursery or summer roosting colonies of little brown bat may result from project activities. No known winter roosting, hibernacula or critical habitat for this species was identified within the RAA. No little brown bat were observed during the field studies, as discussed in **Section 6.1.8.1.2.3.**

The potential decrease in little brown bat populations and/or habitat as a result of construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The effect is considered minor relative to habitat availability. Potential effects to little brown bat would be limited to the Project Footprint and would occur infrequently throughout the life of the Project including during critical life stages. Effects are considered irreversible. The risk of a decrease in little brown bat populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as the little brown bat is listed by SARA and ESEA.

6.3.3.2.3 Forest Birds

There is potential for a decrease in forest bird Species at Risk populations and/or habitat from construction, maintenance and operation activities. This is associated with previously identified effects including clearing (**Section 6.3.2.1**), loss of nests (**Section 6.3.2.2**), sensory disturbance (**Section 6.3.2.3**) and vehicle collisions (**Section 6.3.2.5**). Forest bird Species at Risk include bank swallow, barn swallow, Canada warbler, common nighthawk, eastern wood pewee, olive-side flycatcher, peregrine falcon, rusty blackbird and short-eared owl. The potential environmental effects prior to the implementation of

mitigation measures were assessed for each species individually (**Appendix 6-4**). While there are some differences in the assessed adversity among species due to species-specific habitat requirements and lifecycle characteristics, the potential effects on forest birds are generally consistent, with only a couple of exceptions.

The potential decrease in forest bird Species at Risk populations and/or habitat as a result of construction, maintenance and operation, prior to the implementation of mitigation measures, is generally considered negative and would occur throughout the life of the Project. The potential decrease in eastern wood-pewee populations, however, is considered negligible as none were documented during field studies and the Wildlife RAA is well outside of the published range of the species. The effect to habitat from clearing is considered minor relative to habitat availability for each forest bird Species at Risk. The effect would likely occur beyond the Project Footprint within the Wildlife LAA and could occur during critical life stages (ex: nesting).

Effects would occur sporadically throughout the life of the Project for most forest bird Species at Risk with the exception of barn swallow, bank swallow and peregrine falcon where effects would occur infrequently. Infrequent effects were assessed for barn and bank swallow as their habitat preferences generally are not found within the Project Footprint. Infrequent effects were assessed for peregrine falcon due to the fact that none were identified during field studies and the species is only considered a potential transient migrant within the Wildlife RAA. Effects are considered irreversible and the risk of a decrease to forest bird Species at Risk populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as each species is listed by SARA and some are also listed by ESEA.

6.3.3.2.4 Waterbirds

There is potential for a decrease in waterbird Species at Risk populations and/or habitat from construction, maintenance and operation activities. This is associated with previously identified effects including clearing (**Section 6.3.2.1**), loss of nests (**Section 6.3.2.2**), sensory disturbance (**Section 6.3.2.3**), hunting pressure (**Section 6.3.2.4**), vehicle collisions (**Section 6.3.2.5**) and drainage alteration (**Section 6.2.4.1.1**). Waterbird Species at Risk include horned grebe and yellow rail. The potential environmental effects prior to the implementation of mitigation measures were assessed for both species individually (**Appendix 6-4**). Due to similarities in their habitat requirements and lifecycle characteristics, the potential effects on waterbird Species at Risk are consistent.

The potential decrease in waterbird Species at Risk populations and/or habitat as a result of construction, maintenance and operation, prior to the implementation of mitigation measures, is considered negative and would occur throughout the life of the Project. The effect of habitat clearing is considered minor relative to habitat availability within the Wildlife RAA. The effect would likely occur beyond the Project Footprint within the LAA and could occur during critical life stages (ex: nesting). Effects would occur sporadically throughout the life of the Project and are considered irreversible. The risk of a decrease to

waterbird Species at Risk populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as both species are listed by SARA.

6.3.4 Indigenous Peoples and Human Health

Information sources, such as community knowledge, TK studies, MI's IPEP (**Chapter 5**) and heritage resource studies as described in **Chapter 4**, **Section 4.4** were used to identify potential effects on Indigenous Peoples and the Human Environment in the Indigenous LAA and RAA. Guidance was sought from the Agency's "Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under the *Canadian Environmental Assessment Act*, 2012" (Canadian Environmental Assessment Agency 2015b) and "Useful Information for Environmental Assessments" (Health Canada 2010). Linkages between Project components and activities and Indigenous Peoples were examined to determine the potential indirect effects that changes to the natural environment because of the proposed Project may have on Indigenous Peoples. Direct effects, such as reduced access to travel routes bisected by the all-season road, were also examined.

6.3.4.1 Land and Resource Use

Land use in the Indigenous RAA consists mainly of traditional activities by Indigenous people belonging to Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation. The proposed Project has the potential to affect use of lands and resources for traditional purposes such as hunting, trapping, fishing and gathering as a result of changes in land use and increased access to previously isolated areas by both locals and non-residents. Construction activities (ex: blasting) have the potential to interact with the timing of traditional activities. During operation of the Project, increased access could be a benefit to local communities by providing easier or new access to resources in the Indigenous LAA. Members from Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Narrows Northern Affairs Community indicated during the TK studies that increased access could be a benefit to the communities. Members from these communities also noted that additional land access may shift patterns of travel and harvesting.

The proposed Project could also indirectly affect traditional activities as a result of potential changes to the biophysical environment including effects on wildlife and wildlife habitat, fish and fish habitat and vegetation which could affect harvesting patterns and/or harvesting success. Affected harvested resources include wildlife (ex: moose, marten), game birds (ex: ducks, geese), fish (ex: walleye), berries (ex: blueberries) and traditional medicines (ex: Labrador tea). Specific locations of preferred harvesting areas have been provided in confidence by the three First Nations and the God's Lake Narrows Northern Affairs Community through the TK studies.

Other land and resource uses included in the effects assessment include lodges and outfitters, parks and Protected Areas, mining and aggregate resources and commercial forestry.

6.3.4.1.1 Hunting and Trapping

Moose hunting occurs all year while caribou hunting generally occurs in the fall and winter. Waterfowl hunting occurs in the spring and fall, while game bird hunting primarily occurs in the fall. Three RTLs are crossed by the all-season road in the Oxford House RTL District (52, 54 and 55) and seven are crossed in the God's Lake RTL District (4 to 6, 8 to 10 and 12), as previously described in **Section 6.1.11.3**. These traplines are most frequently used between October and mid-December in prime trapping season.

There may be a reduction in food supply and culturally important species as a result of previously identified effects on ungulates (ex: moose, caribou), furbearers (ex: marten) and birds and their habitat through clearing, sensory disturbance, hunting pressure, vehicle collisions, predation and disease and loss of nests (**Section 6.2.5.5** and **Section 6.3.2**). Clearing and construction may temporarily displace some wildlife and result in a reduction in hunting and trapping success rates. There is potential for hunting and trapping (domestic and commercial) activities to be adversely affected from temporary nuisances (ex: noise, vibration, traffic) during construction, maintenance and operation of the proposed Project.

Potential effects of construction, maintenance and operation on hunting and trapping and associated food supply, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. Indigenous Peoples can adapt to the effect with some adjustments in where they hunt and trap because it is anticipated that the effects would occur only sporadically and in a portion of a RTL at any given time. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA and could occur at a critical life stage of the species being hunted and trapped. In terms of ecological and social context, the Project has potential adverse effects on traditional use activities due to the removal and/or disturbance to food supply. Effects on revenue from effects to commercial trapping are discussed in **Section 6.3.4.3**.

6.3.4.1.2 Recreation and Commercial Fishing

There is no existing commercial fishing in the Indigenous RAA and as such there would be no effects from the proposed Project. There is however potential for traditional and recreational fishing activities to be adversely affected and an associated reduction in food supply as a result of the effects from construction, maintenance and operation on fish habitat and fish populations. These include previously identified effects related to water quality, shock waves, fishing pressure, fish passage, habitat and invasive species as discussed in **Section 6.3.1**.

The local Indigenous communities fish all year. During the TK studies, Manto Sipi Cree Nation indicated that members fish for northern pike and walleye in spring and summer near the proposed road alignment and use gill nets to fish for walleye on a lake close to the alignment in the winter. Bunibonibee Cree Nation members indicated that there are several important areas where fishing activity takes place in the spring, summer and fall near the proposed all-season road alignment. Some members from Bunibonibee Cree Nation indicated that the all-season road could increase access to a lake for fishing in the spring, summer

and fall. God's Lake First Nation indicated that walleye, perch and northern pike fishing occurs in a small lake near the all-season road alignment close to the community.

The potential effects of construction, maintenance and operation on food supply from fishing, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. Indigenous Peoples can adapt with some adjustments to where they fish in part because the Projects effects on fish and fish habitat would be sporadic during construction and maintenance activities at watercourse crossings. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA and without mitigation could occur at a critical life stages for fish. In terms of the ecological and social context, the Project has potential adverse affects on traditional use activities due to the removal and/or disturbance to food supply.

6.3.4.1.3 Gathering

Construction, maintenance and operation of the proposed Project could result in a reduction in food supply of harvested vegetation (ex: berries) and medicinal plants (ex: Labrador tea). Through the TK studies, the local Indigenous communities identified the type of plants used for sustenance and cultural value and areas where they are harvested within the Project Footprint and the Vegetation LAA. There was no overlap among the communities for the areas that were harvested and, as described in **Section 6.1.11.3.4**, the total harvest areas accounted for 31.6% (8.9 km^2), 31.9% (90.5 km^2) and 25.7% (367.6 km^2) of the Project Footprint, Vegetation LAA and Vegetation RAA, respectively.

Potential effects of construction, maintenance and operation on food supply from gathering plants, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. While dust may have a temporary physical effect on vegetation within the vicinity of the construction area (via smothering), dust is not considered relevant to change quality of country foods. Indigenous Peoples can adapt with some adjustments to where they gather plants in part because the Projects effects on vegetation would be sporadic during construction and maintenance activities and the harvested species are available throughout the area. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA. In terms of the ecological and social context, the Project has potential adverse affects on traditional use activities due to the removal and disturbance to food supply.

6.3.4.1.4 Outdoor Recreation

Travel routes in the Indigenous LAA and RAA include waterways such as, rivers and lakes, as well as land trails such as, portage routes, walking trail and snowmobile trails, some of which are used for recreation. Potential effects of the Project on travel routes are discussed in **Section 6.3.4.2**. Likewise potential effects of the Project on traditional and recreational fishing are discussed in **Section 6.3.4.1.2**. Other areas identified by the local communities during the TK studies as important to recreation (ex: beaches, family gathering sites, educational areas) are not anticipated to be adversely affected by the proposed Project because of the spatial separation. The closest recreational area to the all-season road is a beach in Manto

Sipi Cree Nation approximately 700 m away, while most other identified recreational areas are more than 3 km from the proposed alignment.

6.3.4.1.5 Lodges and Outfitters

There are no ecotourism businesses in the Indigenous RAA or LAA. Tourism activities are based at the eight remote fly-in fishing lodges in the Indigenous RAA, as described in **Section 6.1.11.3.7**, with activities generally taking place in the vicinity of the lodges. Two of the lodges are located in the Indigenous LAA with God's River Lodge being the closest, approximately 2.9 km from the all-season road alignment and then Healy's God's Lake Narrows Lodge located approximately 3.3 km from the all-season road alignment. The remaining lodges are located between 15 km to 55 km from the proposed alignment. Potential effects on the lodges primarily relate to changes in fishing as a result of potential effects to fish and fish habitat as discussed in **Section 6.3.1**.

Lodge owners in the Indigenous RAA were invited to the Public Open Houses held for the proposed Project. In addition, MI contacted owners to obtain feedback and answer questions and discuss any interests they may have regarding the proposed Project. The owners of Elk Island Lodge, Edmund Lake Lodge, God's River Lodge and Healy's God's Lake Narrows Lodge indicated that they wanted the proposes all-season road to be constructed earlier than currently planned. The lodge owners also indicated that they want access to PR 373 (Project 5) sooner as it would reduce the costs of operations (**Chapter 5, Section 5.4**). The lodges do provide some socio-economic benefits including employment opportunities (ex: guiding) for local Indigenous people.

6.3.4.1.6 Parks and Protected Areas

Other than the Reserve lands for the three First Nations, there are no federal lands or National Historic Sites in the Indigenous RAA. The proposed all-season road would connect to existing and proposed access roads at the Reserve boundaries and would not cross through Reserve lands. There are no parks or designated protected areas or other lands protected under the Manitoba PAI in the Indigenous RAA. The segments of all-season road from Manto Sipi Cree Nation and Bunibonibee Cree Nation, to the junction where it connects to the all-season road segment from God's Lake, crosses through the Knee Lake ASI as does a small portion of the road from God's Lake First Nation to the junction. The Knee Lake ASI, however, is not yet protected under the PAI. No adverse effects are anticipated given MI's environmental program and the environmental protection and management plans that would be implemented for the Project (**Chapter 8)**.

6.3.4.1.7 Mining and Aggregate Resources

There are no mineral leases, potash withdrawals, private quarry permits or quarry and surface leases in the Indigenous RAA and therefore no potential Project effect on those resource uses. There are four mining claims in the Indigenous LAA with the closest approximately 1.0 km from the proposed all-season road alignment. There are eight quarry withdrawals and eight active casual quarry permits within the Indigenous LAA. Four of the quarry withdrawals (two held by MI and two held by Northern Affairs) and

five expired casual quarry permits overlap the all-season road alignment. Nineteen quarries are anticipated to be required for construction and would be located on Provincial Crown Land and within 500 m of the centreline of the all-season road, where possible. Any quarries that would not be required for maintenance activities would be decommissioned following construction (**Chapter 3, Section 3.3.5**). Beyond the materials that would be used for road construction and maintenance no adverse effects on aggregate resources are anticipated given MI's environmental program and the environmental protection and management plans that would be implemented for the Project (**Chapter 8)**.

6.3.4.1.8 Forestry

There are no commercial forestry activities in the Indigenous RAA and therefore, there would be no effects from the proposed Project.

6.3.4.2 Travel Routes

Travel routes in the Indigenous LAA and RAA include ATV and snowmobile trails, as well as open-water and frozen waterways. These routes are important to local communities as they serve to connect them to lands and resources used for traditional purposes in recognition and exercise of Indigenous and treaty rights. During construction and when in-service, the all-season road would bisect some travel routes and may result in reduced access for resource use and outdoor recreation. Considering that the construction of the all-season road would be completed in segments starting from Bunibonibee Cree Nation and extending south and eastwards (**Chapter 3, Section 3.2.3**), disruption to travel routes that intersect the all-season road ROW would be greatest when a segment of the all-season road is under construction. When operational, the all-season road would provide an improved travel route among the communities.

The TK studies indicate that many trappers use snowmobiles to access their traplines in the winter and early spring. During the TK study for Manto Sipi Cree Nation, members indicated that five snowmobile routes were intersected by the all-season road alignment. The all-season road alignment also intersects a boat travel route in the area of Hawkins Lake. Bunibonibee Cree Nation members indicated that the all-season road alignment crosses two ATV routes, one of which is used in the spring to access a goose hunting area and the other is used for summer access to a lake. In addition, the all-season road alignment intersects a harvesting route for moss berries. God's Lake First Nation members indicated that the all-season road alignment intersects a walking route and two snowmobile routes near the community, the latter which is used to access traplines. The alignment also crosses a snowmobile route near a lake.

During Rounds 4 and 5 of the IPEP, members from Manto Sipi Cree Nation expressed a desire to maintain access for traplines that the all-season road crosses through (**Chapter 5, Table 5.8** – Traplines). Similarly, in Rounds 4 and 6, members of Bunibonibee Cree Nation indicated that MI should meet with affected trappers prior to construction.

Potential effects of construction, maintenance and operation on traditional travel routes used for recreation and resource use, prior to the implementation of mitigation measures, are considered

negative. Access along these routes would be more restricted when active construction is occurring in the area; however, the access would be modified throughout the life of the Project. Indigenous peoples can adapt with some adjustments to how and where they travel for the sporadic interruption when the access is most restricted during the construction period. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA. In terms of the ecological and social context, the Project has potential adverse affects on traditional activities and outdoor recreation as a result of decreased access to travel routes.

6.3.4.3 Economy

Construction, maintenance and operation of the proposed Project is expected to generate overall positive economic effects for the local Indigenous communities. Interest in employment opportunities was raised by Manto Sipi Cree Nation in Rounds 4 and 5 of the IPEP and Bunibonibee Cree Nation during Round 4 (**Chapter 5, Table 5.8** under "Employment). During the TK study, several members from God's Lake First Nation indicated that the all-season road would reduce flights among the communities connected by the road, which is a benefit to the communities as flights are costly.

Construction would be carried out under contracts tendered and managed by MI, as discussed in **Chapter 3, Section 3.4.1.14**. During the period of peak construction of the proposed Project, an estimated maximum workforce of 120 is anticipated. Commercial airline and air charter companies and local and regional suppliers of construction materials and supplies are expected to benefit during construction. As part of MI's commitment to local residents participating in and benefiting from the Project, MI specifically includes a requirement for a percentage of the construction tenders to be supplied locally through Manitoba's Indigenous Procurement Initiative (ex: equipment, services, employment). The percentage of local content is modified for each contract based on discussions with the community to identify and confirm its capacity to deliver equipment, services and/or manpower. In terms of operation and maintenance (**Chapter 3, Section 3.4.2.12**), typical staff complements would require 4 persons to maintain the all-season road. These could be permanent staff employed by MI or contract workers employed by a local contractor fulfilling a service agreement or bid hourly contract.

During operation the all-season road would increase access for trapping activities, resulting in an overall long-term positive effect on local incomes. However, there could be a decrease in trapping income for local trappers as a result of reduced trapping harvest during construction (ex: habitat loss, sensory disturbance, hunting pressure). The effect, prior to mitigation, would have a medium-term duration lasting until completion of construction and remediation. It is anticipated that Indigenous peoples can adapt with some adjustments to where they trap as only portions of the RTLs may be affected by active construction. Additionally, the effects would occur sporadically when construction activities are in close proximity to a registered trapline. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA. In terms of the ecological and social context, the decrease in trapping income is a potential adverse effect on traditional use activities.

6.3.4.4 Heritage and Archaeological Resources

Heritage, archaeological, cultural and sacred sites are important to local Indigenous communities as they are part of their heritage. Information on sites of cultural importance and sacred sites were identified through the TK studies and the IPEP. Based on a baseline desktop study, a flyover of the alignment and a HRIA of the proposed alignment, twelve previously unrecorded sites and a total of 149 artifacts were identified within the Heritage LAA, as described in **Section 6.1.9.4**. Only four of these newly recorded sites are within the 100 m ROW for the all-season road and potentially affected.

The proposed Project may result in loss or disturbance to heritage, archaeological, cultural and/or sacred sites during ROW clearing and construction and as a result of increased access. The potential effects, prior to the implementation of mitigation measures, are considered negative. While the loss and disturbance during construction would be short-term associated with discrete activities the increased access could result in loss or disturbance throughout the life of the Project. These resources, if affected by the proposed Project, are of importance to local Indigenous communities and are not recoverable. Potential effects may extend beyond the Project Footprint into the Heritage LAA. While the potential for the effect to occur would be sporadic the effect would be irreversible. In terms of the ecological and social context, the Project has potential adverse affects on local Indigenous communities as heritage, archaeological and cultural (sacred) sites are of great importance to local communities.

6.3.4.5 Human Health and Safety

The potential environmental effects on human health and safety associated with Project construction, maintenance and operation activities are linked to the potential direct and indirect effects on the environmental components that those activities interact with. Therefore, potential adverse effects of Project construction on human health and safety are, in part, determined through the assessment of construction, maintenance and operation effects on the VCs linked to those activities. For human health, associated environmental effects assessment determinations are found in the effects assessment sections for Atmospheric Environment, Groundwater and Surface Water, as well as Resource Use (**Sections 6.2.1**, **6.2.4** and **6.3.4.1** respectively).

An assessment for human health and safety as an independent VC was also completed. Effects on the human health and safety during construction, maintenance and operation are associated with activities such as ROW clearing, blasting, road and bridge construction and the operation of heavy equipment in remote areas removed from medical facilities and services. Potential indirect effects of the Project on health and safety of local community members were also considered. These include potential effects of Project construction, maintenance and operation activities that alter existing air quality, noise exposure levels and drinking water quality (**Section 6.1.1** and **Section 6.1.5**) and the quality and availability of country foods collected through hunting, trapping, fishing and gathering (**Section 6.1.9.1**). Some Indigenous people may also have a fear of contamination of water or country foods which may detract from the use of an area or lead to avoidance of an area or other fears.

As no construction or maintenance activities for the all-season road would take place within the boundaries of Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation, the Project would not directly affect Reserve Lands. In addition, there are no known residences, cabins or camps in immediate proximity to the proposed all-season road alignment. The nearest residences to the alignment are located in communities near the ends of each section of road and are approximately 250 m in Manto Sipi Cree Nation, 1.5 km in Bunibonibee Cree Nation and God's Lake First Nation and 3 km in God's Lake Narrows Northern Affairs Community. Similarly, there are only two lodges that are located in the Indigenous LAA, with God's River Lodge being the closest, approximately 2.9 km from the all-season road alignment and then Healy's God's Lake Narrows Lodge located approximately 3.3 km from the all-season road alignment.

As such, residences and people in the local communities and visiting lodges would not be exposed to an increase in particulate matter and noise from construction activities would be much less than 70 dB. Community members would be primarily subject to potential direct effects of Project construction, maintenance and operation activities when travelling outside of their communities and within proximity to the road.

In Round 6 of the IPEP, a member of Bunibonibee Cree Nation asked how the possibility of bringing drugs and alcohol into the community, illegal hunting, speeding, animal strikes and drivers polluting the environment could be prevented (**Chapter 5, Table 5.8** – Law Enforcement). In response, it was indicated that most of these are issues for law enforcement to address. These need to be discussed among Chief and Council, the RCMP and MSD, with the exception that MI's role is to design and build the road in a manner that minimizes effects on the environment, such as providing site lines to reduce wildlife strikes. The issue was also raised by God's Lake First Nation in Round 5 (**Chapter 5, Table 5.8** – Indigenous Peoples) and during the TK studies.

6.3.4.5.1 Community Member and Worker Safety

There are inherent health and safety concerns with construction in remote areas that are removed from medical facilities and services. There is a risk to community members and worker safety (ex: injury, death) during road construction and maintenance associated with use of heavy equipment, bridge construction and maintenance, quarry and borrow pit development, blasting, rock crushing, aggregate sorting and other related activities. Construction and maintenance worker health and safety may be at risk from vehicle accidents, noise, burns, explosions and the handling of hazard substances such as fuels and other materials. Local community members may also be at risk of injury and death from collisions with equipment, machinery and vehicles and to a much lesser extent fires and explosions.

During the operational phase of the all-season road, there is a number of road or traffic-related safety risks to road users and users of trails that intersect the all-season road. These include vehicle accidents and collisions with vehicles, maintenance equipment and wildlife. The need to build the road to standards

to minimize the potential for accidents and collisions was raised during the IPEP (**Chapter 5, Section 5.3.1.4**) meeting with God's Lake Narrows Northern Affairs Community.

The potential effects to community member and worker safety, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. Without mitigation there is the potential for loss of life. Generally, risks to human health would be limited to the Project Footprint in the immediate vicinity of active construction and to a lesser extent along the entire all-season road during operation (ex: vehicle collisions). Accidents would likely occur sporadically during construction and only infrequently during operation. Most injuries are readily reversible, however, worker and public safety is very important from a social context.

6.3.4.5.2 Medicinal Plant Harvesting

The potential effect of construction, maintenance and operation of the proposed Project on gathering medicinal plants (ex: Labrador tea) was previously assessed in **Section 6.3.4.1.3**. However, because medicinal plant harvest locations have more cultural value than food gathering locations the potential loss of these, prior to the implementation of mitigation measures is considered an irreversible effect.

6.3.4.5.3 Changes in Drinking Water Quality

Risks to the health of local community members and the construction work force may occur indirectly during construction, maintenance and operation, through Project-induced changes to the quality of tributary watercourses that flow into watercourses that are used as a potable water source. The communities of Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Narrows Northern Affairs Community source their drinking water from water treatment plants that obtainsurface water from either Oxford Lake or God's Lake. There is a risk that water quality of these lakes could be affected by road and bridge construction activities (ex. from large accidental spills or sediment releases) since the Project crosses tributaries of these lakes. Potable water for the construction camps would be trucked, as required, from existing sources in the nearby communities. Depending on the availability, groundwater may be obtained with prior approval from MSD (**Chapter 3, Section 3.3.7**). Trapline holders did not indicate that they drink untreated water when they are out trapping.

The potential to impair drinking water quality could occur from several Project activities with the potential to release deleterious substances to watercourses within the Project Footprint, described as follows.

- Runoff of stormwater and meltwater from road and bridge surfaces under construction and in operation can contain substances such as sediment, nutrients and hydrocarbons. During and following significant rainfall events or periods of melt, substance runoff into surface water and receiving streams can result in short-term changes in water quality.
- Geochemical leachate generated by the blasting, excavation and storage of specific bedrock types potentially found along the all-season road alignment and at quarry sites can generate acidic runoff that leaches metals and can impair drinking water quality. The risk and degree of adverse

environmental effects of acid rock drainage and/or metal leaching is dependent on many factors such as the amount of sulphide mineralization compositions present in the exposed rock.

- Concrete and concrete wash water from cast-in-place concrete structures such as bridge abutments, footings and bridge decks. The high pH of wash water from uncured or partly-cured concrete can affect drinking water quality. Concrete wash water can also contain particulates that can increase turbidity when spilled.
- Hydrocarbons such as oil, gasoline and hydraulic fluids used by construction and maintenance vehicles, machinery and equipment operating or serviced near watercourses. Hydrocarbons can impair drinking water quality and are hazardous to human health.

Drinking Water Quality Standards (Government of Manitoba 2018) and Guidelines for Canadian Drinking Water Quality (Health Canada 2017b) have been published by the Province of Manitoba and Health Canada, respectively and serve as the standards against which construction and operation effects on drinking water quality can be assessed. Given the distance between project activities and Oxford and God's lakes, the risk of drinking water quality being affected by the project is low. Accidents and malfunctions could cause the release of petroleum products, however the resulting contaminants benzene, toluene, ethylene, xylene, and petroleum hydrocarbons would dilute to the point of not being detectable at the water treatment plant intakes. MI's Environmental Protection Procedures (EPs) and Environmental Specifications (ES 130s) provide numerous best practices to reduce the possibility of accidents and malfunctions (**Appendix 8-2**).

The risks to community and worker health from decreased quality of community water supply, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. There is the potential for contaminant concentrations to exceed applicable federal and provincial guidelines and may affect surface water quality beyond a defined mixing zone in the general area of the activity or spill. While the source of contaminants would be from the Project Footprint there is the potential for decreased water quality to extend to within the Indigenous LAA. Sources of contaminants would likely occur sporadically during construction, however, only infrequently during operation. Decreased quality of community water supply could be reversed over a long period if the sources of contaminants are controlled. In terms of the ecological and social context, a potable water supply is important to the communities.

6.3.4.5.4 Changes in Air Quality

Road construction, maintenance and operation activities have the potential to reduce air quality through the generation of fugitive dust and other particulates from blasting, rock crushing, clearing, burning of woody debris and other construction-related activities and through dust and emissions from vehicle and equipment operations. Primary emissions from the operation of vehicles, machinery and equipment that can compromise air quality are CO_2, CH_4, N_2O and VOCs. The direct effect of the Project on air quality was previously assessed in **Section 6.2.1.1**. Air quality contaminants such as particulates (ex: total suspended particulates, $PM_{2.5}$, PM_{10}) and vehicle emissions (ex: SO_x, NO_x, diesel particulates) can affect the health of receptors within the Project Footprint and the Indigenous LAA. The Manitoba Ambient Air Quality Criteria

(Government of Manitoba 2005) and Canadian Ambient Air Quality Standards (CCME 2012) serve as the technical standard against which Project construction and operation effects on air quality can be assessed.

The nearest residences to the all-season road are approximately 250 m in Manto Sipi Cree Nation, 1.5 km in Bunibonibee Cree Nation and God's Lake First Nation and 3 km in God's Lake Narrows Northern Affairs Community. Wind measured at the God's Lake Narrows airport show that prevailing wind blows from the west and northwest, as illustrated in **Figure 6-3** and as such the majority of any dust blown off the road would be directed away from communities. Very high wind events and very dry, unfrozen conditions are pre-requisites for dispersal of dust to a degree that would reach the nearest residence; planned dust mitigation (watering of roads) would further minimize risk of occurrence. Individual use of project and adjacent areas would be limited in duration either when driving through area, or stopping to collect plants. If collecting plants, use of area would typically be conducted under favorable conditions (i.e. not in wind storm where dust dispersion would be occurring).

The potential effects to human health from decreased air quality, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. There is the potential for dust and emission levels to change by 10 to 20% of the baseline conditions. While the source of contaminants would be from the Project Footprint there is the potential for decreased air quality to extend to within the Indigenous LAA. Sources of contaminants would likely occur sporadically during construction and frequently during operation (ex: public and commercial vehicle traffic). Decreased air quality is readily reversed when the sources of contaminants are controlled. The potential to affect human health, as a result of dust and emissions is considered a moderate effect from a social context.

6.3.4.5.5 Changes in Noise Exposure

Road construction and maintenance activities would introduce temporary and on-going noise into the Indigenous LAA, as discussed in **Section 6.2.1.3**, that may causing hearing loss, sleep disturbance, interference with speech comprehension and increased risk of health effects (Health Canada 2017a). Adverse sound exposure levels may be generated by construction activities, in particular drilling, blasting and heavy equipment usage. Noise levels associated with all-season road construction, measured during Project 1 as part of safety and health audits, ranged from 80 to 110 dB with drilling generating the highest levels at 110 dB. The effects of noise would decrease with increasing distance from the source, as described in **Section 6.2.1.3,** such that with the exception of drilling, sound levels would be below 70 dB approximately 50 m away. Likewise, noise levels above existing baseline conditions are not expected to occur beyond 300 meters of construction activities and beyond 500 meters of blast sites.

Few human receptors are present as there are no known residences or cabins in immediate proximity to the proposed all-season road alignment. Construction activities for the project are located approximately 250 m from the nearest known residence in Manto Sipi Cree Nation, 1.5 km in Bunibonibee Cree Nation and God's Lake First Nation and 3 km in God's Lake Narrows Northern Affairs Community. The minimum distance from a potential quarry site to the closest residence is 1.5 km. At this distance the sound level

from construction activities at the quarry, based on measured attenuation outside the dwelling, would be much less than 70 dB.

The potential effects to human health from increased noise levels, prior to the implementation of mitigation measures, are considered negative and would occur throughout the life of the Project. As a result of the distance to community receptors and in conjunction with natural attenuation of dense forest the noise levels would be consistent with baseline noise levels. The extent of noise effects would be greatest within the Project Footprint and decreasing as it extends into the Indigenous RAA. The loudest sources of noise would likely occur sporadically during construction. During operation noise would occur frequently from public and commercial vehicle traffic. With the exception of possible blasting for more materials, when required during maintenance, noise levels are anticipated to return to baseline once construction in the area has ceased. It is not anticipated that the noise levels would have any adverse social effect.

6.3.4.5.6 Changes in Quality or Availability of Country Foods

Changes in the quality of "country foods" (ex: traditional foods in the diet of Indigenous peoples) resulting from Project construction, maintenance and operation activities may indirectly affect human health through consumption or reduced availability of country foods. For example, the release of sediment in a fish-bearing watercourse from which fish are harvested by local community members can temporarily reduce the availability of that fish species and reduce fishing success. Similarly, changes in air quality and noise levels associated with Project construction, maintenance and operation activities may alter the current distribution and thus availability, or quality of plants and animals. The quality of country food and medicinal plants collected from within areas where dust has settled is not expected to be affected if foods are thoroughly rinsed prior to ingestion. Communications of the risk of dust settling on country foods will be communicated to the community through the IPEP program.

Indigenous people may also avoid areas traditionally used as a result of fear of contamination of harvesting areas. The potential effect of construction, maintenance and operation of the proposed Project on the quality and availability of country foods (ex: berries, fish, moose, furbearers, waterfowl) was previously assessed throughout **Section 6.3.4.1**.

6.3.5 Federal Decision and Transboundary Effects

There are no expected changes to the environment on federal lands and lands in another province or outside of Canada. If DFO determines that Authorization is required under the *Fisheries Act*, there is the potential that the required offsetting plan may have an effect on the environment. The potential effects, however, would be no different than what has been already assessed. As such there is no additional assessment of effects beyond what was previously described throughout **Section 6.2** and **Section 6.3**.

6.4 Mitigation

As part of MI's commitment to environmental protection and sustainability, the design and routing of the Project has been developed with awareness of the importance of the ecological and social resources of the area including the value of the environment to the people and wildlife of the region. The route alignment for the proposed all-season road was selected following review of a number of proposed route alternatives and design options and their potential effects on the people, air, water, land, fish, vegetation, wildlife, heritage and archaeological resources and traditional land use and activities.

Input received from Elders, elected officials and community members of Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Narrows Northern Affairs Community was used to validate and refine the proposed all-season road alignment (**Chapter 2**) and contributed to the use of appropriate designs and the application of environmental protection measures for the construction, maintenance and operation phases of the Project. The environmental components that contribute to the ecological and cultural resources of the area were examined individually and collectively to find the best feasible route for the all-season road; a route that would connect the four communities, while respecting and preserving the environment of the region.

Many potential effects of road construction, maintenance and operation can be avoided or minimized through appropriate siting of the road alignment and road design. A variety of measures have been incorporated into the proposed Project to avoid potential effects where possible or mitigate adverse effects to minimize them where avoidance is not possible.

- Selecting a road alignment in close proximity to required building materials (ex: rock, clay) to minimize the disturbance footprint.
- Working directly with the local communities (Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Narrows Northern Affairs Community) on the review and refinement of the alignment through leadership, elder and community meetings.
- Providing opportunities for input by stakeholders, the public and regulatory authorities into alignment selection and refinement.
- Selecting a road alignment that provides appropriate setbacks from important physical features such as sensitive cultural, heritage and biophysical sites and waterbodies, where possible.
- Selecting crossing locations to avoid sensitive aquatic environments such as spawning areas and to minimize in-water works.
- Designing culverts to preserve existing surface and shallow subsurface flow patterns (ex: designs of watercourse crossing structures that span the wetted perimeter [clear span], where possible and meet 1:50 year flood design standards).
- Selecting quarry, borrow and temporary work/staging locations that avoid sensitive or important features associated with traditional activities and Indigenous and treaty rights (ex: trapper cabins, gathering areas).

- Incorporating measures into Project design and construction planning to accommodate traditional activities and Indigenous and treaty rights (ex: maintain trails, provide access to traplines for trappers).
- Committing to construction activities and practices (ex: erosion and sediment control, schedule, blasting, equipment idling), including health and safety, in construction contract documents that avoid or minimize potential effects on the environment.

Information on the route selection process is provided in **Chapter 2**. Information on the design mitigation features and measures that were used to reduce or avoid a number of potential environmental effects are described in **Chapter 3** and **Chapter 8**. MI's environmental program and the environmental protection and management plans that would be implemented for the Project are also outlined in **Chapter 8**. MI has developed a series of EPs (**Appendix 8-2**) and Environmental Protection Specifications (ES 130s) (**Appendix 8-3**) that are distributed to contractors as part of the contract agreements for construction activities. The purpose of these procedures and specifications is to ensure construction, maintenance and operation activities are performed according to applicable legislation, regulations, guidelines, permits and contracts and appropriate mitigation measures to protect the environment are implemented.

Specific technically and economically feasible measures to mitigate the adverse environmental effects of the project, as previously identified in the corresponding sub-sections of **Section 6.2** and **Section 6.3** are identified and described in the following sub-sections and summarized in **Appendix 6-4**.

6.4.1 Atmospheric Environment

6.4.1.1 Air Quality

6.4.1.1.1 Increase in Particulates

Proposed measures to mitigate potential adverse environmental effects of fugitive dust during the Project construction, maintenance and operation include implementing dust suppression measures and restricting vehicle speed limits. Additionally, aggregate size control and use of granitic material reduces dust generation from the roadbed. MI's EP18 (Dust Suppression Procedures) and ES 130.11 (Dust and Particulate Control) would be adhered to.

EP18 outlines best management practices for implementation and use of dust suppression on roadways including following the manufacturer's specifications, limiting application to roadways and carefully monitoring application rates to ensure adequate coverage and ensuring no pooling or runoff. Dust suppressant should not be applied on sections of road which are prone to flooding and should not be applied if precipitation is occurring or forecast to occur before the product sets or cures. Additional mitigation measures listed in ES 130.11 include using only approved suppressants (no use of waste petroleum or petroleum by-products) and covering of loads with tarps during transport. Stock piles or spoil piles are to be maintained as to minimize the potential for wind erosion.

6.4.1.1.2 Increase in Vehicle Emissions

Proposed measures to mitigate the potential environmental effect of an increase in vehicle emissions (ex: SO_x, NO_x, diesel particulates) to the atmosphere include using low sulphur fuels, requiring a high standard of maintenance for equipment and vehicles and limiting unnecessary long-term idling. Additionally, quarries, borrow areas, construction laydown areas and camps would be located as close to the road corridor and active construction areas as conditions allow reducing the driving distances.

6.4.1.2 Greenhouse Gases

Proposed measures to mitigate potential adverse environmental effects of GHG emission during the Project construction and operation include using low sulphur fuels, limiting unnecessary long-term vehicle and equipment idling, conducting regular maintenance on vehicles and equipment and limiting traffic to construction vehicles and equipment during construction. Measures to mitigate the loss of carbon sink associated with clearing the ROW include selecting an alignment through areas that are already disturbed, which would reduce the amount of existing vegetation to be removed.

Despite the loss of some areas of carbon sink, as discussed in **Section 6.2.1.2**, the all-season road would have a net positive effect on GHG emissions (decrease in GHG emissions) due to increased fuel efficiencies on the all-season road surface and the change in mode of transportation during operation (reducing air traffic). MI's ES 130.6.3 (General), regarding equipment maintenance, would be adhered to. This includes maintaining equipment and vehicles in good working order.

6.4.1.3 Noise

The distance between noise sources from Project activities and the nearest residences in nearby communities is great enough that noise effects should not occur at receptor points, as discussed in **Section 6.2.1.3**. Regardless, information would be posted in communities to notify/update people on construction activities, including blasting schedules.

Mitigation measures for noise generated by blasting include the maintenance of undisturbed forest buffers around the quarries unless the clearing is required for safety reasons. Additionally, best management practices would be used such as use of blasting plans, blasting mats, charging procedures and blasting ratios; the use of deterrents to exclude wildlife from the active blasting areas; and the appropriate scheduling of blasting when in the vicinity of sensitive wildlife sites. Disturbance effects are further mitigated by the majority of construction activities occurring during daylight hours with blasting activities restricted by provincial regulation (*Manitoba Quarry Minerals Regulation* 1992 44(1)) to business hours (9am to 4pm Monday through Friday).

To mitigate against vehicle and equipment noise MI would adhere to EP4 (Noise Control) and ES 130.12 (Noise and Noise Limitations). Specifically all equipment used on the Project would be effectively "sound-reduced" by means of proper silencers, mufflers, acoustic linings and shields. The contractor would comply with all noise bylaws of adjacent First Nation communities and any noise related clauses

incorporated in the Environment Act License for the Project. Any operation of equipment or blasting activity outside the hours as regulated would require an exemption in writing from the adjacent First Nation communities and amendment to the Environment Act Licence where required.

6.4.1.4 Ambient Light Levels

There is no lighting proposed associated with construction, maintenance and operation of the all-season road and therefore the Project would not change the current day-time or night-time light levels. As such, no specific mitigation measures are proposed regarding light levels.

6.4.2 Geology and Geochemistry

As the Project would have little to no change to geology or geochemistry, as discussed in **Section 6.2.2**, no specific mitigation measures are proposed. There is little to no potential for acid rock drainage due to project activities, as discussed in **Section 6.2.4.1**. Nevertheless, there is still potential that minerals which are sulphide-bearing and/or contain elevated metal concentrations may be present. As part of the quarry site selection (EP20, **Appendix 8-2**) potential sites and construction materials would be assessed for presence of sulphide mineralization or pyritic lithologies and rock with acid rock drainage potential would be avoided. Mitigation would include on-site confirmation of the presence of sulphide mineralization or pyritic lithologies for potential quarry sites prior to construction. Evaluation for potential acid rock drainage would include the following.

- Visual inspection for the presence/absence of pyrite or other evidence of potentially acid generating rock (ex: precipitates or accumulations of iron or sulphate minerals).
- Laboratory testing (ex: acid-generating potential, acid-neutralizing potential, sulphur analysis) of bedrock samples.

6.4.3 Topography and Soil

6.4.3.1 Terrain Alteration

Mitigation measures employed to reduce removal of soil and subsequent terrain alteration associated with construction of quarries and borrows pits include selecting an all-season road alignment that minimizes the need for terrain alterations, in particular selecting an alignment where materials are readily available and avoiding low lying areas which would require extensive fill. Disturbed areas (ex: camps, laydown areas, quarries, temporary access) that would not be required for Project maintenance and operation would be decommissioned and rehabilitated in accordance with EP22 (Temporary Site Decommissioning) and ES 130.8 (Designated Areas and Access).

Site decommissioning would include removal of all temporary structures, stripping and removal of granular material placed during construction and returning the grade to pre-disturbance conditions. Soil that was stockpiled when the area was developed would then be spread to promote natural re-establishment of vegetation. In cases where seeding is required for re-vegetation, seeding would

commence as soon as appropriate growing conditions occur after completion of grading. When conditions do not permit immediate seeding MI would ensure seeding is completed within the next growing season. Seeding operations would not be carried out under adverse conditions of high winds, or ground covered with snow, ice or standing water.

6.4.3.2 Spills and Hazardous Materials

Construction of the all-season road would improve road conditions. The alignment was selected to improve lines of sight along the road and near bridge approaches to reduce the likelihood and frequency of vehicle accidents and associated release of hazardous materials. Additionally the access would be improved for spill response crews in the event of a vehicle accident. Additional mitigation measures to minimize the potential effect of spills on soils include proper handling of potential contaminants, proper response in the event of a spill and appropriate remediation following any spills as described in the following sub-sections.

6.4.3.2.1 Refuelling and fuel handling

Fuel would be handled and re-fueling areas would be designated during construction and maintenance activities in accordance with EP2 (Petroleum Handling and Storage) and ES 130.9.2.5 (Petroleum Handling and Storage). Contractors would comply with Manitoba Regulation 188/2001 respecting "*Storage and Handling of Petroleum Products and Allied Products*" and transportation of petroleum would be in accordance with the *Dangerous Goods Handling and Transportation Act*. Designated areas for fuel storage and re-fueling activities would be;

- situated a minimum of 100 m from water
- have the topsoil stripped
- be underlain with a minimum of 30 cm of impermeable soil (or approved alternative)
- would contain an appropriately sized dyke to retain any spill

In the event that equipment must be refueled outside of a designated area, the fuel would be transported in approved containers and absorbent pads/ground sheets would be used. Cleaning, washing and servicing of equipment would also be restricted to the designated areas.

All employees involved in the handling and storage of fuels would have Workplace Hazardous Materials Information System (WHMIS) and spill response training. Bulk waste oil would be stored in above ground oil tanks with secondary containment and a weatherproof cover and would be recycled by a reputable recycling agency. Petroleum storage containers would be inspected daily for leakage and would be promptly removed from site if any damage or leaks are encountered. All petroleum product storage sites and mobile transportation units would be equipped with appropriate fire suppression products. Fueling procedures detailed in EP2 would be followed for fueling of equipment from a fixed fuel tank, sliptank and jerry can. Additional mitigation measures regarding re-fueling and fuel handling including fuel trucks,

petroleum storage tank installation and removal, labeling, signage, site security, product inventory, secondary containment and storage tank registration are discussed in EP2.

6.4.3.2.2 Spill Response

Spill response and remediation would be completed in accordance with EP3 (Spill Response) and ES 130.10 (Spills, Remediation and Emergency Response). The contractor would develop a spill response plan in accordance with applicable contract specifications, environmental legislation, permits and authorizations. Information to be available on-site at all times includes an updated list of key contacts and telephone numbers for reporting spills and problems and WHMIS documents for all hazardous materials at the work area. Material Safety Data Sheets (MSDS) would be submitted to MI prior to any hazardous materials being brought to site.

Spill containment and clean up supplies for spills of dangerous goods or hazardous wastes would be available at all sites where construction related activities occur. An on-site emergency response coordinator would be designated. All major spills of petroleum products or other hazardous substances with significant effect on the environment and threat to human health and safety (as defined in Table 1 of EP2) or any spill in a waterbody or watercourse would be reported to MSD immediately by calling the 24-hour emergency spill number. All spills would also be reported to MI within 24 hours and would provide the specified information detailed in EP3.

6.4.3.2.3 Remediation

In the event of a spill on the ground the entire affected area would be cleaned up and all soil with contaminant levels exceeding the applicable criteria would be appropriately disposed of at a licenced soil recycling facility. If affected soil is to be stored on site for any amount of time, a designated storage area would be identified and prepared to prevent further effects to other soil in the area. Soil would be remediated to CCME guidelines and in accordance ES 130.10 (Spill, Remediation and Emergency Response).

As part of decommissioning temporary construction areas not required for maintenance, an environmental site assessment would be conducted at designated areas, if contamination is suspected. Spill sites may also require an environmental site assessment and/or a remedial action plan. Additional details pertaining to remediation workplan and disposal of affected material are described in ES 130.10.

6.4.3.3 Soil Loss

Soil loss due to road construction and maintenance would be mitigated by selecting a road alignment which minimizes the requirements of terrain alteration and material requirements. This includes avoiding low lying areas that would require extensive fill to bring the all-season road up to the required grade.

6.4.4 Groundwater and Surface Water

6.4.4.1 Surface Water

6.4.4.1.1 Drainage and Flow Patterns

To mitigate against the potential disruption to surface water drainage and flow patterns, bridges and culverts at watercourse crossings and equalization culverts would be designed to accommodate 1:50 year flood events and downstream flows would be maintained at all times during construction. Regular culvert maintenance and cleanouts would also be required to limit the potential of blockage and subsequent flow restriction. Bridge and culvert design and maintenance would be in accordance with the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, DFO's measures to avoid causing harm to fish and fish habitat, EP7 (Stream Crossings), EP11 (Culvert Maintenance and Replacement), ES 130.15.5 (Stream Crossings) and ES 130.15.9 (Culvert Maintenance and Replacement).

In the event of a blockage, the removal of accumulated material (ex: branches, stumps, other woody materials, garbage) would be limited to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function. The accumulated material and debris shall be removed slowly to prevent downstream flooding. If maintenance of culverts requires the removal of a beaver dam, MI's Nuisance Beaver Management Program (**Chapter 3, Appendix 3-6**) would be followed. Additional mitigation measures related to the effects of altered drainage on fish passage are described in **Section 6.4.6.4.**

6.4.4.1.2 Erosion and Sedimentation

Mitigation measures to reduce the potential effect of erosion and sediment on surface water quality include minimizing clearing and soil disturbance, in particular near water bodies and watercourses. Clearing would occur during fall and winter months in accordance with ES 130.17 (Clearing and Grubbing) and vehicle and equipment use would be limited to within the ROW and operations would be halted during heavy rain events (EP6). Any clearing within 30 m of a watercourse, such as at crossings, would be hand-cleared where it is safe to do so, to prevent disturbance to the organic soil layer. No borrow material would be removed from or stockpiled within 100 m of a waterbody and backfill installed adjacent to fish-bearing waterbodies would consist of clean and well graded granular material free of fines.

With the exception of at watercourse crossings, a 100-m vegetated buffer would be retained at all waterbodies in accordance with ES 130.15.1. If a 100-m buffer is not possible between the road and the waterway, a buffer zone width of approximately 10 m plus 1.5 times the slope gradient or 30 m should be used, whichever is greater. Disturbed areas including shorelines would have natural drainage maintained and would be restored to their original condition as soon as practicable following completion of construction activities in accordance with EP22 (Temporary Site Decommissioning) and ES 130.8 (Designated Areas and Access).

Erosion and sediment control (ESC) measures (ex: silt fencing, erosion control blankets, straw wattles, geotextile) would be installed in accordance with EP16 (Erosion and Sediment Control) and ES 130.16 (Erosion and Sediment Control). ESC measures would be installed prior to the commencement of any work near fish habitat and regularly inspected and maintained, particularly following major rain events and spring melt. A turbidity curtain would be installed downstream of any in-water work in fish-bearing waterways. Stream banks and beds would be protected with erosion-resistant materials such as riprap at culvert openings. ESC measures would remain in place and would be maintained until the vegetation has become established. Energy dissipation controls (ex: ditching, riprap, collection ponds) would be implemented where appropriate.

6.4.4.1.3 Spills and Hazardous Materials

Construction of the all-season road would improve road conditions. The alignment was selected to improve lines of sight along the road and near bridge approaches to reduce the likelihood and frequency of vehicle accidents and associated release of hazardous materials. Additionally the access would be improved for spill response crews in the event of a vehicle accident.

The mitigation measures described in **Section 6.4.3.2** to reduce the potential effects to soil from leaks, spills or releases of fuel and hazardous materials would also mitigate potential effects to surface water quality. Measures that are specific to protect surface water quality include designating re-fueling areas a minimum of 100 m from waterbodies and fuel handling procedures in accordance with EP2 (Petroleum Handling and Storage) and ES 130.9.2.5 (Petroleum Handling and Storage). Spill response and remediation would be in accordance with EP3 (Spill Response) and ES 130.10 (Spills, Remediation and Emergency Response) as previously described in **Section 6.4.3.2**.

Any spill in a waterbody or watercourse would be reported to MSD immediately by calling the 24-hour emergency spill number. The containment and remediation of spills on the ground removes the potential for the hazardous materials to run-off into nearby surface water.

6.4.4.1.4 Acid Rock Drainage

There is little to no potential for acid rock drainage due to project activities, as discussed in **Section 6.2.4.1**. Nevertheless, there is still potential that minerals which are sulphide-bearing and/or contain elevated metal concentrations may be present. As part of the quarry site selection (EP20, **Appendix 8-2**) potential sites and construction materials would be assessed for presence of sulphide mineralization or pyritic lithologies and rock with acid rock drainage potential would be avoided. Mitigation would include on-site confirmation of the presence of sulphide mineralization or pyritic lithologies for potential quarry sites prior to construction. Evaluation for potential acid rock drainage would include the following.

- Visual inspection for the presence/absence of pyrite or other evidence of potentially acid generating rock (ex: precipitates or accumulations of iron or sulphate minerals).
- Laboratory testing (ex: acid-generating potential, acid-neutralizing potential, sulphur analysis) of bedrock samples.

6.4.4.2 Groundwater

6.4.4.2.1 Groundwater Availability

There is little to no use of groundwater as a potable water source in the Indigenous RAA and there are no recorded wells on the provincial GW Drill database. Regardless, mitigation measures to reduce the potential of lowering the groundwater table due to quarry and borrow pit construction include adherence to EP20 (Quarry Site Selection and Requirements). Specifically quarries and borrow pits would not be located within 400 m of a residence or within 15 m of a property line.

6.4.4.2.2 Groundwater Quality

While groundwater is not used as a potable water source, the mitigation measures previously discussed to mitigate effects to soil (**Section 6.4.3.2**) and surface water (**Section 6.4.4.1.3**) from spills of fuel or hazardous materials would also mitigate effects to groundwater quality. Specific Measures to protect groundwater quality include designating re-fueling areas away from existing wells in accordance with EP2 (Petroleum Handling and Storage) as they could provide a pathway of spills into the groundwater.

6.4.5 Riparian, Wetland and Terrestrial Environments

6.4.5.1 Vegetation

6.4.5.1.1 Disturbance and Loss of Plant Communities

Mitigation measures to reduce the disturbance, loss, reduced diversity and fragmentation of plant communities due to clearing of native vegetation includes limiting clearing to designated areas within the ROW in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing). Specifically, clearing and grubbing would be limited to all-season road alignment, construction camps and laydown areas, quarries, borrow pits and the associated access routes. The clearing would be conducted between September 1 and April 1 of the following year.

Vegetation buffers would be maintained between the ROW and any development including borrow areas, quarries, laydown areas, personal property, utility poles and camps. Vegetation buffers would also be maintained between the ROW and sensitive features (ex: watercourses). Grubbing would not occur within 2 m of trees that would be left standing in order to prevent damage to their root systems. Trees would be felled towards the centre of the ROW and woody debris would not fall or be pushed into adjacent standing timber that would not be cleared. Construction vehicle and equipment use would be restricted to the site, existing roads, or approved access routes that have been cleared (ES 130.6.1).

Areas disturbed by construction that are not required for Project maintenance and operation would be decommissioned and rehabilitated once construction activities are completed in accordance with EP22 (Temporary Site Decommissioning). This consists of restoring disturbed areas to their original condition (ES 130.8.7). Access roads that are no longer required would be blocked using rocks, gates, timbers or other barriers to impede access and the road would be removed as soon as possible following the completion of work.

Temporary site locations would be left in a condition that promotes natural re-vegetation of the site. In cases where seeding is required for re-vegetation, seeding would commence as soon as appropriate growing conditions occur after completion of grading. When conditions do not permit immediate seeding MI would ensure seeding is completed within the next growing season. Seeding operations would not be carried out under adverse conditions of high winds, or ground covered with snow, ice or standing water. If an area is to be re-seeded, an approved seed mix consisting of locally and regionally compatible species (native) would be used (ES 130.16.13).

6.4.5.1.2 Disturbance and Loss of Wetlands

Mitigation measures to reduce the disturbance and loss of wetlands (ex: bog, fen, marsh, swamp, shallow water) include selecting an alignment that avoids low lying wetland areas where there are better conditions in the immediate vicinity. When wetland areas cannot be avoided, then construction activities would be conducted during winter months when the ground is frozen. Construction measures recommended by Ducks Unlimited to minimize effects to wetlands would be used where applicable and feasible (Ducks Unlimited Canada *et al.* 2014). Construction camps, temporary access roads, work areas, quarries and borrow pits would not be located in wetlands. In particular quarries would not be located within 100 m of a waterbody or sensitive wildlife habitat in accordance with EP20 (Quarry Site Selection and Requirements).

Road design measures would be implemented to maintain existing moisture conditions that support localized vegetative communities. Specifically, equalization culverts would be designed to accommodate 1:50 year flood events and installed and appropriately spaced to maintain local landscape hydrology. To ensure that local hydrology is maintained culverts would be regularly maintained and cleaned in accordance with EP11 (Culvert Maintenance and Replacement) and ES 130.15.9 (Culvert Maintenance and Replacement). Details regarding culvert maintenance were previously discussed in **Section 6.4.4.1.1**.

6.4.5.1.3 Introduced Species

Mitigation measures to reduce the potential risk of invasive and non-native plant species include limiting clearing to designated areas in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing). Clearing and grubbing would be conducted between September 1 and April 1 of the following year. Construction vehicle and equipment use would be restricted to the site, existing roads, or approved access routes that have been cleared (ES 130.6.1). Prior to being brought to site construction equipment and vehicles would be properly cleaned to prevent the transfer of invasive species in accordance with EP25 (Prevention of the Transfer of Invasive Species) and ES 130.15.1 (Working Within or Near Water - General).

Disturbed areas not required for Project maintenance and operation would be decommissioned and rehabilitated, as described in **Section 6.4.5.1.1**, in accordance with EP22 (Temporary Site Decommissioning). If an area is to be re-seeded, an approved seed mix consisting of locally and regionally compatible species (native) would be used (ES 130.16.13). In the event that herbicides are required to

manage invasive weedy species in targeted areas where they have established, Pesticide Use Permits would be acquired and conditions would be adhered to.

6.4.5.1.4 Spills and Herbicide Use

The mitigation measures previously discussed to mitigate effects to soil (**Section 6.4.3.2**) from spills of fuel or hazardous materials would also mitigate the potential impairment or loss of vegetation. This includes adhering to designated refuelling areas and fuel handling procedures (EP2 and ES 130.9.2.5), spill response procedures (EP3 and ES 130.10) and remediation to CCME guidelines (EP3 and ES 130.10). To mitigate the potential effect to non-targeted or desirable plant species, herbicides would not be applied beyond the ditch embankment, and only to targeted areas. Additionally, herbicide application would be in accordance with manufacturer's guidelines (ex: application techniques, concentrations) and permit terms and conditions.

6.4.5.1.5 Wildfires

Mitigation measures to reduce the potential for wildfires due to fires and explosions from construction and maintenance activities include proper storage and handling of combustible materials in accordance with EP2 (Petroleum Storage) and ES 130.9 (Materials Handling, Storage and Disposal). Petroleum handling and storage would comply with Manitoba Regulation 188/2001 respecting "*Storage and Handling of Petroleum Products and Allied Products*" and petroleum products would be transported in accordance with the Manitoba Provincial "*Dangerous Goods Handling and Transportation Act*". Petroleum storage tanks would be grounded and the dispensing tank would be attached with a bonding cable to an appropriate location on the receiving tank prior to commencing fuelling. Storage sites for petroleum products would be secured and signs including hazard warnings, who to contact in case of a spill, access restrictions and under whose authority the access is restricted shall be posted. Employees involved in the handling and storage of fuels shall have WHMIS and spill response training. Combustible engines would be shutdown during fuelling. Smoking and open flames would be prohibited at the petroleum storage area at all times.

Additional mitigation measures to reduce the potential for wildfires due to construction and maintenance activities include only conducting burning under controlled (monitored) conditions and in adherence to EP1 (Clearing and Grubbing), EP15 (Wildfires) and (ES 130.20 Wildfires). Prior to the commencement of construction, an evacuation and emergency preparedness plan addressing wildfires would be prepared. Cleared and grubbed material that is to be burned shall be piled for burning and located a minimum of 15 m from other wood and brush piles and standing timber. No burning of debris piles shall occur on deep organic soils. No fire would be started without first taking sufficient precautions to ensure that the fire can be kept under control. Burning would be limited during the dry season (April 1 to November 15) and only done with a burning permit obtained from MSD. All conditions imposed by the burning permit would be adhered to.

In the event that a wildfire occurs it would be immediately reported to MSD and the contract administrator. If a wildfire is identified where construction activities are taking place, activities would be stopped and all reasonable (safe) attempts would be made to extinguish the fire. Available equipment, services and labour would be made available for the purposes of wildfire protection operations.

6.4.5.2 Mammals

6.4.5.2.1 Ungulates

6.4.5.2.1.1 Habitat Alteration, Fragmentation and/or Loss

Mitigation measures to reduce the potential effects of the Project on ungulate habitat alteration, fragmentation and loss include following clearing and grubbing timelines and restrictions to avoid critical calving times in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing). Specifically, clearing and grubbing would be limited to the all-season road alignment, construction camps and laydown areas, quarries, borrow pits and the associated access routes. To limit the amount of cleared area required, existing cutlines, routes and trails would be used where they are present. Clearing and grubbing would only be undertaken between September 1 and April 1, of the following year, to minimize disturbance to wildlife (ex: caribou parturition times of May 10 to June 15).

Grubbing would not occur within 2 m of trees that would be left standing in order to prevent damage to their root systems. Trees would be felled towards the centre of the ROW and woody debris would not fall or be pushed into adjacent standing timber that would not be cleared. A vegetation buffer would be maintained between the areas cleared and any sensitive features to be avoided such as watercourses, calving areas and mineral licks identified during baseline studies. Any new sensitive areas found during clearing would be reported to the Contract Administrator and are not to be cleared. Construction vehicle and equipment use would be restricted to the site, existing roads, or approved access routes that have been cleared (ES 130.6.1). Disturbed areas not required for Project maintenance and operation would be decommissioned and rehabilitated, as described in **Section 6.4.5.1.1**, in accordance with EP22 (Temporary Site Decommissioning) and ES 130.8 (Designated Areas and Access).

Road design measures would be implemented to maintain existing moisture conditions that support localized wetland communities. Specifically, equalization culverts would be installed and spaced appropriately to maintain local landscape hydrology and would be designed to accommodate 1:50 year flood events. To ensure that local hydrology is maintained, culverts would be regularly maintained and cleaned in accordance with EP11 (Culvert Maintenance and Replacement) and ES 130.15.9 (Culvert Maintenance and Replacement). Details regarding culvert maintenance were previously discussed in **Section 6.4.4.1.1**.

6.4.5.2.1.2 Sensory Disturbance

Mitigation measures to reduce the potential sensory disturbance on ungulates due to vehicle and equipment noise and vibration include following clearing and grubbing and blasting timelines and

restrictions to avoid critical calving times. Clearing and grubbing would be completed in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing), as described in **Section 6.4.5.2.1.1**.

In accordance with EP14 (Wildlife) no blasting would be permitted within 2 km of known caribou calving areas along access roads and quarry areas from April 15 to July 31 and within close proximity to sensitive wildlife habitat during critical lifecycle periods. No temporary roadbed borrow operations would occur within 2 km of known caribou calving areas along access roads from May 15 to July 1. Construction traffic would be restricted to the site, existing roads, or approved access routes (ES 130.6). Additionally construction activities would be staged such that sensory disturbance would be limited to defined contract areas rather than throughout the entire Project Footprint.

Typical noise control would be used in accordance with to EP4 (Noise Control) and ES 130.12 (Noise and Noise Limitations). Equipment used on the project would be effectively "sound-reduced" by means of proper silencers, mufflers, acoustic linings, acoustic shields or acoustic sheds. Dust suppression would also be used in accordance with EP18 (Dust Suppression Practices) and ES 130.11 (Dust and Particulate Control). Dust suppression would be conducted as necessary using water or other approved dust suppressants. Vehicles used to haul materials to or from the work site would have the load covered with a tarpaulin during transport.

6.4.5.2.1.3 Increase in Hunting Pressure

Measures to reduce the potential increase in hunting pressure on moose and caribou include designing the road with no pullouts or parking areas that would facilitate increased access for hunting. To reduce increased hunting during construction, contractors and MI employees working on the Project would be prohibited from hunting or trapping wildlife at or in the vicinity of the site in accordance with EP14 (Wildlife) and ES 130.19 (Wildlife). Additionally, firearm possession would be prohibited in construction camps, with the exception of firearms used to protect against nuisance animals, as authorized by MSD.

Following construction completion, temporary access roads and winter road access points would be decommissioned and reclaimed to allow for the regeneration of vegetation in accordance with EP21 (Road Closure and Reclamation Plan Temporary), EP22 (Site Decommissioning) and ES 130.8 (Designated Areas and Access). This would restrict off-road access by vehicles and reduce the opportunities for hunting off the existing winter road. Access would also be restricted to quarries that would be used for maintenance activities during the operation phase to reduce hunting opportunities as per ES 130.6 (General) and ES 130.8 (Designated Areas and Access). MI would liaise with MSD and participate on committees and working groups and share wildlife information obtained through monitoring efforts.

6.4.5.2.1.4 Mortality Due to Vehicular Collisions

To reduce the potential moose and caribou mortality due to vehicle collisions during construction the all-season road corridor would be restricted to construction personnel. Information about wildlife awareness would be provided to road construction workers. Construction equipment and vehicles would be traveling

at reduced speeds, which would further minimize the risk of a wildlife collision (Jaarsma *et al.* 2006; Van Langevelde and Jaarsma 2009).

The all-season road has been designed to optimize line of sight, which would reduce the risk of vehicle collisions with moose and caribou during operation. The line of site would be routinely maintained through vegetation management with removal of tall trees and shrubs. The use of highway road salts would be avoided during maintenance as they can attract ungulates and possibly increase incidence of vehicle collisions (Grosman *et al.*, 2009). Speed limits would be reduced and wildlife warning signs would be posted in areas where wildlife collisions are identified as a problem in accordance with EP14 (Wildlife).

6.4.5.2.1.5 Mortality Due to Increased Predation

Mitigation measures to reduce the potential increase in moose and caribou mortality due to increased predation include decommissioning and reclaiming temporary access roads and winter road access points at the completion of construction vegetation in accordance with EP21 (Road Closure and Reclamation Plan Temporary), EP22 (Site Decommissioning) and ES 130.8 (Designated Areas and Access). No additional mitigation measures are proposed as access during the late spring, summer and early fall would not change due to the Project as the terrain and habitat beyond the Project Footprint would not change.

6.4.5.2.1.6 Mortality Due to Introduction of Disease

The potential for increased moose and caribou mortality due to introduction of disease from white-tailed deer is considered negligible, as described in **Section 6.2.5.5.1.6**, due to the distance between the Project and the range of white-tailed deer. Regardless, mitigation measures to reduce the potential for white-tailed deer occupancy includes limiting clearing to designated areas within the ROW using existing cutlines, routes and trails where they are present in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing). Temporary access roads, trails and winter road access points would be decommissioned and reclaimed following completion of construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles in accordance with ES 130.8 (Designated Areas and Access).

6.4.5.2.2 Aquatic and Terrestrial Furbearers

6.4.5.2.2.1 Habitat Alteration, Fragmentation and/or Loss

Mitigation measures to reduce the potential effects of the Project on terrestrial and aquatic furbearer habitat alteration, fragmentation and loss include following clearing and grubbing timelines and restrictions in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing), as described in **Section 6.4.5.2.1.1**. Additionally, at watercourse crossings where clearing is required within 30 m of a watercourse, it would be done by hand. A vegetation buffer would be maintained between the ROW and any sensitive features identified during baseline studies (ex: denning areas and lodges). Any new sensitive areas found during clearing would be reported to the Contract Administrator and are not to be cleared.

Construction traffic would be restricted to the site, existing roads, or approved access routes (ES 130.6). Slash and brush debris piles would not be burned in the spring or early summer to avoid disturbing small wildlife species which may have young in the piles in accordance with EP1 (Clearing and Grubbing). Disturbed areas not required for Project maintenance and operation would be decommissioned and rehabilitated, as described in **Section 6.4.5.1.1**, in accordance with EP22 (Temporary Site Decommissioning).

The all-season road alignment was selected to maintain a minimum 100-m vegetated buffer from watercourses, with the exception of construction of a watercourse crossing. Work near waterbodies would adhere to EP6 (Working Within or Near Fish Bearing Waters) and ES 130.15 (Working Within or Near Water). To avoid disturbance to riparian vegetation existing trails, roads or cut lines would be used to access the site. Banks and shoreline areas that are disturbed would be restored to their original conditions as soon as practicable, including re-vegetation if necessary.

Wetland hydrological regimes would be maintained by designing bridge and culvert crossings to accommodate 1:50 year flood event and conducting regular culvert maintenance and cleanout in accordance with EP11 (Culvert Maintenance and Replacement) and ES 130.15.9 (Culvert Maintenance and Replacement). If maintenance of culverts requires the removal of a beaver dam, MI's Nuisance Beaver Management Program (**Chapter 3, Appendix 3-6**) would be followed, as well as ES 130.15.10 (Beaver Dam Removal). Beaver dam removal is not to occur in winter, must be authorized by MSD and must be done in a manner that does not affect fish or result in shoreline modification downstream. Beaver dam removal is to be done gradually therefore allowing a slow release of water.

6.4.5.2.2.2 Sensory Disturbance

Mitigation measures to reduce the potential sensory disturbance on furbearers due to vehicle and equipment noise and vibration include following clearing and grubbing and blasting timelines and restrictions to avoid critical denning and rearing times. Clearing and grubbing would be completed in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing), as described in **Section 6.4.5.2.1.1**.

In accordance with EP14 (Wildlife), no blasting would be permitted within close proximity to sensitive wildlife habitat during critical lifecycle periods. Construction traffic would be restricted to the site, existing roads, or approved access routes (ES 130.6). Additionally construction activities would be staged such that sensory disturbance would be limited to defined contract areas rather than throughout the entire Project Footprint.

Typical noise control would be used in accordance with to EP4 (Noise Control) and ES 130.12 (Noise and Noise Limitations). Equipment used on the project would be effectively "sound-reduced" by means of proper silencers, mufflers, acoustic linings, acoustic shields or acoustic sheds. Dust suppression would also be used in accordance with EP18 (Dust Suppression Practices) and ES 130.11 (Dust and Particulate Control). Dust suppression would be conducted as necessary using water or other approved dust

suppressants. Vehicles used to haul materials to or from the work site would have the load covered with a tarpaulin during transport.

6.4.5.2.2.3 Mortality Due to Vehicular Collisions and Nuisance Wildlife Management

The mitigation measures previously described for ungulates in **Section 6.4.5.2.1.4** would also reduce the potential terrestrial and aquatic furbearer mortality due to vehicle collisions. In addition vegetation buffers would be preserved at watercourses in accordance with ES 130.15.1 (General) providing natural corridors for furbearers. Likewise bridges and culverts at watercourse crossings would accommodate 1:50 year flood events with regular culvert maintenance and cleanouts (EP11 and ES 130.15.9) to maintain wetland hydrologic regime and provide alternative means for furbearers to cross the all-season road. If maintenance of culverts requires the removal of a beaver dam, MI's Nuisance Beaver Management Program (**Chapter 3, Appendix 3-6**) would be followed, as well as ES 130.15.10 (Beaver Dam Removal). Beaver dam removal is not to occur in winter and is to be done gradually therefore allowing a slow release of water.

6.4.5.3 Reptiles and Amphibians

6.4.5.3.1 Habitat Alteration, Fragmentation and/or Loss

Mitigation measures to reduce the potential effects of the Project on amphibian habitat alteration, fragmentation and loss include following clearing and grubbing timelines and restrictions in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing), as described in **Section 6.4.5.2.1.1**. At watercourse crossings where clearing is required within 30 m of a watercourse, it would be done by hand. A vegetation buffer would be maintained between the ROW and any sensitive features identified during baseline studies and any new sensitive areas found during clearing would be reported to the Contract Administrator and are not to be cleared.

Construction traffic would be restricted to the site, existing roads, or approved access routes (ES 130.6). Slash and brush debris piles would not be burned in the spring or early summer, in accordance with EP1 (Clearing and Grubbing), to avoid disturbing amphibians which may be using the piles. Disturbed areas not required for Project maintenance and operation would be decommissioned and rehabilitated, as described in **Section 6.4.5.1.1**, in accordance with EP22 (Temporary Site Decommissioning).

The all-season road alignment was selected to maintain a minimum 100-m vegetated buffer from watercourses, with the exception of construction of a watercourse crossing. If a 100-m buffer is not possible between the road and the waterway, a buffer zone width of approximately 10 m plus 1.5 times the slope gradient or 30 m should be used, whichever is greater. Work near waterbodies would adhere to EP6 (Working Within or Near Fish Bearing Waters) and ES 130.15 (Working Within or Near Water).

Construction activities would not occur in fish bearing waters between April 15 and July 15 or during periods of high stream flow. In-water work would be staged to occur as a single event and machinery access would be limited to a single point on the shoreline. To avoid disturbance to riparian vegetation

existing trails, roads or cut lines would be used to access the site. Banks and shoreline areas that are disturbed would be restored to their original conditions as soon as practicable, including re-vegetation if necessary.

Wetland hydrological regimes would be maintained by designing bridge and culvert crossings to accommodate 1:50 year flood event and conducting regular culvert maintenance and cleanout in accordance with EP11 (Culvert Maintenance and Replacement) and ES 130.15.9 (Culvert Maintenance and Replacement). If maintenance of culverts requires the removal of a beaver dam, MI's Nuisance Beaver Management Program (**Chapter 3, Appendix 3-6**) would be followed, as well as ES 130.15.10 (Beaver Dam Removal). Beaver dam removal is not to occur in winter, must be authorized by MSD and must be done in a manner that does not affect fish or result in shoreline modification downstream. Beaver dam removal is to be done gradually therefore allowing a slow release of water.

6.4.5.3.2 Increased Winter Mortality by Soil Compaction and Freezing

Mitigation measures to reduce the potential effects of soil compaction and freezing include limiting clearing to designated areas within the ROW in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing). Specifically, clearing and grubbing would be limited to all-season road alignment, construction camps and laydown areas, quarries, borrow pits and the associated access routes. The all-season road alignment was selected to maintain a minimum 100-m vegetated buffer from watercourses, with the exception of construction of a watercourse crossing. If a 100-m buffer is not possible between the road and the waterway, a buffer zone width of approximately 10 m plus 1.5 times the slope gradient or 30 m should be used, whichever is greater. Work near waterbodies would adhere to EP6 (Working Within or Near Fish Bearing Waters) and 130.15 (Working Within or Near Water). Additionally, at watercourse crossings where clearing is required within 30 m of a watercourse it would be done by hand. Construction traffic would be restricted to the site, existing roads, or approved access routes (ES 130.6).

6.4.6 Fish and Fish Habitat

In addition to mitigation measures described in the following sub-sections, MI would seek input from DFO and MSD, Fisheries Branch on in-water work associated with fish bearing watercourse crossings. MI would seek to obtain *Fisheries Act* Authorizations prior to conducting the work, where required. MI would implement mitigation measures and conditions outlined in the Authorizations received. Where required, a fish habitat offsetting plan would be developed and implemented as approved by DFO.

6.4.6.1 Effect on Fish Populations due to Spills or Hazardous Materials

Mitigation measures to reduce the potential effect to fish populations as a result of spills are the same as mitigation measures to address the risk of spills on surface water quality (**Section 6.4.4.1.3**) and on soils (**Section 6.4.3.2**). This includes adhering to refuelling and fuel handling procedures (EP2 and ES 130.9.2.5), spill response procedures (EP3 and ES 130.10) and remediation to CCME guidelines (EP3 and ES 130.10).

Designated areas would be established for fuel storage and re-fueling activities a minimum of 100 m from waterbodies, as described in **Section 6.4.4.1.3**.

6.4.6.2 Disruption of Fish due to Blasting

Mitigation measures to reduce the potential for injury or death of fish due to the effects of blasting include adhering to EP12 (Blasting Near a Watercourse), ES 130.15.11 (Blasting Near a Watercourse) and the DFO "*Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters*" (Wright and Hopky 1998). Blasting plans would be developed prior to commencement of blasting in areas that could affect fish habitat. In the event the DFO guidelines cannot be followed, the blasting plans would be submitted to DFO to obtain necessary approvals prior to commencement of blasting. Appropriate setback distances would be employed based on substrate type and the weight of explosive charge. Blasting plans would comply with blasting regulations and reflect the appropriate timing of life cycle events as they relate to critical life functions of fish and wildlife species (ex: spawning). Blasting in watercourses classified as fish habitat is prohibited between April 15 and July 15 of any year, or during periods of high stream flow or identified spawning periods.

6.4.6.3 Increased Fishing Pressure due to Improved Access

Measures to reduce the potential increase in fishing pressure on local fish populations include restricting access to potential parking areas at watercourse crossings along the proposed all-season road. This can be done by installing large riprap/aggregate on slopes at stream crossing sites where access did not exist prior to the Project to limit access for fishing. Additionally, the road alignment and temporary access roads were selected to avoid sensitive fish habitat. To reduce increased fishing pressure during construction, contractors and MI employees working on the Project would have restricted access in accordance with the Province of Manitoba fisheries management actions (ex: restrictions on fishing periods, use of catch and release only, limits on allowable catch and licenses and conservation closures). Following construction completion, temporary access roads and winter road access points would be decommissioned and reclaimed (ES 130.8.7) to allow for the regeneration of vegetation. This would restrict off-road access by vehicles and reduce the opportunities for fishing off the existing winter road.

6.4.6.4 Blockage or Reduction in Fish Passage

To mitigate effects to fish passage bridges and culverts at watercourse crossings would be designed to accommodate 1:50 year flood events. Regular culvert maintenance and cleanouts would be conducted during the operation stage to limit the potential for blockage or flow reduction and subsequent disruption of spawning. Culvert design and maintenance would be in accordance with the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, DFO's measures to avoid causing harm to fish and fish habitat, EP7 (Stream Crossings), EP9 (Fish Passage), EP11 (Culvert Maintenance and Replacement), ES 130.15.5 (Stream Crossings), ES 130.15.6 (Base Flow, Diversions and Fish Passage) and ES 130.15.9 (Culvert Maintenance and Replacement).

Culvert construction would be timed to prevent disruption to sensitive fish life stages by adhering to DFO's restricted activity timing windows. Construction activities would not be undertaken in fish bearing waters between April 15 and July 15 or during periods of high stream flow. The construction of stream crossings would be completed during the lowest stream flow, preferably under frozen conditions, and should be a single event, if the construction schedule can accommodate this. Sediment and erosion control measures would be installed prior to works which have the potential to introduce sediment into the watercourse. A minimum 100-m vegetated buffer strip would be maintained between the worksite and the watercourse, except at the actual crossing location. Cleared trees, vegetation or construction materials would not obstruct waterways during any season and would be stored above the ordinary high water mark.

Where construction is required under unfrozen conditions, cofferdams or other diversions would be installed to separate the dewatered worksite from flowing water, and designed to accommodate any expected high flows during the construction period. Flow would be maintained at all times to permit the safe and unimpeded passage of fish. A temporary diversion channel to direct flows around the work site would be constructed if flows are to be constricted by more than two thirds of the original stream width in fish bearing waters. Gradient controls would be used as required to ensure that diversion channel slopes correspond to the existing channel gradients. The original flows through the site would be restored as soon as work is completed.

For pumped diversions of fish bearing watercourses, water intakes would be sized and screened to prevent blockage and/or fish mortality in accordance with DFO's Freshwater Intake End-of-Pipe Fish Screen Guideline. Downstream flows would be maintained at all times during construction. Culverts would be installed with a minimum of 30 cm or 10% of culvert diameter (whichever is greater) below the normal stream bed. Additional design considerations include maintaining the natural alignment of the stream, minimizing the number of crossings, crossing at right angles to the stream and at narrow channel sections to minimize overall construction footprint. The need for and duration of cofferdam or other diversion use is based on detailed design and site-specific conditions experienced during the construction period. As such, estimates related to footprints and durations cannot provided at this point in project planning. This information will be provided to DFO when it becomes available in application for Fisheries Act Authorizations where required.

Culvert maintenance would also adhere to DFO's restricted activity timing windows. If accumulated material is preventing the passage of water and/or fish through the structure, emergency debris removal may be carried out at any time of year. If maintenance of culverts requires the removal of a beaver dam, MI's Nuisance Beaver Management Program (**Chapter 3, Appendix 3-6**) would be followed, as well as ES 130.15.10 (Beaver Dam Removal). Beaver dam removal is not to occur in winter, must be authorized by MSD and must be done in a manner that does not affect fish or result in shoreline modification downstream. Beaver dam removal is to be done gradually therefore allowing a slow release of water. Any disturbance to the bed or bank occurring during culvert maintenance or replacement would be restored once the work is complete.

6.4.6.5 Effects of Suspended Sediments

The mitigation measures previously described to reduce the potential effect of erosion and sediment on surface water quality (**Section 6.4.4.1.2)** would also reduce the potential decreased quality of fish habitat and effects to fish. Additional measures that are specific to fish and fish habitat include adhering to DFO timing windows for in-stream work and adhering to EP6 (Working Within or Near Fish Bearing Waters), EP7 (Stream Crossings), EP11 (Culvert Maintenance and Replacement) and ES 130.15.2 (Timing of Work). No construction activities would occur in fish bearing waters or potentially fish bearing waters between April 15 and July 15, during periods of high stream flow or identified spawning periods. In waters that have fall spawning fish, construction activities would not occur from September 1 to May 15, unless otherwise authorized by DFO. In-water work would be restricted to low flow periods and would be scheduled during a period when the watercourse is seasonally dry or frozen to the bottom if those conditions occur.

Where construction activities are required in fish bearing water, the in-stream construction area would be isolated to prevent the release of sedimentation downstream of the work area. Fish salvage would be conducted in the isolated area in accordance with EP10 (Fish Salvage) and ES (130.15.7 Fish Salvage). Fish salvage would require a permit for handling of fish and would include direct oversight of a qualified fish biologist. Fish salvage would occur prior to the commencement of in-water construction activities and/or prior to dewatering of an isolated work area. Fish salvage would be conducted immediately after a watercourse has been isolated. Captured fish would be released downstream of the worksite.

Project activities would follow Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat as well as adhere to EP6 (Working Within or Near Fish Bearing Waters) and ES 130.15 (Working Within or Near Water). The disturbance to the stream bed and banks would be minimized by using existing trails, roads or cut lines to access the site where possible to avoid disturbance to riparian vegetation. Construction activities would be suspended during adverse weather conditions (ex: heavy rain). Backfill used adjacent to fish bearing waterbodies would be clean and well graded granular material that is free of fines. Concrete works would be conducted in a manner that does not allow direct or indirect entry of concrete, concrete fines or concrete wastewater into the watercourse. Banks/shoreline areas that are disturbed would be restored to their original conditions as soon as practicable, including re-vegetation if necessary. Erosion and sediment control measures would be implemented, inspected and maintained until vegetation is established.

6.4.6.6 Alteration and Loss of Riparian and In-Stream Habitat

Mitigation measures to reduce the alteration and loss of riparian and in-stream habitat include design mitigation to minimize in-water footprints, minimizing vegetation clearing and disturbance and reclamation of disturbed areas following construction, all in accordance with ES 130.15 (Working Within or Near Water). Machinery access for in-water work would be limited to a single point on the shoreline and the distance between the access point and worksite would be minimized. Existing roads, trails and cut lines would be used to access the site if they exist to avoid additional disturbance to riparian

vegetation. Where habitat loss is unavoidable and where required by DFO, an offsetting plan would be developed and implemented as approved by DFO.

Project activities would follow Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat, DFO's measures to avoid causing serious harm to fish and fish habitat, as well as adhere to EP7 (Stream Crossings) and ES 130.15.5 (Stream Crossings). This includes the previously described vegetated buffer and scheduling. Temporary stream crossings would be located at straight stream sections, perpendicular to the bank and would be located at narrow channel sections to minimize crossing length. The number of temporary stream crossings constructed would be minimized. Temporary stream crossings would be removed as soon as possible following completion of the work or when it is no longer required and would be restored to its original state. Restoration would include appropriate erosion and sediment control measures and re-vegetation of disturbed areas as required.

6.4.6.7 Introduction of Aquatic Invasive Species

Because the equipment would most likely be transported to site during the winter time along the existing winter road it is anticipated that any invasive species on the equipment would not survive. Regardless, to mitigate against the potential introduction of aquatic invasive species, Project activities would adhere to EP25 (Prevention of the Transfer of Invasive Species) and ES 130.15.1 (Working Within or Near Water - General). Any equipment which has previously been in contact with an aquatic ecosystem in Manitoba with known aquatic invasive species including but not limited to rivers, lakes and marshes must be properly cleaned so as to prevent the spread of aquatic invasive species. In particular, equipment that has (or would) come in contact with control zones listed in EP25 (ex: Lake Winnipeg, Red River, Nelson River) must be decontaminated. This equipment must be cleaned, drained, dried and inspected before and after in-water work. Equipment of particular concern includes water tanks, tank trucks, pumps, hoses, intake screens, boats and motors as well as fish and water monitoring equipment. Equipment that has come into contact with aquatic ecosystems in another province, territory, or country must be decontaminated as described in EP25. Measures taken to prevent the spread of aquatic and terrestrial invasive species are to be incorporated in work and documented.

6.4.7 Migratory Birds

6.4.7.1 Habitat Alteration, Fragmentation and/or Loss

The mitigation measures previously described to reduce the potential effect of ungulate habitat alteration, fragmentation and loss (**Section 6.4.5.2.1.1)** would also reduce the potential effect on migratory and non-migratory bird habitat. This includes following clearing and grubbing timelines and restrictions to avoid breeding and nesting times, limiting clearing to designated areas, maintaining vegetated buffers from waterbodies and sensitive sites (ex: stick nests), restricting equipment use to cleared and disturbed areas, appropriate brush disposal and maintaining local landscape hydrology with culverts designed to 1:50 year flood and regularly cleaned of debris. Disturbed areas not required for

Project maintenance and operation would be decommissioned and rehabilitated, as described in **Section 6.4.5.1.1**, in accordance with EP22 (Temporary Site Decommissioning).

6.4.7.2 Loss of Nests and Mortality to Young Birds

The mitigation measures previously described to reduce the potential habitat alteration, fragmentation and loss (**Section 6.4.5.2.1.1)** would also mitigate the loss of nests and mortality to young migratory (ex: raptors, waterfowl, forest birds) and non-migratory (upland game birds) birds. In particular, a 100-m vegetation buffer would be maintained between areas cleared and any sensitive features (ex: stick nests, heron rookeries) identified during baseline studies. Any new sensitive features found during clearing would be reported to the Contract Administrator and are not to be cleared. Additionally, no person would take or be in possession of or willfully destroy the nest or eggs of birds (EP14).

6.4.7.3 Sensory Disturbance and Displacement

Mitigation measures to reduce the potential sensory disturbance and displacement to migratory (ex: raptors, waterfowl, forest birds) and non-migratory (upland game birds) birds due to vehicle and equipment noise and vibration include following clearing and grubbing and blasting timelines and restrictions to avoid critical breeding and nesting times. Clearing and grubbing would be completed in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing), as described in **Section 6.4.5.2.1.1**. In accordance with EP14 (Wildlife), no blasting would be permitted within close proximity to sensitive wildlife habitat during critical lifecycle periods. Construction traffic would be restricted to the site, existing roads, or approved access routes (ES 130.6). Additionally construction activities would be staged such that sensory disturbance would be limited to defined contract areas rather than throughout the entire Project Footprint.

Typical noise control would be used in accordance with to EP4 (Noise Control) and ES 130.12 (Noise and Noise Limitations). Equipment used on the project would be effectively “sound-reduced” by means of proper silencers, mufflers, acoustic linings, acoustic shields or acoustic sheds. Dust suppression would also be used in accordance with EP18 (Dust Suppression Practices) and ES 130.11 (Dust and Particulate Control). Dust suppression would be conducted as necessary using water or other approved dust suppressants. Vehicles used to haul materials to or from the work site would have the load covered with a tarpaulin during transport.

6.4.7.4 Mortality Due to Increase in Hunting Pressure

The mitigation measures previously described to reduce the potential increase in ungulate hunting pressure (**Section 6.4.5.2.1.1)** would also mitigate the potential hunting pressure and mortality of migratory and non-migratory birds. This includes designing the road with no pullouts or parking areas, prohibiting hunting by MI employees and contractors working on the Project, restricting firearm possession, decommissioning and reclaiming temporary construction areas not required for maintenance activities and restricting access to quarries that would be used for maintenance activities.

6.4.7.5 Mortality Due to Vehicular Collisions

The mitigation measures previously described to reduce the potential ungulate mortality due to vehicular collisions (**Section 6.4.5.2.1.4)** would also mitigate the potential effect on migratory and non-migratory birds. This includes designing the road with optimised line of sight that would be maintained, wildlife awareness information provided to contractors, as well as reduced speeds and warning signs posted in areas where wildlife collisions are identified as a problem.

6.4.8 Species at Risk

There are several general mitigation measures that would apply to each of the Species at Risk discussed within this section. These general mitigation measures are described as follows.

- The alignment was selected to use existing disturbed or cleared areas, where they exist and to avoid waterbodies (except at crossings) and sensitive habitat (ex: spawning sites, calving sites, raptor nests, multi-generational stick nests, nesting colonies).
- Existing water flow patterns, water levels and wetland hydrologic regimes would be maintained along with vegetated buffers between disturbed areas and waterbodies.
- Clearing and grubbing timelines and restrictions would be followed to avoid critical calving and nesting times (EP1 and ES 130.17.1).
- Disturbed areas not required for Project maintenance and operation would be decommissioned and rehabilitated (EP22).
- Contract administrators, inspectors and construction staff would receive training and handbooks to facilitate identification of potential Species at Risk that could be encountered and a member of the Environmental Inspection team would be advised when encounters occur to document and report on species presence and management strategies applied, as required.
- Herbicide application would be prohibited near identified environmentally sensitive sites or beyond the all-season road ROW and applied by hand within 30 m of any waterbody.

6.4.8.1 Aquatic Environment

Mitigation measures that would be implemented to reduce potential negative effects to rare fish species (ex: lake sturgeon) populations, associated with previously identified effects, have already been described for water quality (**Sections 6.4.6.1** and **6.4.6.5**), shock waves (**Section 6.4.6.2**), fishing pressure (**Section 6.4.6.3**), fish passage (**Section 6.4.6.4**), habitat alteration/loss (**Section 6.4.6.6**) and invasive species (**Section 6.4.6.7**). In addition to the general mitigation applicable to all Species at Risk, mitigation measures of specific relevance to lake sturgeon include conducting any in-water activity below the high water mark outside of spawning and incubation periods in summer (May 15 to July 15). Any in-water work would be conducted in isolation of flowing water to mitigate the potential for sediment transfer to downstream habitats.

6.4.8.2 Terrestrial Environment

6.4.8.2.1 Vegetation

Mitigation measures that would be implemented to reduce potential disturbance and loss of vegetation Species at Risk, associated with previously identified effects, have already been described for clearing (**Sections 6.4.5.1.1**) and disturbance and loss of wetlands (**Section 6.4.5.1.2**). In addition to the general mitigation measures applicable to all Species at Risk, mitigation measures of particular relevance to rare vegetation species include limiting clearing to designated areas in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing) and limiting vehicle and equipment use to the ROW (ES 130.6.1). Any identified vegetation Species at Risk would be flagged prior to clearing. The road alignment would be adjusted to avoid protected species where there are appropriate conditions in the immediate vicinity. Invasive weedy species would be managed by use of herbicides as required.

6.4.8.2.2 Mammals

6.4.8.2.2.1 Woodland Caribou

Mitigation measures that would be implemented to reduce potential negative effects to woodland caribou and their habitat, associated with previously identified effects, have already been described. This includes mitigation measures for clearing (**Section 6.4.5.2.1.1**), sensory disturbance (**Section 6.4.5.2.1.2**), hunting pressure (**Section 6.4.5.2.1.3**), vehicle collisions (**Section 6.4.5.2.1.4**), predation (**Section 6.4.5.2.1.5**) and disease (**Section 6.4.5.2.1.6**). From the general mitigation measures applicable to all Species at Risk those most important to reduce potential Project effects to woodland caribou include selecting an alignment which avoids sensitive habitat (ex: calving sites), following clearing and grubbing timelines and restriction to avoid calving times and decommissioning and rehabilitation.

6.4.8.2.2.2 Wolverine

Mitigation measures that would be implemented to reduce potential negative effects to wolverine and their habitat, associated with previously identified effects, have already been described. This includes mitigation measures for clearing (**Section 6.4.5.2.2.1**), sensory disturbance (**Section 6.4.5.2.2.2**) and vehicle collisions (**Section 6.4.5.2.2.3**). In addition to the general mitigation measures applicable to all Species at Risk, baseline studies and local knowledge would be used to identify natal and maternal den sites, if present and provide construction staff information of potential den sites.

6.4.8.2.2.3 Little Brown Bat

Mitigation measures that would be implemented to reduce potential negative effects to the little brown bat and their habitat, associated with previously identified effects, have already been described. This includes mitigation measures for clearing (**Section 6.4.5.2.2.1**) and sensory disturbance (**Section 6.4.5.2.2.2**). In addition to the general mitigation measures applicable to all Species at Risk, construction staff would be provided with information on potential bat hibernacula to avoid if observed during construction, such as abandoned mine shafts.

6.4.8.2.3 Forest Birds

Mitigation measures that would be implemented to reduce potential negative effects to forest bird Species at Risk and their habitat, associated with previously identified effects, have already been

described. This includes mitigation measures for clearing (**Section 6.4.7.1**), loss of nests (**Section 6.4.7.2**), sensory disturbance (**Section 6.4.7.3**) and vehicle collisions (**Section 6.4.7.5**). In addition to general mitigation measures applicable to all Species at Risk, there are some species specific mitigation measures for bank swallow, barn swallow and common nighthawk.

As bank swallows and barn swallows use vertical and near-vertical rock faces for nesting, these locations would be identified and avoided for road routing and quarry selection when an alternative option is available in the immediate vicinity. When temporary construction areas are being decommissioned any structures would be inspected for barn swallow nests prior to removal from site if they are to be decommissioned during the breeding and rearing season. If barn swallow nests are identified, they would not be disturbed during the breeding and rearing season.

Prior to reinstating a quarry or borrow site for maintenance activities, the rock face would be surveyed for bank swallow nests. As common nighthawks also nest in rocky areas, the area would be surveyed for their presence. If bank swallow or common nighthawk nests are identified, they would not be disturbed during the breeding season.

6.4.8.2.4 Waterbirds

Mitigation measures that would be implemented to reduce potential negative effects to waterbird Species at Risk and their habitat, associated with previously identified effects, have already been described. This includes mitigation measures for clearing (**Section 6.4.7.1**), loss of nests (**Section 6.4.7.2**), sensory disturbance (**Section 6.4.7.3**), hunting pressure (**Section 6.4.7.4**), vehicle collisions (**Section 6.4.7.5**) and drainage alteration (**Section 6.4.4.1.1**). General mitigation measures applicable to all Species at Risk would also be employed. Measures of particular relevance to waterbirds include maintaining wetlands and water flows at crossings. Additionally, when disturbed areas are reclaimed, if there is an interest or requirement to increase waterbird habitat, excavations would be sloped to promote retention of water and creation of ponds.

6.4.9 Indigenous Peoples

6.4.9.1 Land and Resource Use

The all-season road is anticipated to increase access for resource users and provide improved year round interaction among the local communities connected by the road. To minimize potential adverse effects on land and resource use, MI would provide regular Project construction progress updates to local communities to facilitate local planning of these activities and provide opportunities for on-going input into the Project. This should minimize the potential effects of construction activities and the interaction of these activities with the timing of traditional practices by the local Indigenous communities. The list of mitigation measures provided in **Appendix 6-4,** to address land and resource use is not exhaustive, as many of the mitigation measures proposed to minimize effects on environmental components such as wildlife and wildlife habitat, fish and fish habitat and vegetation also protect land and resource use. In

addition, mitigation and environmental protection measures that are applicable to land and resource use are also included in the provisions outlined in **Chapter 8**.

6.4.9.1.1 Hunting and Trapping

Mitigation measures to reduce the potential effects of the Project on hunting and trapping include designing and adjusting the alignment, where there are equitable conditions in the immediate vicinity, based on community input to avoid loss of valued habitat and hunting areas. The all-season road alignment was selected to maintain a minimum 100-m vegetated buffer from watercourses, with the exception of construction of a watercourse crossing. The alignment was also selected to optimise sightlines to reduce potential for wildlife-vehicle collisions and was designed with no pullouts or parking areas that would facilitate increased access for hunting.

MI would provide regular Project construction progress updates to local communities to facilitate local planning of hunting and trapping activities and provide opportunities for on-going input into the Project. Hunting success would be maintained through mitigation measures to protect mammals and birds and their habitat and to limit hunting opportunities from the all-season road ROW as previously described in **Section 6.4.5.2** and **Section 6.4.7**.

In particular mitigation measures include following clearing and grubbing timelines and restrictions in accordance with EP1 (Clearing and Grubbing) and ES 130.17 (Clearing and Grubbing), as described in **Section 6.4.5.2.1.1**. In accordance with EP14 (Wildlife), no blasting would be permitted within close proximity to sensitive wildlife habitat during critical lifecycle periods. Work near waterbodies would adhere to EP6 (Working Within or Near Fish Bearing Waters) and 130.15 (Working Within or Near Water). To reduce increased hunting during construction, contractors and MI employees working on the Project would be prohibited from hunting or trapping wildlife at or in the vicinity of the site in accordance with EP14 (Wildlife) and ES 130.19 (Wildlife). Additionally, firearm possession would be prohibited in construction camps, with the exception of firearms used to protect against nuisance animals, as authorized by MSD.

Typical noise control would be used in accordance with to EP4 (Noise Control) and ES 130.12 (Noise and Noise Limitations) and dust suppression would be used in accordance with EP18 (Dust Suppression Practices) and ES 130.11 (Dust and Particulate Control), as described in **Section 6.4.5.2.1.2**. Following construction completion, temporary access roads and winter road access points would be decommissioned and reclaimed (ES 130.8.7) to allow for the regeneration of vegetation. This would restrict off-road access by vehicles and reduce the opportunities for hunting off the existing winter road. Access would also be restricted to quarries that would be used for maintenance activities during the operation phase to reduce hunting opportunities as per ES 130.6 (General) and ES 130.8 (Designated Areas and Access). Maintenance activities would be scheduled to avoid sensitive mammal and bird life stages unless required for safety reasons.

Some additional mitigation measure specifically to reduce the Project effects on trapping include MI providing information to trappers regarding the construction schedule and activities and working with trappers so that their traps are not damaged by construction. If active traps are discovered during construction, work would stop in the area and the trapper would be notified. Access to traplines and trails would be maintained during construction and trail crossings would be designed to maintain trapper access and trails providing greater access for trappers to their traplines during operation.

6.4.9.1.2 Recreational Fishing

Mitigation measures that would be implemented to reduce potential negative effects on traditional and recreational fishing, associated with previously identified effects, have already been described for water quality (**Sections 6.4.6.1** and **6.4.6.5**), shock waves (**Section 6.4.6.2**), fishing pressure (**Section 6.4.6.3**), fish passage (**Section 6.4.6.4**), habitat alteration/loss (**Section 6.4.6.6**) and invasive species (**Section 6.4.6.7**). In addition to these previously identified mitigation measures, MI would provide regular Project construction progress updates to local communities to facilitate local planning of these activities and provide opportunities for on-going input into the Project. Efforts to maintain pre-existing access to fishing areas by providing for ongoing navigation of waterways during construction would minimize adverse effects on sustenance and recreational fishing success.

6.4.9.1.3 Gathering

Mitigation measures that would be implemented to reduce potential reduction in food and medicinal supply due to disturbance and loss of vegetation, associated with previously identified effects, have already been described for clearing (**Sections 6.4.5.1.1**) and disturbance and loss of wetlands (**Section 6.4.5.1.2**), invasive species (**Sections 6.4.5.1.3**) and wildfires (**Sections 6.4.5.1.5**). In addition to these previously identified mitigation measures, MI would provide regular Project construction progress updates to local communities to facilitate local planning of harvesting activities and provide opportunities for on-going input into the Project. In particular, important medicinal and cultural plants and harvesting areas would be identified and mapped prior to clearing for Project planning and design. The road would be designed and alignment adjusted, where there are equitable conditions in the immediate vicinity, based on community input to avoid loss of important harvesting areas.

6.4.9.2 Travel Routes

Mitigation measures to reduce the potential effects of the Project on access to traditional travel routes include designing bridges to maintain navigability and providing an approach for users to cross the road at key culvert crossings. Appropriate signage would be installed to inform both boater and driver. MI would provide regular Project construction progress updates to the local communities to communicate which areas along the all-season road route would be under construction, provide information on how and when travel routes would be affected and which routes would require alternative temporary re-routing. Contracts would state that contractors must provide or identify alternative access during crossing

construction. MI would also inform the communities regarding the location and timing of maintenance activities (ex: bridge maintenance) that may require alternative travel route planning.

On-going engagement with communities during the Project construction phase would allow for the identification of key travel routes that require continued access during particular seasons. Solutions can be discussed with the communities to preserve access along travel routes where and when necessary. For example, a member from God's Lake First Nation indicated, during the IPEP, that each year a traditional canoe quest occurs from God's Lake to Bunibonibee Cree Nation and was concerned about the effect of the proposed Project. In response, MI indicated that they would work with the communities to accommodate key crossing locations along the route by installing portages (**Chapter 5, Table 5.8**).

While all watercourses to be crossed by the Project are identified as "non-scheduled" under the federal *Navigations Protection Act*, MI would meet Transport Canada navigation clearance requirements for bridges utilizing information received from community members on type and size of vessels used. To accommodate safe snowmobile and ATV crossings of the all-season road, the road platform would be modified at key access points as identified by and discussed with communities to include graded ramps that would create an approach and sufficiently cleared areas to facilitate on-coming traffic visibility.

6.4.9.3 Economy

Construction, maintenance and operation of the proposed Project is expected to generate overall positive economic effects for the local Indigenous communities, as described in **Section 6.3.4.3**. In particular the all-season road would provide improved access for trappers, during operation, increasing their trapping income and therefore mitigation measures have not been proposed.

Mitigation measures to reduce the potential adverse Project effects on trapping income for local trappers as a result of reduced trapping harvest associated with previously identified effects during construction, have already been described for clearing, sensory disturbance and vehicle-collision in **Section 6.4.5.2.2**. In addition to these previously described mitigation measures, TK interviews, workshops and studies were conducted to identify areas of importance to trappers and minimize interaction with the Project.

During Round 5 of the IPEP (**Chapter 5, Table 5.8**), a trapper from God's Lake First Nation asked whether the alignment of the all-season road could be changed through his trapline. Similarly, in Rounds 4 and 6, members of Bunibonibee Cree Nation indicated that MI should meet with affected trappers prior to construction. MI has identified an alignment change, has discussed the request with Chief and Council and is awaiting their approval to proceed with the alignment revision to minimize effects on the trapline holder. MI would continue to work with the affected trapper and Chief and Council to finalize the alignment. MI would also provide current Project information to affected trappers to minimize potential for traps to be set in areas to be disturbed by construction. Trapper access to traplines and trails would be maintained during construction with trail crossings designed to maintain trapper access as discussed

in **Section 6.4.9.2**. If active traps are discovered during construction, work would stop and the trapper would be notified.

6.4.9.4 Heritage and Archaeological Resources

HRIAs for the proposed Project provided information that was used to refine the proposed all-season road alignment, where there are equitable conditions in the immediate vicinity, to avoid sensitive sites of high and medium priority and to identify mitigation measures. Operation and maintenance of the proposed all-season road is not anticipated to affect heritage, archaeological, cultural and sacred sites in the Heritage LAA considering vehicle use of the all-season road and maintenance activities would be confined to previously affected areas.

Mitigation measures to reduce the potential effects of the Project on heritage, archaeological, cultural and sacred sites during construction include conducting further investigation of the alignment prior to construction as identified by the previous field assessments and in accordance with EP13 (Heritage Resources) and ES 130.18 (Heritage Resources). Protection measures (ex: avoidance, maintaining buffers, access controls) for known sites would be employed in discussion with Manitoba HRB and the local communities.

In the event that artifacts are uncovered during construction and maintenance, work at the location would be stopped and a recovery or protection plan implemented by a qualified archaeologist in consultation with Manitoba HRB and the local communities. The location of any known heritage and archaeological sites, or those found during construction, would not be disclosed to minimize potential disturbance in the future. Appropriate community and cultural activities would be conducted prior to construction in the vicinity of heritage resources as requested by local communities. In addition to limiting equipment and workers to construction areas (ES 130.6.1), temporary access roads and winter road access points would be decommissioned and reclaimed following construction in accordance with EP21 (Road Closure and Reclamation Plan Temporary), EP22 (Site Decommissioning) and ES 130.8 (Designated Areas and Access).

6.4.9.5 Human Health and Safety

Potential environmental effects of Project construction, maintenance and operation include direct and indirect human health effects from changes to drinking water quality, air quality, noise and the quality and availability of country foods. As such mitigation measures to address potential effects to human health and safety are often the same as those listed to mitigate the corresponding physical and biological environments. Mitigations identified in EIS will limit receptor exposures to contaminates and include spill control, dust management control (using watering not chemicals), use non-acid generating rock to produce aggregate materials, and to use physical rather than chemical means to control vegetation where possible. The mitigation measures summarized in **Appendix 6-4** are not exhaustive, as environmental protection procedures and specification for the Project that are applicable to protect human health and safety are also included in the provisions outlined in **Chapter 8** (**Appendix 8-2 and Appendix 8-3**).

Visual assessment of project areas during inspections and information received through IPEP will identify potential risks, initiate procedures/mitigation measures to minimize/eliminate risk to human health. If there is an accidental spill, appropriate mitigation will be taken to remove contaminated materials, follow-up testing to ensure cleanup is successful, and reporting to Sustainable Development as per approved remedial action plans. Copies of reports can also be submitted to local community leadership upon request.

Accidental releases will be cleaned up and sites that may have become impacted by contaminants will be assessed and remediated as required by Manitoba Contaminated Sites Remediation Act and associated regulation using CCME and Health Canada guidelines and documents regarding contaminated and impacted sites where applicable:

- CCME, *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volumes 1 to 4* (2016).
- CCME, *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites - Volume I: Main Report, PN 1101* and *Volume II: Analytical Method Summaries, PN 1103* (1993).
- CCME, *Subsurface Assessment Handbook for Contaminated Sites, PN 1144* (1994).
- CCME, *Guidance Manual for Developing Site-specific Soil Quality Remediation Objectives for Contaminated Sites in Canada, PN 1197* (1996).
- CCME, *A Framework for Ecological Risk Assessment: General Guidance PN 1195* (1996) and *Technical Appendices, PN 1274* (1997).
- CCME, *Guidance Document on the Management of Contaminated Sites in Canada, PN 1279*, (1997).
- CCME, *Reference Method for the Canada Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, PN 1310* (2001).
- CCME, *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products, PN 1326* (2003).
- CCME, *A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines, PN 1332* (2006).
- CCME, *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil:* and *Technical Supplement* (2008).
- CCME, *National Classifications System for Contaminated Sites (NCSCS) - Guidance Document, PN 1403* (2008).
- CCME, *Canadian Environmental Quality Guidelines*, (1999 – 2013)
- Health Canada, *Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment, Version 2.0* (2010).
- Health Canada, *Guidelines for Canadian Drinking Water Quality — Summary Table* (2012).

  Note: these guidelines are periodically updated as new research becomes available, and work will follow updated guidelines.

Accidents and malfunctions are further addressed in **Section 6.6.1**.

6.4.9.5.1 Community Member and Worker Safety

Mitigation measures to reduce the potential effects of the Project on community member and worker safety risk during construction include MI providing regular construction progress updates to the local communities to communicate which areas along the all-season road route would be under construction and would ensure that emergency service providers are aware of the Project construction schedule. Public access to construction areas would be restricted to only the approved workforce, with the exception of trappers and other traditional users who would be provided safe access. Signage, barricades and notices provided to the local communities would be employed to keep community members away from active construction areas.

Construction workers would be trained in safe practices, including the use of Personal Protective Equipment, would abide by Health and Safety Plans and would attend regular construction site safety briefings. Construction contractors would develop and implement appropriate Health and Safety Plans, conduct regular safety training and inspections, use trained and certified blasting crews and equip and maintain construction equipment, machinery and vehicles with appropriate safety features (ex: back-up warning devices). Contractors would also adhere to MI's ES 130s including ES 130.10 (Spills and Remediation and Emergency Response), ES 130.11 (Dust and Particulate Control), ES 130.12 (Noise and Noise Limitations) and ES 130.14 (Staff Training and Awareness).

Mitigation measures to reduce the risk of potential effects of the Project on community member safety during operation include using an appropriate road geometric design standard. As described in **Chapter 3, Section 3.3.1** the road would be designed and built to the Manitoba Highway Standard of a secondary arterial road with a road top width of 8.4 m. The road would be constructed with a design speed of 90 km/h, or potentially less where natural landscape features inhibit the design standard. The posted speed limit would be 70 km/h or less where required for safety. Traffic volumes on the proposed all-season road is expected to be less than 300 vehicles annually.

To accommodate safe travel route crossings of the all-season road, the road platform would be modified at key trapline access points and other key community access points (ex: portages, snowmobile and ATV trails) to include gradual slopes and sufficiently cleared areas to facilitate on-coming traffic visibility. The line of sight would be maintained and signage indicating these crossing locations would be installed where required. Dust suppression would also be used in accordance with EP18 (Dust Suppression Practices) and ES 130.11 (Dust and Particulate Control). Dust suppression would be conducted as necessary using water or other approved dust suppressants.

6.4.9.5.2 Medicinal Plant Harvesting

Mitigation measures that would be implemented to reduce potential effects on gathering medicinal plants (ex: Labrador tea) due to disturbance and loss of vegetation, associated with previously identified effects, have already been described for clearing (**Sections 6.4.5.1.1**) and disturbance and loss of wetlands (**Section 6.4.5.1.2**), invasive species (**Sections 6.4.5.1.3**) and wildfires (**Sections 6.4.5.1.5**). In particular, important medicinal and cultural plants and harvesting areas have been identified and mapped through previous TK studies and would be verified with communities prior to clearing for Project planning and design. The road would be designed and alignment adjusted, where there are equitable conditions in the immediate vicinity, based on community input to avoid loss of important harvesting areas.

6.4.9.5.3 Changes in Drinking Water Quality

Mitigation measures that would be implemented to reduce potential effects to community and worker health from decreased quality of community water supply, associated with previously identified effects, have already been described. This includes mitigation measures for surface water (**Section 6.4.4.1**) and groundwater (**Section 6.4.4.2**). Some of the key mitigation measures previously described include maintaining a 100-m vegetated buffer around waterbodies, designating re-fueling areas a minimum of 100 m from waterbodies and fuel handling procedures in accordance with EP2 (Petroleum Handling and Storage) and ES 130.9.2.5 (Petroleum Handling and Storage). Spill response and remediation would be in accordance with EP3 (Spill Response) and ES 130.10 (Spills, Remediation and Emergency Response) as previously described in **Section 6.4.3.2**.

6.4.9.5.4 Changes in Air Quality

Mitigation measures that would be implemented to reduce potential risk to human health and disturbance of local communities, associated with previously identified effects, have already been described for air quality (**Sections 6.4.1.1**). In addition to the previously identified mitigation measures, activities that generate dust or smoke (ex: blasting, burning) would not take place during high wind conditions when in close proximity to the local communities. Disturbed areas (ex: camps, laydown areas, quarries, temporary access) that would not be required for Project maintenance and operation would be decommissioned and rehabilitated in accordance with EP22 (Temporary Site Decommissioning) and ES 130.8 (Designated Areas and Access).

6.4.9.5.5 Changes in Noise Exposure

The distance between noise sources from Project activities and the nearest residences in nearby communities is great enough that harmful noise effects would not occur at receptor points, as discussed in **Section 6.2.1.3**. Additionally, the mitigation measures previously identified to mitigate noise (**Sections 6.4.1.1**) would further reduce the potential disturbance to local communities. Regardless, information would be posted in communities to notify/update people on construction activities, including blasting schedules.

For environments where a worker is likely to be exposed to a noise that exceeds 85 dbA L_{ex}, standard construction practices such as informing the worker about the hazards of the level of noise and providing workers with hearing protector that complies with CAN/CSA Z94.2-02 as required by the *Manitoba Workplace Safety and Health Regulation* 217/2006 part 12 would mitigate the effects on workers. Given that construction sites are closed to non-construction workers for safety reasons, others are not at risk. Regulations that would be followed regarding worker exposure to noise are provided in the *Workplace Safety and Heath Regulation* of Manitoba's *Workplace Health and Safety Act* 1993 and would include the use of appropriate personal protective equipment (including hearing protection) and coordinating the timing of blasting with the period of fewest on-site workers.

6.4.9.5.6 Changes in Quality or Availability of Country Foods

Changes in the quality of "country foods" (ex: traditional foods in the diet of Indigenous peoples) resulting from Project construction, maintenance and operation activities have the potential to indirectly affect human health through consumption or reduced availability of country foods. The potential effect of construction, maintenance and operation of the proposed Project on the quality and availability of country foods (ex: berries, fish, moose, furbearers, waterfowl) was previously assessed throughout **Section 6.3.4.1** with associated mitigation measures discussed throughout **Section 6.4.9.1**.

6.4.10 Federal Decision and Transboundary Effects

There are no expected changes to the environment on federal lands and lands in another province or outside of Canada. If DFO determines that Authorization is required under the *Fisheries Act*, there is the potential that the required offsetting plan may have an effect on the environment. The potential effects and associated mitigation measures, however, would be no different than what has been already identified. As such, there are no additional mitigation measures beyond what was previously described throughout **Section 6.4.1** to **Section 6.4.9**.

6.5 Significance of Residual Effects

Residual effects are the environmental effects remaining following the implementation of technically and economically feasible mitigation measures that were outlined in **Section 6.4** and summarized in **Appendix 6-4**. Following the application of mitigation to minimize the potential effects to the physical environment (**Section 6.2**) and VCs (**Section 6.3**) the residual effects were screened using the criteria identified in **Chapter 4, Section 4.5.5** (ex: duration, magnitude, timing, geographic extent, frequency, reversibility, ecological and social context) to assess and determine the significance of the residual adverse environmental effects. To apply these criteria, a three-level ranking system was identified as defined in **Chapter 4, Table 4.4**. For the EA, MI defines an adverse residual effect associated with a selected VC as significant if it meets both of the following criteria:

- a Level III rating result for ecological and social context

- a Level II or III rating result for each of the effect attributes of duration, magnitude, timing, extent, frequency and reversibility

A discussion of the potential Project residual effects, following the implementation of mitigation measures, is detailed in the following sections. A summary of these residual effects as well as the assessed level of the potential residual effect, for each of the criteria (ex: duration, magnitude, timing, geographic extent, frequency, reversibility, ecological and social context) is provided in **Appendix 6-5**.

6.5.1 Atmospheric Environment

6.5.1.1 Air Quality

6.5.1.1.1 Increase in Particulates

With implementation of the mitigation measures indicated in **Section 6.4.1.1.1** the level of adversity for road construction-related particulates (dust) has been reduced for magnitude. The residual adverse effect is an increase in particulates from road construction activities (ex: blasting, rock crushing, stockpiling, roadbed construction, hauling) and the use of construction vehicles and equipment. The potential residual effect would be limited to the construction phase of the project and is therefore short-term. While the increase in particulate may be above baseline levels, emissions would be within regulations and guidelines. There would be no increase in particulates in the communities as the road does not enter the Federal Reserve land or the communities within. The extent would be limited to the immediate vicinity of portions of the Project under active construction and the active quarry areas within the Project Footprint and would only occur sporadically during construction. The residual effect is readily reversible as any dust settles soon after the discrete activity is stopped. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

With implementation of the mitigation measures indicated in **Section 6.4.1.1.1** the level of adversity for road maintenance-related particulates (dust) has been reduced for magnitude and ecological and social context. The residual adverse effect is an increase in particulates from road maintenance activities (ex: blasting, rock crushing, stockpiling, roadbed/surface repair, hauling) and the use of maintenance equipment. Maintenance would occur throughout the life of the Project and therefore the potential residual effect is considered long-term. Similar to during construction, the increase in particulates during maintenance may have the potential to be above baseline levels, however emissions would be within regulations and guidelines. There would be no increase in particulates in the communities as the road does not enter Federal Reserve lands or the communities within and dust causing activities near the communities won't be conducted during high wind events. The extent would be limited to the immediate vicinity of portions of the Project being maintained within the Project Footprint and would occur sporadically during maintenance activities. The residual effect is readily reversible as any dust settles soon after the maintenance activity has ended. Potential social effects include the potential reduction of driver

visibility resulting in collisions. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

With implementation of the mitigation measures indicated in **Section 6.4.1.1.1** the level of adversity for road operation-related particulates (dust) has been reduced for magnitude and ecological and social context. The residual adverse effect is an increase in particulates from public and commercial vehicle traffic during operation and therefore would occur throughout the life of the Project. The increase in particulates would be the same as that for any other gravel road in the Province and have the potential to be above baseline levels, however emissions would be within regulations and guidelines. The extent would be limited to the Project Footprint, with no increase in particulates in the communities as the road does not enter the communities. The residual effect would occur on a regular and frequent basis when there is vehicle travel, primarily during summer and fall when the roads are dry and not frozen. The residual effect is readily reversible as any dust settles soon after a vehicle has passed. Potential social effects include the potential reduction of driver visibility resulting in collisions. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.1.1.2 Increase in Vehicle Emissions

With implementation of the mitigation measures indicated in **Section 6.4.1.1.2** the level of adversity for vehicle emissions (ex: SO_x, NO_x, diesel particulates) to the atmosphere has been reduced for magnitude. The residual adverse effect is an increase in vehicle emissions from vehicle and equipment use during construction, maintenance and operation. Vehicle emissions during construction and discrete maintenance activities would only occur for a short time, however, emission from public and commercial vehicle traffic during operation would occur throughout the life of the Project.

Emissions have the potential to be above baseline, however emissions would be within regulations and guidelines. The emission sources would be limited to the Project Footprint and given the lack of other emission sources in the area it is expected that a change in parameter concentrations would not be measurable beyond the Project Footprint. Construction activity would be spread out over 1 to 4 km at any given time therefore emissions do not have a localized point source. Vehicle emissions would be regular and frequent during construction, maintenance and operation as all construction vehicles and equipment, maintenance equipment and public vehicles have emissions. The residual effect is readily reversible. No adverse ecosystem and social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.1.2 Greenhouse Gases

With implementation of the mitigation measures indicated in **Section 6.4.1.2** the level of adversity for greenhouse gas emissions (ex: SO_x, NO_x, diesel particulates) to the atmosphere from construction

activities is unchanged. The residual adverse effect is an increase in greenhouse gas emissions from construction vehicles and equipment.

The potential increase of 14,807 tonnes CO_2e per year would occur for the duration of Project construction and is therefore considered medium-term. The magnitude of increase in GHG emissions would be less than 0.003% of Canada's 2030 target CO_2 emission rate of 523 Mt/year. The emission sources would be limited to the Project Footprint although the emissions would occur regularly and frequently as construction vehicles and equipment would be operating for the duration of the road construction. Considering that the magnitude of the residual effect is so small, it would be reversible over a long period by the reduction in GHG emissions during the life of the Project. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

With implementation of the mitigation measures indicated in **Section 6.4.1.2** the level of adversity for greenhouse gas emissions (ex: SO_x, NO_x, diesel particulates) to the atmosphere from operation is unchanged. The residual adverse effect is a negligible increase in greenhouse gas emissions from operation of the all-season road and loss of carbon sink from ROW clearing that would likely be offset by increased efficiency and change in modes of transportation utilized.

The magnitude of change in GHG emissions during operation would be negligible or slightly positive and is therefore less than 0.1% of Canada's 2030 target CO_2 emission rate of 523 Mt/year. The change in GHG emissions would occur over the duration of Project as vehicles would be continually used and the ROW clearing would be maintained. Similar to during construction, the emission sources would be limited to the Project Footprint during operation although the emissions would be regular and frequent from public and commercial vehicle usage. As the effect is negligible or slightly positive it would be offsetting the construction related increase in GHG emissions. Additionally, the natural revegetation of the winter road corridors not used for the all-season road would help reverse the residual effects from GHG emissions over a long period. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.1.3 Noise

With implementation of the mitigation measures indicated in **Section 6.4.1.3** the level of adversity for ambient noise levels is unchanged. The residual adverse effect is an increase in ambient noise levels from blasting and vehicle and equipment use during construction, maintenance and operation. The increase in ambient noise levels is primarily from blasting and equipment use during construction but would also occur during maintenance activities and public and commercial vehicle traffic during operation and is therefore a long-term effect. As noted in **Section 6.2.1.3**, because of the distance from receptors, noise levels are expected to remain below guidelines. Noise would be regular and frequent during construction, maintenance and operation of the Project. Increased noise levels from construction activities are expected

to extend beyond the Project Footprint into the LAA. Noise levels would attenuate to below 70 dB before reaching human receptors not directly associated with construction activities. No ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.1.4 Ambient Light Levels

There is no lighting proposed associated with construction, maintenance and operation of the all-season road, as discussed in **Section 6.2.1.4** and therefore the Project would not change the current day-time or night-time light levels.

6.5.2 Geology and Geochemistry

The Project would have little to no change to geology or geochemistry, as discussed in **Section 6.2.2** and therefore there are no significant residual effects.

6.5.3 Topography and Soil

6.5.3.1 Terrain Alteration

With implementation of the mitigation measures indicated in **Section 6.4.3.1** the level of adversity for removal of soil and subsequent terrain alteration as a result of the Project has been reduced for reversibility. The residual adverse effect is the negligible alteration of terrain due to quarry and borrow pit development during construction.

The removal of materials from quarries and borrow pits would be limited to initial road construction and would therefore be short-term in nature. The magnitude of residual effects is considered minor relative to availability of materials and would be limited to the Project Footprint. The effect would occur during initial road construction with a few quarries being retained for maintenance and operation activities. Following implementation of mitigation measures, terrain alteration is considered reversible over a long period. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.3.2 Spills and Hazardous Materials

With implementation of the mitigation measures indicated in **Section 6.4.3.2** the level of adversity for possible spills on soils has been reduced for magnitude. The residual adverse effect is an increase in contaminant concentrations in soil due to spills of fuel (ex: hydrocarbons) or hazardous materials from construction equipment or vehicles and vehicular accidents.

Fuel or hazardous material spills could occur throughout the life of the Project. Following soil remediation, contaminant concentrations would adhere to applicable regulations. Potential spills would be localized to

where hazardous materials are used and stored within the Project Footprint. During road construction there is the potential for spills to occur sporadically due to the number of construction equipment and vehicles present. Whereas spills would likely occur infrequently during road maintenance activities as there would be much less equipment. Likewise spills would occur infrequently and be limited to vehicular accidents and other vehicle malfunctions associated with public and commercial vehicle traffic during operation.

Assuming the spill or release is appropriately cleaned up and remediated the contaminant concentrations would be readily reversible. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.3.3 Soil Loss

With implementation of the mitigation measures indicated in **Section 6.4.3.3** the level of adversity of soil loss during construction is unchanged. The residual adverse effect is the loss of granular/lacustrine soils (sand and gravel) for use as construction materials. The amount of soil resources to be used during construction would be minor relative to available materials in the vicinity of the Project and would be restricted to being obtained from the Project Footprint. Soil resource loss for road construction would only occur infrequently during the construction phase of the Project, however, once used the effect is irreversible. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

With implementation of the mitigation measures indicated in **Section 6.4.3.3** the level of adversity of soil loss during maintenance is unchanged. The residual adverse effect is the loss of granular/lacustrine soils (sand and gravel) for use as maintenance materials throughout operation for the life of the Project. The amount of soil resources to be used during maintenance would be less than during construction so again is considered minor relative to available materials in the vicinity of the Project and would be restricted to being obtained from the Project Footprint. Road maintenance would occur sporadically during operation of the road and again the effect is irreversible. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.4 Groundwater and Surface Water

6.5.4.1 Surface Water

6.5.4.1.1 Drainage and Flow Patterns

With implementation of the mitigation measures indicated in **Section 6.4.4.1.1** the level of adversity of effects to surface drainage and flows was reduced for magnitude, timing, frequency and ecological and social context. The residual adverse effect is the disruption of surface drainage and flow systems from all-

season road, quarries and borrow pits, access roads, watercourse crossings and road drainage resulting in increased or decreased flows in watercourses.

With appropriately sized culverts at watercourse crossings and drainage equalization locations, changes in flows would be within the range of natural variation, although they would occur throughout the life of the Project. With flow variations within the range of natural variation the timing of any flow alterations is not anticipated to negatively affect fish, so there are no critical life stage concerns. Potential flow changes would still extend beyond the Project Footprint within the LAA. Potential changes in drainage and flows would be infrequent while the road is in place and would be readily reversible. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.4.1.2 Erosion and Sedimentation

With implementation of the mitigation measures indicated in **Section 6.4.4.1.2** the level of adversity of effects to water quality due to erosion and sedimentation was reduced for duration, magnitude, extent and ecological and social context. The residual adverse effect is the reduction of surface water quality as a result of erosion and sedimentation from the all-season road, quarries, borrow pits, access roads, watercourse crossings and associated work areas.

Following implementation of mitigation measures, the duration of potential effects is medium-term. Suspended sediment concentrations in waterbodies are expected to be within applicable regulations, with no anticipated adverse effects beyond the defined mixing zones. The timing of erosion and sedimentation has the potential to negatively affect fish and fish spawning activities. Effects could occur sporadically as erosion and sedimentation primarily occur during precipitation events, spring runoff and prior to the re-establishment of vegetation on disturbed soils. By mitigating the potential for erosion the resulting sedimentation and altered surface water quality would be limited to within the Project Footprint. When the source of erosion and sedimentation is controlled, the effect to water quality would readily return to existing conditions. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.4.1.3 Spills and Hazardous Materials

With implementation of the mitigation measures indicated in **Section 6.4.4.1.3** the level of adversity of effects to water quality due to spills is reduced for magnitude, extent, frequency, reversibility and ecological and social context. The residual adverse effect is the reduction of surface water quality as a result of spills of fuel or hazardous materials from construction equipment or vehicles and vehicular accidents which can occur throughout the life of the Project.

Spills are not expected to result in contaminant concentration in surface water outside of applicable regulations and there are no anticipated adverse effects beyond the defined mixing zones. The timing of decreased water quality has the potential to negatively affect fish and fish spawning activities at sensitive life stages. Potential changes in water quality would be restricted to immediately downstream of the construction activities, within the Project Footprint, as there are no anticipated measurable contaminant concentrations beyond the defined mixing zones. By preventing spills and immediately remediating spills that do occur, the effect to water quality is readily reversible. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.4.1.4 Acid Rock Drainage

The Project would have little to no potential for acid rock drainage as acid generating rocks would be avoided, as discussed in **Section 6.2.4.1.4** and therefore there are no significant residual effects.

6.5.4.2 Groundwater

6.5.4.2.1 Groundwater Availability

With implementation of the mitigation measures indicated in **Section 6.4.4.2.1** the level of adversity of potential groundwater dewatering is unchanged. The residual adverse effect is the dewatering of local groundwater at construction quarries and borrow pits.

The potential change in the groundwater levels is anticipated to be small (less than 15% of seasonal variation), be short-term associated with establishing the quarries and localized to the area immediately surrounding the quarries and borrow pits within the Project Footprint. Groundwater dewatering is expected to occur sporadically, associated with establishing quarry areas and borrow pits during construction and potentially during maintenance if additional quarries and borrow pits are required. The effect is considered readily reversible and no adverse ecosystem or social effects are anticipated due to the lack of groundwater users throughout the Indigenous RAA. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.4.2.2 Groundwater Quality

With implementation of the mitigation measures indicated in **Section 6.4.4.2.2** the level of adversity of a decrease in groundwater quality due to spills was reduced for magnitude, extent, frequency and ecological and social context. The residual adverse effect is a reduction in groundwater quality as a result of spills of fuel or hazardous materials from construction equipment or vehicles and vehicular accidents which can occur throughout the life of the Project.

Contaminant concentrations in groundwater are expected to remain within applicable federal and provincial groundwater guidelines with potential effects to groundwater quality limited to the Project Footprint. Spills to soil would be remediated thereby preventing residual effects to groundwater quality.

If groundwater quality is reduced because of spills it would take a long time to reverse the effect. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5 Riparian, Wetland and Terrestrial Environments

6.5.5.1 Vegetation

6.5.5.1.1 Disturbance and Loss of Plant Communities

With implementation of the mitigation measures indicated in **Section 6.4.5.1.1** the level of adversity of disturbance to plant communities was reduced for magnitude, timing and extent. The residual adverse effect is the disturbance to or loss of plant communities (reduced diversity) and fragmentation due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps during construction and maintenance.

Vegetation clearing may measurably affect common vegetation species or communities. Clearing would be scheduled to avoid critical life stages and effects of clearing would be limited to the Project Footprint following the implementation of mitigation measures. Clearing would only occur during construction and is therefore infrequent; however, the resulting effects would last for the life of the Project. The effect of clearing is reversible over a long period as native vegetation would grow back. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.1.2 Disturbance and Loss of Wetlands

With implementation of the mitigation measures indicated in **Section 6.4.5.1.2** the level of adversity of disturbance to wetlands was reduced for magnitude and timing. The residual adverse effect is the disturbance to or loss of wetlands (ex: bog, fen, marsh, swamp, shallow water) due to clearing and construction of the all-season road.

The disturbance and loss of wetlands may measurably affect common vegetation species or communities and would occur throughout the life of the Project. Wetland loss or disturbance would be scheduled to avoid critical life stages of species that inhabit these environments. The clearing and construction activities and resulting effects would be restricted to the Project Footprint and would only occur during initial road construction. Wetland disturbance and loss is reversible over a long period. The effect is considered to have moderate ecosystem effects. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.1.3 Introduced Species

With implementation of the mitigation measures indicated in **Section 6.4.5.1.3** the level of adversity of potential effects to native vegetation due to invasive and non-native species was reduced for magnitude, timing and extent. The residual adverse effect is an increased risk for invasive and non-native plant species to displace native plant communities and modify the vegetation composition and structure during construction, maintenance and operation.

Introduction of invasive and non-native species may measurably affect common vegetation species or communities. With the implementation of mitigation measures, invasive and non-native plant species are not expected to become established and spread and therefore would be limited to the Project Footprint. Controlling invasive species would help native species flower and spread seed without the competition and stress during this critical life stage. The effect is continuous as vehicle use during operation and maintenance carries a risk of introducing invasive and non-native species throughout the life of the Project. Displaced native plant communities and modified vegetation composition and structure in the area are considered reversible over a long period with control of the invasive species. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.1.4 Spills and Herbicide Use

With implementation of the mitigation measures indicated in **Section 6.4.5.1.4** the level of adversity of spill and herbicide effects to vegetation was reduced for magnitude and timing. The residual adverse effect is the impairment or loss of vegetation and desirable species as result of spills of fuel or hazardous materials from construction equipment or vehicles and vehicular accidents and potential use of herbicides during maintenance throughout the life of the Project.

A potential spill or release of deleterious substances would likely only affect common vegetation species or communities and is considered minor. By preventing, containing or cleaning up spills when they occur it is unlikely that vegetation would be disturbed during establishment or flowering stages. Likewise herbicide use would be scheduled to avoid time periods when desirable species are establishing and flowering. Residual effects would be limited to the Project Footprint where construction and maintenance activities are occurring. The potential impairment to vegetation may occur sporadically during discrete spills, accidents and herbicide application. Vegetation loss and impairment is reversible over a long period. No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.1.5 Wildfires

With implementation of the mitigation measures indicated in **Section 6.4.5.1.5** the level of adversity of wildfire risk is reduced for magnitude and timing. The residual adverse effect is an increased risk of

wildfires from fires and explosions during construction and maintenance and carelessness during operation.

A wildfire may measurably affect common vegetation species or communities, although the boreal forest is adapted to wildfire succession. Wood burning would be limited during the dry season to avoid higher risk periods and only done with a burning permit following permit conditions. Wildfires could occur sporadically throughout the life of the Project and have the potential to cover large areas and therefore extend beyond the LAA into the RAA. Wildfires are an important natural disturbance that drives vegetation dynamics at the landscape, stand and species level and is therefore reversible over a long period (Szwaluk Environmental Consulting Ltd. *et al.* 2017b). No adverse ecosystem or social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2 Mammals

6.5.5.2.1 Ungulates

6.5.5.2.1.1 Habitat Alteration, Fragmentation and/or Loss

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.1** the level of adversity of effects to ungulate habitat was reduced for timing, extent and reversibility. The residual adverse effect is the alteration, fragmentation and/or loss of moose and caribou habitat due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps during construction and maintenance.

Moose and caribou populations may be measurably affected by the alteration, fragmentation and loss, throughout the life of the Project, although the amount of habitat potentially affected is small relative to habitat availability. Project activities would be scheduled to avoid critical life stage (ex: calving). Residual effects would be limited to the Project Footprint. The changes to habitat would occur sporadically, primarily associated with initial clearing and are considered reversible over a long period. Ecosystem effects were assessed as moderate due to the importance of ungulates to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.1.2 Sensory Disturbance

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.2** the level of adversity of sensory disturbance to ungulates was reduced for magnitude, timing, reversibility and ecological and social context. The residual adverse effect is an increase in sensory disturbance to and displacement of moose and caribou due to vehicle and equipment noise and vibration during construction, maintenance and operation.

Moose and caribou populations are not likely to be measurably affected by the sensory disturbance, as residual effects are likely to occur at the individual level. The sensory disturbance would be continuous during construction, maintenance and operation throughout the life of the Project. Project activities would be scheduled to avoid critical life stages (ex: calving). Given the mobility of ungulates and the degree to which sound travels, residual effects would likely extend beyond the Project Footprint within the Wildlife LAA. Residual sensory disturbance effects to moose and caribou are considered reversible over a long period. Ecosystem effects were assessed as moderate due to the importance of ungulates to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.1.3 Increase in Hunting Pressure

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.3** the level of adversity of hunting pressure on caribou was reduced for magnitude and reversibility. The residual adverse effect is an increase in caribou mortality due to increased hunting pressures during construction and with increased access along the all-season road during operation throughout the life of the Project.

The increased hunting pressure is not likely to measurably affect caribou populations, as residual effects are likely to occur at the individual level. As caribou are seasonally hunted, typically in the winter, critical life stages (ex: calving) are avoided and the residual effects would occur sporadically. The potential residual effect would likely extend beyond the Project Footprint within the LAA. Following the implementation of mitigation measures the residual effect of hunting on caribou is considered reversible over a long period. The ecological and social contexts are considered high as boreal woodland caribou are listed by SARA and ESEA and Eastern Migratory caribou are assessed by COSEWIC. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.3** the level of adversity of hunting pressure on moose was reduced for magnitude, timing, extent and reversibility. The residual adverse effect is an increase in moose mortality due to increased hunting pressures during construction and with increased access in spring, summer and fall along the all-season road during operation throughout the life of the Project.

The increased hunting pressure may measurably affect moose populations. Moose hunting occurs year-round therefore is considered continuous. Licenced hunting occurs outside of critical life stages and it is expected that Indigenous hunters would respect critical life stages and avoid harvesting pregnant moose and calves. Following implementation of mitigation measures, the increased access along the all-season road would likely enable hunting beyond the Project Footprint within the Wildlife LAA. The residual effect of the new access is considered reversible over a long period. The risk of moose mortality from increased hunting pressure is considered to have a moderate ecosystem effect that is important to local

communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.1.4 Mortality Due to Vehicular Collisions

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.4** the level of adversity of ungulate mortality due to vehicular collisions was reduced for frequency and reversibility. The residual adverse effect is an increase in moose and caribou mortality due to vehicular collisions during construction, maintenance and operation throughout the life of the Project.

The effect is limited to the Project Footprint where vehicle usage occurs and would occur at the individual animal level, not likely to have a measurable effect on ungulate populations in the Wildlife RAA. With all-season road traffic occurring throughout the year there is potential that collisions happen during critical life stages (ex: calving). Given the anticipated low traffic volumes and relatively low ungulate densities, ungulate collisions with vehicles are only expected infrequently following the implementation of mitigation measures. The potential effect is considered reversible over a long period. The risk of increased ungulate mortality due to vehicle collisions is considered to have a moderate ecosystem effect due to the importance of moose and caribou to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.1.5 Mortality Due to Increased Predation

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.5** the level of adversity of ungulate mortality due to predation is unchanged. The residual adverse effect is an increase in moose and caribou mortality due to increased predation by wolves from increased access beyond that provided by the existing winter road and transmission lines.

The potential increase in mortality is not likely to have a measurable effect on the population for the reasons discussed in **Section 6.2.5.5.1.5**. The residual effect would likely be beyond the Project Footprint within the Wildlife LAA and could occur during critical ungulate life stages as wolves hunt year-round. Predation was assessed to be sporadic throughout the life of the Project and is considered reversible over a long period. The risk of increased ungulate mortality due to increased predation is considered to have a moderate ecosystem effect due to the importance of moose and caribou to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.1.6 Mortality Due to Introduction of Disease

With implementation of the mitigation measures indicated in **Section 6.4.5.2.1.6** the level of adversity of ungulate mortality due to the introduction of disease was reduced for reversibility. The residual adverse effect is a negligible increase in moose and caribou mortality due to introduction of disease from white-tailed deer (ex: brainworm, liverfluke).

The residual effect is considered negligible due to the distance between the Project and the range of white-tailed deer. If disease were to be introduced to ungulates in the Wildlife RAA, the residual effect would be long-term, could occur at a critical life stage and could extend throughout the Wildlife RAA. While unlikely or infrequent to occur, residual effects would occur at the individual level and would not measurably affect the population. The residual effect is considered readily reversible. The risk of increased ungulate mortality due to introduction of disease from white-tailed deer is considered to have a moderate ecosystem effect due to the importance of moose and caribou to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.2 Aquatic and Terrestrial Furbearers

6.5.5.2.2.1 Habitat Alteration, Fragmentation and/or Loss

With implementation of the mitigation measures indicated in **Section 6.4.5.2.2.1** the level of adversity of effects to furbearer habitat was reduced for timing, extent and reversibility. The residual adverse effect is the alteration, fragmentation and/or loss of furbearer (ex: beaver, marten) habitat due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps.

While the effect would occur throughout the life of the Project the overall habitat loss or alteration in the Wildlife LAA would decrease over time due to the decommissioning of temporary access routes and the natural regeneration of the winter road. Aquatic and terrestrial furbearer populations are not likely to be measurably affected by the alteration, fragmentation and loss. Project activities would be scheduled to avoid effects to critical life stage (ex: denning, rearing times). Residual habitat effects would be limited to the Project Footprint. The changes to habitat would occur infrequently, primarily associated with initial clearing and are considered reversible over a long period. No adverse ecosystem effects are anticipated as a result of habitat alteration, fragmentation and loss on terrestrial and aquatic furbearers. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.2.2 Sensory Disturbance

With implementation of the mitigation measures indicated in **Section 6.4.5.2.2.2** the level of adversity of sensory disturbance to furbearers was reduced for timing and reversibility. The residual adverse effect is an increase in sensory disturbance to and displacement of furbearers (ex: beaver, marten) due to vehicle and equipment noise and vibration during construction, maintenance and operation.

Residual effects to furbearers would occur throughout the life of the Project but would be limited to the Project Footprint and would likely only occur at the individual level not measurably affecting the population. The sensory disturbance would be continuous during construction and operation of the all-season road. Project activities would avoid critical life stages (ex: denning and rearing period). As long as the all-season road remains the sensory disturbance would continue. Residual effects to the furbearers are considered reversible over a long period. While noise and vibration may result in localized changes to

furbearer use of areas near the road, no adverse ecosystem effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.2.2.3 Mortality Due to Vehicular Collisions and Nuisance Wildlife Management

With implementation of the mitigation measures indicated in **Section 6.4.5.2.2.3** the level of adversity of furbearer mortality due to vehicular collisions and nuisance wildlife management was reduced for reversibility. The residual adverse effect is an increase in furbearer (ex: beaver, marten) mortality due to vehicular collisions and nuisance wildlife management during construction, maintenance and operation.

The residual effect is limited to the Project Footprint where vehicle usage and culvert maintenance occurs and would occur at the individual animal level, not likely to have a measurable effect on furbearer populations. With all-season road traffic occurring throughout the year there is potential that collisions happen during critical life stages (ex: denning and rearing period). Given the anticipated low traffic volumes collisions with vehicles are only expected sporadically during the life of the Project. The potential residual effect is considered reversible over a long period as long as the all-season road remains. No adverse ecosystem effects are anticipated as a result of increased mortality of terrestrial and aquatic furbearers. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.3 Reptiles and Amphibians

6.5.5.3.1 Habitat Alteration, Fragmentation and/or Loss

With implementation of the mitigation measures indicated in **Section 6.4.5.3.1** the level of adversity of effects to amphibian habitat was reduced for timing. The residual adverse effect is the alteration, fragmentation and/or loss of amphibian (ex: spring peeper) habitat due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps.

While the effect would occur throughout the life of the Project the overall habitat loss or alteration in the Wildlife LAA would decrease over time due to the decommissioning of temporary access routes and the natural regeneration of the winter road. Amphibian populations are not likely to be measurably affected by the alteration, fragmentation and loss. Project activities would be scheduled to avoid critical life stage. Changes to habitat would occur infrequently, primarily associated with initial clearing and would be limited to the Project Footprint. The changes to habitat are considered irreversible as long as the all-season road remains. No adverse ecosystem effects are anticipated as a result of habitat alteration, fragmentation and loss on amphibians. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.5.3.2 Increased Winter Mortality by Soil Compaction and Freezing

With implementation of the mitigation measures indicated in **Section 6.4.5.3.2** the level of adversity was reduced for timing and reversibility. The residual adverse effect is an increase in winter mortality through compaction and freezing of soils in habitat where amphibians (ex: spring peeper) may be over wintering.

The residual effect is limited to the Project Footprint and is not expected to have a detectable or measurable effect on populations or habitat availability. Project activities would be scheduled to avoid critical life stage for amphibians. The residual effect would occur sporadically associated with initial construction as well as during road maintenance activities throughout the life of the Project. The residual effect is readily reversible. No adverse ecosystem effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6 Fish and Fish Habitat

6.5.6.1 Effect on Fish Populations due to Spills or Hazardous Materials

With implementation of the mitigation measures indicated in **Section 6.4.6.1** the level of adversity of surface water quality effects due to spills on fish was reduced for duration, magnitude, extent, frequency and reversibility. The residual adverse effect is a decrease in fish populations as result of reduced surface water quality from spills of fuel or hazardous materials from construction equipment or vehicles and vehicular accidents.

The residual effect of decreased water quality to fish populations is considered short-term, as effects would be associated with discrete spills or releases. No measurable reduction to fish communities and populations are expected. As spills could occur at any time of the year, the timing of potential effects could overlap with periods of high sensitivity to fish (ex: spawning). Spills to soil would be remediated before they can run-off to surface water reducing the frequency of effects to fish. If a spill were to occur in surface water, effects would be limited to the Project Footprint as they would be contained and remediated. The effects to fish populations as a result of decreased water quality are considered readily reversible. Overall ecosystem and social effects were assessed to be moderate due to the importance of fish to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6.2 Disruption of Fish due to Blasting

With implementation of the mitigation measures indicated in **Section 6.4.6.2** the level of adversity of the effect of shock waves to fish was reduced for magnitude, timing and reversibility. The residual adverse effect is injury or death of fish from compressive shock waves close to blasting activities.

Residual effects would only occur for a short-term as they would be associated with discrete activities (ex: blasting) occurring mostly during the construction phase of the project, although they may also occur as

part of maintenance. Residual effects from blasting are not expected to result in a measurable reduction to fish communities and populations. Negative residual effects to fish would be avoided by avoiding blasting during periods of high sensitivity (ex: spawning). The compressive shock wave would be limited to the immediate vicinity of blasting within the Project Footprint and would only occur sporadically. The effects to fish populations as a result of injury of death from blasting are considered readily reversible. The effects of blasting on fish were assessed to have moderate ecosystem effects due to the importance of fish to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6.3 Increased Fishing Pressure due to Improved Access

With implementation of the mitigation measures indicated in **Section 6.4.6.3** the level of adversity of increased fishing pressure was reduced for magnitude, extent, frequency and reversibility. The residual adverse effect is an increase to fishing pressures on local fish populations resulting from increased access to watercourses.

Increased fishing pressures are not expected to measurably reduce fish communities and populations. As fishing could occur at any time of the year, the timing of potential residual effects could overlap with periods of high sensitivity to fish (ex: spawning). Increased fishing would most likely be limited to within the Project Footprint at watercourse crossings. Increased fishing pressures are considered infrequent as it could occur seldomly throughout the life of the Project with the measures to restrict fishing access. As there would be no measurable reduction to fish populations, effects from increased fishing pressure are reversible over a long period. The potential residual effect of increased fishing pressure on local fish populations was assessed to have moderate ecosystem effect due to the importance of fish to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6.4 Blockage or Reduction in Fish Passage

With implementation of the mitigation measures indicated in **Section 6.4.6.4** the level of adversity of potential blockage or reduction of fish passage was reduced for magnitude, timing and reversibility. The residual adverse effect is the blockage or reduction in fish passage and disruption of spawning from temporary construction crossings and permanent watercourse crossings.

Blocked or reduced fish passage and disruption of spawning, following the implementation of mitigation measures, is not expected to measurably reduce fish communities and populations. Disruption of fish spawning is not expected as critical life stages would be avoided. The changes in fish passage would be limited to temporary and permanent crossing locations within the Project Footprint. The blockage or reduction of fish passage would occur infrequently when the culvert or watercourse crossings are installed but would last for the life of the Project. As there would be no measurable reduction to fish populations, effects from reduction in fish passage are readily reversible. Effects on fish passage are considered to have

a moderate ecosystem effect. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6.5 Effects of Suspended Sediments

With implementation of the mitigation measures indicated in **Section 6.4.6.5** the level of adversity of fish habitat quality effects due to suspended sediments was reduced for duration, magnitude, timing and frequency. The residual adverse effect is decreased quality of fish habitat and effects to fish as a result of increased suspended solids from disturbed banks, right-of-way runoff and in-stream works during construction.

Changes in suspended sediments from the Project are short-term as they are associated with discrete event primarily during construction activities. The residual effects are not expected to result in net loss of the productive capacity of fish habitat affecting fish communities and population. Construction activities that could increase suspended sediments would be scheduled to avoid periods of high sensitivity to fish (ex: spawning). As suspended sediment can move with flowing water the effect to fish and fish habitat could extend downstream beyond the Project Footprint within the LAA. Residual effects of erosion and sedimentation would be infrequent in nature as they would occur primarily during precipitation events, spring runoff and prior to the re-establishment of vegetation on disturbed soils. The residual effect is readily reversible. The decrease in fish habitat quality due to an increase in suspended sediments was assessed to have a moderate ecosystem effect due to the importance of fish to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6.6 Alteration and Loss of Riparian and In-Stream Habitat

With implementation of the mitigation measures indicated in **Section 6.4.6.6** the level of adversity of riparian and fish habitat loss and alteration was reduced for magnitude and timing. The residual adverse effect is the alteration and loss of riparian habitat (shorelines) and fish habitat (in-stream) at water crossings throughout the life of the Project.

The residual effects are not expected to result in net loss of the productive capacity of fish habitat affecting fish communities and population. Periods of high sensitivity to fish (ex: spawning) would be avoided. Effects would only occur at crossing locations and would therefore be limited to the Project Footprint. Habitat loss and alteration would primarily occur infrequently during the initial construction and where offsetting (if required) would be implemented. The effect is reversible over a long period. Riparian and in-stream habitat alteration and loss is considered a moderate ecosystem effect due to the importance of fish to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.6.7 Introduction of Aquatic Invasive Species

With implementation of the mitigation measures indicated in **Section 6.4.6.7** the level of adversity of the potential introduction of aquatic invasive species was reduced for magnitude and extent. The residual adverse effect is an increased risk of aquatic invasive species (ex: zebra mussel) during construction, maintenance and operation that can reduce diversity and populations of native species and modify habitat.

As noted in **Section 6.3.1.7**, the potential effect is considered negligible prior to the implementation of mitigation measures due to the lack of connectivity to the provincial road network and the fact that machinery and equipment would be transported to site in the winter allowing for aquatic invasive species removal requirements to be met. The increased risk to introduce aquatic invasive species would only occur for a short-term period associated primarily with use of construction equipment. No measurable reduction to fish communities and populations is anticipated. Potential residual effects could occur during a period of high sensitivity to fish. Following the implementation of mitigation measures, the introduction of aquatic invasive species is not likely to occur. If aquatic invasive species were to be introduced, however, it would be irreversible and therefore is considered to have a moderate ecosystem effect. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.7 Migratory Birds

6.5.7.1 Habitat Alteration, Fragmentation and/or Loss

With implementation of the mitigation measures indicated in **Section 6.4.7.1** the level of adversity of effects to bird habitat was reduced for magnitude, timing, extent and reversibility. The residual adverse effect is the alteration, fragmentation and/or loss of migratory (ex: raptors, waterfowl, forest birds) and non-migratory (ex: upland game birds) bird habitat due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps.

Modelling shows that habitat loss is small relative to the amount of available habitat. The magnitude of residual effects is likely to occur at the individual level, not measurably affecting bird populations. Project activities would be scheduled to avoid critical life stage. Residual effects would be limited to the Project Footprint. The changes to habitat would occur infrequently, primarily associated with initial clearing, however, it would last throughout the life of the Project. If the all-season road is removed the alteration to the habitat is considered reversible over a long period. No adverse ecosystem effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.7.2 Loss of Nests and Mortality to Young Birds

With implementation of the mitigation measures indicated in **Section 6.4.7.2** the level of adversity of effects to nests and young birds was reduced for magnitude, timing, frequency and reversibility. The

residual adverse effect is the loss of nests and mortality to young migratory (ex: raptors, waterfowl, forest birds) and non-migratory (ex: upland game birds) birds during construction, maintenance and operation.

The residual effect is likely to occur at the individual level, not measurably affecting populations. Project activities would be scheduled to avoid critical life stages (ex: nesting). The potential residual effect is primarily associated with clearing of vegetation which is limited to the Project Footprint but would occur throughout the life of the Project. Residual effects of loss of nests and mortality to young birds are considered infrequent and readily reversible. No adverse ecosystem effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.7.3 Sensory Disturbance and Displacement

With implementation of the mitigation measures indicated in **Section 6.4.7.3** the level of adversity of sensory disturbance to birds was reduced for timing, extent and reversibility. The residual adverse effect is an increase in sensory disturbance to and displacement of migratory (ex: raptors, waterfowl, forest birds) and non-migratory (ex: upland game birds) birds due to vehicle and equipment noise and vibration during construction, maintenance and operation.

The sensory disturbance is likely to occur at the individual level and would not measurably affect the population. The residual effect of sensory disturbance would be restricted to the Project Footprint. The sensory disturbance would be continuous during construction and operation throughout the life of the Project. Project activities would be scheduled to avoid critical life stages (ex: nesting). Potential residual effects to birds are considered reversible over a long period. No adverse ecosystem effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.7.4 Mortality Due to Increase in Hunting Pressure

With implementation of the mitigation measures indicated in **Section 6.4.7.4** the level of adversity of hunting pressure on birds was reduced for magnitude, timing and reversibility. The residual adverse effect is an increase in mortality of migratory (ex: waterfowl) and non-migratory (ex: upland game birds) birds due to increased hunting pressures during construction and with increased access in spring, summer and fall along the all-season road throughout the life of the Project.

The residual effect of increased hunting pressure may measurably affect populations. While waterfowl hunting typically occurs in spring and fall, upland game bird hunting can occur year-round and therefore the residual effect is considered continuous. Licenced hunting occurs outside of critical life stages and while Indigenous hunters can hunt at any time of the year, they generally do not affect population levels. The increased access along the all-season road could provide access to watercourses that would enable hunting beyond the Project Footprint into the Wildlife LAA. However, as noted, there is ample available waterfowl habitat throughout the Wildlife RAA and habitat conditions near the Project Footprint may improve for upland game birds as a result of the Project. The residual effect is considered reversible over

a long period. The risk of bird mortality from increased hunting pressure is considered to have a moderate ecosystem effect that is important to local communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.7.5 Mortality Due to Vehicular Collisions

With implementation of the mitigation measures indicated in **Section 6.4.7.5** the level of adversity of bird mortality due to vehicular collisions was reduced for reversibility. The residual adverse effect is a negligible increase in mortality of migratory (ex: waterfowl, forest birds) and non-migratory (ex: upland game birds) birds due to vehicular collisions during construction, maintenance and operation.

While the potential increase in bird mortality would occur throughout the life of the Project, collision with vehicles would be limited to the Project Footprint. Bird mortality would occur at the individual level and it is not likely to have a measurable effect on bird populations in the Wildlife RAA. With all-season road traffic occurring throughout the year there is potential that collisions happen during critical life stages (ex: breeding and nesting). Given the anticipated low traffic volumes collisions with vehicles are expected to be infrequent throughout the life of the Project. As there are no anticipated changes to populations the residual effect of bird mortality is considered readily reversible. The risk of increased migratory and non-migratory bird mortality due to vehicle collisions is not anticipated to have adverse ecosystem effects. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8 Species at Risk

6.5.8.1 Aquatic Environment

With implementation of the mitigation measures indicated in **Section 6.4.8.1** the level of adversity of effects to rare fish species was reduced for timing. The residual adverse effect is a potential decrease in the population and/or habitat of rare fish species (ex: lake sturgeon) as a result of previously identified effects (water quality, shock waves, fishing pressure, fish passage, habitat and invasive species) from construction, maintenance and operation activities.

The magnitude of effect is considered minor due to limited potential for in-water effects and the limited number of locations where lake sturgeon may occur. The potential effect to habitat would be at the God's River crossing which is suitable foraging habitat and considered non-limiting habitat. The source of effects could occur sporadically associated with construction and maintenance activities that would occur throughout the life of the Project. In-water work would be scheduled to be outside of critical life stages. A potential decrease in the lake sturgeon population is considered reversible over a long period. As lake sturgeon is designated as Special Concern by COSEWIC a potential decrease to the population is considered to have a high ecological and social context. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8.2 Terrestrial Environment

6.5.8.2.1 Vegetation

With implementation of the mitigation measures indicated in **Section 6.4.8.2.1** the level of adversity of effects to rare vegetation species was reduced for magnitude and timing. The residual adverse effect is the potential disturbance or loss of vegetation Species at Risk resulting from clearing during construction and maintenance. No measurable residual effect to rare or protected species is expected following the implementation of mitigation measures.

Project activities would be scheduled to avoid critical life stages. Beyond the initial effect, clearing would also be conducted infrequently as part of on-going maintenance to retain sight lines throughout the life of the Project. Clearing is limited to the Project Footprint and is considered reversible over a long period. The ecological and social context of potential disturbance or loss of vegetation Species at Risk is considered high due to the protection/designation of species listed by SARA and ESEA. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8.2.2 Mammals

6.5.8.2.2.1 Woodland Caribou

With implementation of the mitigation measures indicated in **Section 6.4.8.2.2.1** the level of adversity of effects to woodland caribou was reduced for timing and frequency. The residual adverse effect is a potential decrease in the population and/or disturbance to habitat of woodland caribou as a result of previously identified effects (clearing, sensory disturbance, hunting pressure, vehicle collisions, predation and disease) from construction, maintenance and operation activities.

The residual effect is considered minor relative to habitat availability. As discussed in **Section 6.2.5.5.1.1** habitat is not limiting in the Wildlife RAA or across the larger region including the Molson Boreal Woodland Caribou MU and the Hayes River Upland Ecoregion. Potential effects to woodland caribou would likely occur beyond the Project Footprint within the Wildlife LAA. Project activities would be scheduled to avoid critical life stages (ex: calving). Residual effects would be infrequent throughout the life of the Project and are considered irreversible. The risk of a decrease in woodland caribou populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as boreal woodland caribou are protected under SARA and ESEA and Eastern Migratory caribou are assessed by COSEWIC. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8.2.2.2 Wolverine

With implementation of the mitigation measures indicated in **Section 6.4.8.2.2.2** the level of adversity of effects to wolverine was reduced for timing and frequency. The residual adverse effect is a potential decrease in the population and/or disturbance to habitat of wolverine as a result of previously identified

effects (clearing, sensory disturbance and vehicle collisions) from construction, maintenance and operation activities.

The amount of habitat affected is minor relative to habitat availability in the Wildlife LAA and RAA. As discussed in **Section 6.1.8.1.2.2** the highest density of wolverine in Manitoba is in the north-east part of the province and populations in Manitoba are thought to be increasing (COSEWIC 2014). While the direct clearing, sensory disturbance and vehicle collisions would occur within the Project Footprint any potential population change would extend into the Wildlife LAA. Project activities would be scheduled to avoid critical life stages (ex: denning). Residual effects would be infrequent throughout the life of the Project and are considered irreversible. The risk of a decrease in wolverine populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as wolverine are listed as a species of Special Concern by the COSEWIC and under Schedule 1 of SARA. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8.2.2.3 Little Brown Bat

With implementation of the mitigation measures indicated in **Section 6.4.8.2.2.3** the level of adversity of effects to the little brown bat was reduced for timing. The residual adverse effect is a potential decrease in the population and/or disturbance to habitat of little brown bat as a result of previously identified effects (clearing and sensory disturbance) from construction, maintenance and operation activities.

The residual effect is considered minor relative to habitat availability. Potential residual effects to little brown bat would likely be limited to the Project Footprint and would occur infrequently throughout the life of the Project. Project activities would be scheduled to avoid critical life stages. Residual effects are considered irreversible. The risk of a decrease in little brown bat populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as the little brown bat is listed by SARA and ESEA. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8.2.3 Forest Birds

Forest bird Species at Risk potentially present in the Wildlife RAA include bank swallow, barn swallow, Canada warbler, common nighthawk, eastern wood pewee, olive-side flycatcher, peregrine falcon, rusty blackbird and short-eared owl. With implementation of the mitigation measures indicated in **Section 6.4.8.2.3** the level of adversity of effects to forest birds was reduced for timing (all birds), extent (all except bank swallow) and frequency (all except bank swallow, barn swallow and peregrine falcon). The residual adverse effect is a potential decrease in the population and/or disturbance to habitat of forest bird Species at Risk as a result of previously identified effects (clearing, sensory disturbance, loss of nests and vehicle collisions) from construction, maintenance and operation activities.

The potential residual effect is considered negligible for the eastern wood-pewee as none were documented during field studies and the Wildlife RAA is well outside of the published range of the species. While the residual effect to habitat from clearing would occur throughout the life of the Project the amount of habitat disturbed is minor relative to habitat availability for all forest bird Species at Risk. The residual effect would be limited to the Project Footprint for all bird species, except for bank swallow, where residual effects may occur beyond the Project Footprint within the LAA. Project activities would be scheduled to avoid critical life stages (ex: nesting) for all birds. Residual effects would occur infrequently throughout the life of the Project for all forest bird Species at Risk. The potential population decrease is considered irreversible and the effects are considered to have a high ecological and social effect as each species is listed by SARA and some are also listed by ESEA. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.8.2.4 Waterbirds

Waterbird Species at Risk potentially present in the Wildlife RAA include horned grebe and yellow rail. With implementation of the mitigation measures indicated in **Section 6.4.8.2.4** the level of adversity of effects to waterbirds was reduced for timing, extent and frequency. The residual adverse effect is a potential decrease in the population and/or disturbance to habitat of waterbird Species a Risk as a result of previously identified effects (drainage alteration, clearing, sensory disturbance, loss of nests, hunting pressure and vehicle collisions) from construction, maintenance and operation activities.

The residual effect of habitat clearing is considered minor relative to habitat availability within the Wildlife RAA. The residual effect would be limited to the Project Footprint. Project activities would be scheduled to avoid critical life stages (ex: nesting). Residual effects would occur infrequently throughout the life of the Project and are considered irreversible. The risk of a decrease to waterbird Species at Risk populations and/or habitat due to Project construction, maintenance and operation is considered to have a high ecological and social effect as both species are listed by SARA. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9 Indigenous Peoples

6.5.9.1 Land and Resource Use

6.5.9.1.1 Hunting and Trapping

With implementation of the mitigation measures indicated in **Section 6.4.9.1.1** the level of adversity of effects to hunting and trapping and associated food supply was reduced for magnitude and timing. The residual adverse effect of the Project on hunting and trapping is the reduction in food supply and culturally important species as a result of previously identified effects on ungulates, furbearers and birds and their habitat (clearing, sensory disturbance, hunting pressure, vehicle collisions, predation and disease, loss of

nests) from construction, maintenance and operation activities. The all-season road may open up new harvesting areas which would be positive for the local Indigenous communities.

Potential residual effects are anticipated to occur throughout the life of the Project. Indigenous Peoples are able to adapt to the residual effect with relative ease and maintain pre-development activities because it is anticipated that the effects would occur only sporadically and only in a portion of a RTL at any given time. Project effects may extend beyond the Project Footprint into the Indigenous LAA. With the mitigation measures, critical life stages of the species being hunted and trapped would be avoided and effects would be reversible over a long period. In terms of ecological and social context, the Project has potential to have adverse effects on traditional use activities due to the potential removal and/or disturbance to wildlife. Residual effects on revenue from effects to commercial trapping are discussed in **Section 6.5.9.3**. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.1.2 Recreational Fishing

With the implementation of mitigation measures as indicated in **Section 6.4.9.1.2** the level of adversity of effects to fish as a food supply was reduced for magnitude, timing and ecological and social context. The residual adverse effect of the Project is the reduction in food supply as a result of previously identified effects on fish and their habitat (water quality, shock waves, fishing pressure, fish passage, habitat and invasive species) from construction, maintenance and operation activities.

The potential residual effects of construction, maintenance and operation on food supply from fishing would occur throughout the life of the Project. Indigenous Peoples can adapt with relative ease and maintain pre-development activities in part because the Projects effects on fish and fish habitat would be sporadic during construction and maintenance activities at watercourse crossings. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA and are considered reversible over a long period. With the mitigation measures, critical life stages would be avoided. No adverse social effects are anticipated. The all-season road may open up new harvesting areas which would be positive for the local Indigenous communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.1.3 Gathering

With the implementation of mitigation measures as indicated in **Section 6.4.9.1.3** the level of adversity of effects to gathering was reduced for magnitude, extent and ecological and social context. The residual adverse effect is the reduction in food supply as a result of previously identified effects on harvested vegetation (ex: berries) (clearing, drainage alterations, invasive species and wildfires) from construction, maintenance and operation activities.

The potential residual effects of construction, maintenance and operation on food supply from gathering plants would occur throughout the life of the Project. Indigenous Peoples can adapt with relative ease

and maintain pre-development activities in part because Project effects on vegetation would be sporadic during construction and maintenance activities. Residual effects are anticipated to be limited to the Project Footprint and would be reversible over a long period. No adverse social effects are anticipated. During operation, the Project may provide increased access to areas as well as open up new harvesting areas for berry picking and cultural/medicinal plant gatherings which would be a benefit for the local Indigenous communities. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.2 Travel Routes

With the implementation of mitigation measures as indicated in **Section 6.4.9.2** the level of adversity of effects to travel routes was reduced for magnitude, frequency, reversibility and ecological and social context. The residual adverse effect is a decrease in access to traditional travel routes used for resource harvesting and recreation during construction, maintenance and operation.

The potential decreased access would be greatest when active construction is occurring in an area although the access would be modified throughout the life of the Project. Indigenous peoples can adapt with relative ease and maintain pre-development activities in part because the residual effects would occur infrequently and are readily reversible. Project residual effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA. No adverse social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.3 Economy

During operation the all-season road would increase access for trapping activities, resulting in an overall long-term positive effect on income. There could, however, be a decrease in trapping income for local trappers as a result of reduced trapping harvest during construction. With the implementation of mitigation measures as indicated in **Section 6.4.9.3** the level of adversity of effects to trapping income was reduced for magnitude, frequency, reversibility and ecological and social context. The adverse residual effect is the potential reduction in trapping income for local trappers as a result of reduced trapping harvest from previously identified effects (clearing, sensory disturbance, hunting pressure and vehicle-collision) during construction.

The residual effect would have a medium-term duration lasting until completion of construction and remediation. It is anticipated that Indigenous peoples can adapt with relative ease and maintain pre-development activities as only portions of the RTLs may be affected by active construction. Additionally the residual effects would occur infrequently when construction activities are in close proximity to a registered trapline. Project effects are anticipated to extend beyond the Project Footprint into the Indigenous LAA but are readily reversible. No adverse social effects are anticipated.

The Project is expected to result in positive economic effects for the local Indigenous communities through employment or provision of services during construction and maintenance activities. Trappers may see increased productivity due to improved access to their traplines. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.4 Heritage and Archaeological Resources

With the implementation of mitigation measures as indicated in **Section 6.4.9.4** the level of adversity of effects to heritage resources was reduced for extent (construction and operation), frequency (operation), reversibility (operation) and ecological and social context (construction and operation). The residual adverse effect is the loss or disturbance to heritage, culture (sacred) or community use resources and sites during ROW clearing and construction activities and as a result of increased access.

Potential residual effects of construction on heritage and archaeological resources and sites during ROW clearing and construction activities following the implementation of mitigation measures are short-term in duration, as they would only occur with discrete activities. In terms of loss or disturbance to heritage resources as a result of increased access during construction, maintenance and operation, residual effects are long-term, as they are for the life of the Project.

The proposed Project would result in the potential for disturbance to resources that are of local importance and are not recoverable. Residual effects would be confined to the Project Footprint and would be sporadic during construction and infrequent (or not at all) during operation. The effects should be reversible with a Heritage Resources artifact recovery program. In terms of the ecological and social context, the Project has potential adverse affects to heritage resources. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.5 Human Health and Safety

A Human Health Risk Assessment is not required as the effects are not significant given the mitigation measures to be implemented (**Section 6.4.9.5**) and that the residual effects of the proposed Project would not directly affect Reserve lands, northern affairs, lodges or outfitting areas and are limited to the Project Footprint, as described in the following sub-sections. After application of mitigation measures individuals could experience increased health risk within the project footprint from:

- inhaling contaminants (dust, vehicle exhaust) when in close proximity to equipment conducting construction/maintenance activities or near passing vehicles during operation
- exposure to noise above 70 dB when in close proximity to equipment conducting construction/maintenance activities without proper hearing protection

- ingesting or touching contaminants where there has been an accidental release (spill, car accident) before remediation measures can be carried out.

This risk will be minimized through enforcement of use of personal protective equipment for construction staff, provision of project updates and discussion related to human health risks associated with the project as a part of construction/maintenance safety meetings and IPEP meetings and newsletters. Outcomes of environmental monitoring programs will be shared with the local communities through the IPEP.

6.5.9.5.1 Community Member and Worker Safety

With the implementation of mitigation measures as indicated in **Section 6.4.9.5.1** the level of adversity of effects to worker and community member safety was reduced for magnitude. The residual adverse effect is a safety risk to community members and workers during construction, maintenance and operation activities.

The potential residual effects to community member and worker safety would occur throughout the life of the Project. Following implementation of mitigation measures, there is still the potential for injuries to occur but at a lower severity. Generally, risks to human health would be limited to the Project Footprint in the immediate vicinity of active construction and to a lesser extent along the entire all-season road during operation (ex: vehicle collisions). Accidents would likely occur sporadically during construction, primarily to workers and only infrequently during operation, with most injuries readily reversible. In terms of the ecological and social context, worker and public safety is very important. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.5.2 Medicinal Plant Harvesting

With the implementation of mitigation measures as indicated in **Section 6.4.9.5.2** the level of adversity of effects of the loss of medicinal plant harvest areas was reduced for extent, reversibility and ecological and social context. The residual adverse effect is the potential loss of medicinal plant harvest areas used by community members for therapeutic or healing purposes due to clearing of native vegetation within the ROW, temporary access roads, quarries, borrow pits, work areas and camps.

Once the vegetation is cleared the potential residual effect would occur throughout the life of the Project. The Project is likely to measurably affect plants which are important to local communities. Residual effects are anticipated to be sporadic in nature, limited to the Project Footprint and would be reversible over a long period as areas disturbed by the Project are reclaimed and other harvest areas are located. No adverse social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.5.3 Changes in Drinking Water Quality

With the implementation of mitigation measures as indicated in **Section 6.4.9.5.3** the level of adversity of effects to drinking water quality was reduced for magnitude, extent, frequency, reversibility and ecological and social context. The residual adverse effect is a risk to human health from decreased quality of the community water supplies as a result of previously identified effects (surface and/or ground water quality) during construction, maintenance and operation.

The potential residual effects to community and worker health from decreased quality of community water supply would occur throughout the life of the Project. No adverse effects are anticipated to drinking water quality as contaminant concentrations would be within applicable regulations. Residual effects to water quality would be limited to the Project Footprint. Containing and remediating any spills to soil would greatly reduce the frequency or potential to affect surface water or groundwater quality. Decreased community water supply is considered readily reversible as the sources of any contaminants would be controlled and appropriately remediated. No adverse social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.5.4 Changes in Air Quality

With the implementation of mitigation measures as indicated in **Section 6.4.9.5.4** the level of adversity of effects to air quality with regard to human health was reduced for magnitude, extent and ecological and social context. The residual adverse effect is a risk to human health and disturbance to local communities as a result of reduced air quality (ex: dust, emissions) during construction, maintenance and operation.

The potential residual effects to human health would occur throughout the life of the Project. Following the implementation of mitigation measures, there is the potential for dust and emission levels to change by less than 10% of the baseline conditions and these would be limited to the Project Footprint. Sources of dust would likely occur sporadically during construction and maintenance activities and more frequently during operation (ex: public and commercial vehicle traffic), primarily during dry summer conditions. Decreased air quality is readily reversed when the sources of contaminants are controlled. No adverse social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.5.5 Changes in Noise Exposure

With the implementation of mitigation measures as indicated in **Section 6.4.9.5.5** the level of adversity of effects to noise exposure for human health was reduced for extent and frequency. The adverse residual effect has potential to disturb local communities as a result of increased noise levels during construction, maintenance and operation.

The potential residual effects to human health from increased noise would occur throughout the life of the Project. As a result of the distance to community receptors and in conjunction with natural

attenuation of dense forest the noise levels would be below guidelines and baseline conditions at receptors. The extent of noise effects would be limited to the Project Footprint. The loudest sources of noise would likely occur sporadically during construction and maintenance and would be readily reversible. With the exception of possible blasting for more materials, when required during maintenance, noise levels are anticipated to return to baseline once construction in the area has ceased. No adverse social effects are anticipated. Based on the assessment of adversity for the criteria after implementation of mitigation measures and the defined significance criteria, the residual effects are not significant.

6.5.9.5.6 Changes in Quality or Availability of Country Foods

Changes in the quality of country foods (ex: berries, fish, moose, furbearers, waterfowl) resulting from Project construction, maintenance and operation activities has potential to indirectly affect human health through consumption or reduced availability of country foods. The potential residual effect of construction, maintenance and operation of the proposed Project on the quality and availability of country foods was previously assessed throughout **Section 6.5.9.1**.

6.5.10 Federal Decision and Transboundary Effects

There are no expected changes to the environment on federal lands and lands in another province or outside of Canada, as discussed in **Section 6.3.5**. The potential effects on the environment associated with offsetting, if Authorization is required under the *Fisheries Act,* would be mitigated by the measures previously described throughout **Section 6.4.1** to **Section 6.4.9**. Therefore, there are no significant residual effects.

6.6 Other Effects

6.6.1 Effects of Potential Accidents or Malfunctions

During Project construction, operation and maintenance activities there is a risk that accidents and malfunctions may occur that could potentially affect the environment and human health and safety. This could be the result of human error or natural events. Events may include the accidental spills and releases of hazardous materials on land and water, fires and explosions, accidents or collisions involving construction equipment, vehicles and wildlife and accidental encroachments on sensitive sites/areas. Potential accidents and malfunctions have been identified based on the Project components, activities, equipment and materials (ex: type and quantity).

Emergency Response Plan(s) will contain information required to effectively respond to and manage potential accidents and malfunctions (ex: accidental release of hazardous substances).

Potential accidents and malfunctions that could occur and mitigation measures that would be applied to minimize the probability and severity of such events occurring are described in **Sections 6.6.1.1** to **6.6.1.4**. Information on emergency measures that would be included in the contractor(s) Emergency Response Plans that MI will require is described in **Section 6.6.1.5**. The potential effects, emergency response

procedures that would be followed and an assessment of the risk of the potential accidents and malfunctions occurring after appropriate prevention and mitigation procedures are applied is described in **Section 6.6.1.6**. The environmental protection measures that would be implemented during the Project and which would minimize the probability and severity of accidents and malfunctions are described in **Chapter 8**.

Hazardous substances will be collected, stored, transported, disposed of and/or treated in accordance with applicable government regulations.

6.6.1.1 Accidental Release of Hazardous Substances

Hazardous substances that would be used during construction and maintenance activities include fuels (ex: gasoline, diesel, propane), lubricating oils and greases, hydraulic fluids, herbicides and explosives. Hazardous substances would be stored in compounds located at laydown areas and in accordance with applicable provincial regulations. Quantities of hazardous substances would be limited to amounts required for efficient use and maintenance of machinery during construction and operation with the largest quantities associated with storage of diesel fuel and gasoline. Diesel and gasoline would be stored in double-walled tanks in accordance with the National Fire Code of Canada (2010) and the *Storage and Handling of Petroleum Products and Allied Products Regulation* of *The Dangerous Goods Handling and Transportation Act* (Manitoba).

Herbicides used would be those approved or recommended by MSD and the application and storage of herbicides would be in accordance with applicable guidelines and regulatory requirements. An estimate of the types and quantities of hazardous materials and the potential mechanism of release is summarized in **Table 6.42**.

During construction, there is a risk of accidental releases of hazardous substances during transport to the Project site via the winter road, during transfer and storage at staging areas and work locations and during the operation and maintenance of construction equipment, machinery and vehicles. The primary risks of accidental releases of hazardous substances are associated with construction and maintenance equipment, transport trucks and vehicles. Accidental releases of hazardous materials during construction, operation and maintenance could result from improper storage, mechanical failures, collisions or careless use. Depending on the nature, size and location of the release, soils, surface water and groundwater

Table 6.42: Accidents and Malfunctions – Release of Hazardous Materials

Hazardous Material	Maximum Probable Quantity	Storage or Transport	Mechanism of Release	Form of Material Released
Waste oil	20L or 250L tanks	Manufacture's container and transported in accordance with regulatory requirements	Breach of storage or loss during transfer Accident during transport	Liquid
Lubricating oil	1L, 5L or 20L	Manufacture's container	Breach of storage or loss during transfer	Liquid

Hazardous Material	Maximum Probable Quantity	Storage or Transport	Mechanism of Release	Form of Material Released
			Accident during transport	
Hydraulic fluid	5L to 20L	Manufacture's container	Breach of storage or loss during transfer Accident during transport	Liquid
Diesel	Fuel storage tank 5,000 to 50,000 L	Certified tanks and delivery transport	Breach of storage or loss during transfer Accident during transport	Liquid
Diesel – slip tank	Fuel storage tank 250L to 750L	Certified tanks and delivery transport	Breach of storage or loss during transfer Accident during transport	Liquid
Gas	Fuel storage tank 10,000L	Certified tanks and delivery transport	Breach of storage or loss during transfer Accident during transport	Liquid
Gas – slip tank	Fuel storage tank 250L to 750L	Certified tanks and delivery transport	Breach of storage or loss during transfer Accident during transport	Liquid
Herbicides	4L	Manufacture's container	Breach of storage or loss during transfer Accident during transport	Liquid
Explosives – ammonium nitrate	Storage quantities varies: 15,000 kg to 30,000 kg	Storage magazine	Breach of storage or loss during transfer Accident during transport	Solid - Minute quantities of blast residue - nitrates
	On site transfer - small quantities (<1,000 kg)	Transport – truck (meeting Transport Canada standards)	Misfire during use	Solid - Minute quantities of blast residue - nitrates
	On site transport to project (<1,000 kg)	Transport – truck (meeting Transport Canada standards)	Misfire during use	Solid - Minute quantities of blast residue - nitrates

quality may be affected, which may potentially result in direct and indirect effects on vegetation, wildlife, birds, fish and human health and safety.

The potential mortality of birds as a result of hazardous materials getting into the water or due to overland spills, prior to the implementation of mitigation measures, is considered to be negative and would occur throughout the life of the Project. Waterbirds and ground nesting birds are at highest risk from accidental spills. Waterbirds may get hydrocarbons on their feathers if they are in contaminated water, while ground nesters may have their nest destroyed or get hydrocarbons on their feathers if they are in footprint of the spill. Mortality may occur to birds who come into contact with hydrocarbons. As spills are localized and rarely occur outside of the ROW, potential bird mortality from spills is considered to be minimal. However,

in the event of a major spill, MI will follow the direction of Manitoba Sustainable Development as per the *Environment Act*. The potential impacts of spills on fish are addressed in **Section 6.3.1.1**. The potential impact of spills to Human health via contamination of water is addressed in **Section 6.3.4.5.3**.

Solid and liquid hazardous wastes from the proposed Project would be collected, stored, transported, disposed of and/or treated in accordance with the following provincial legislation − *The Environment Act* (*Waste Disposal Grounds Regulation*), *The Dangerous Goods Handling and Transportation Act* (*Dangerous Goods Handling and Transportation Regulation*, *Environmental Accident Reporting Regulation* and *Storage and Handling of Petroleum Products and Allied Products Regulations*) and *The Transportation of Dangerous Goods Act.* Hazardous substances are also subject to *The Workplace Safety and Health Act* (Manitoba) and regulations.

Soil affected by hydrocarbon spills would be assessed and any soil determined to have contaminant concentrations above acceptable criteria would be managed on-site and removed to an approved treatment site. Other hazardous solid wastes would be disposed of at designated and approved waste disposal grounds. Liquid wastes, including domestic sewage and grey water, would be collected and stored in septic tanks and transported to designated and approved sewage treatment facilities.

The ES 130s that would be included in MI's construction contracts for the Project and the requirements to minimize the potential for accidental release of hazardous substances are outlined in **Chapter 8** (**Appendix 8-3**). The contractor(s) would prepare and implement a Waste Management Plan, as indicated in **Chapter 8, Section 8.4.2.1**, that would describe procedures for the handling, reuse or disposal of hazardous waste generated during construction of the proposed Project in accordance with contract specifications. Contractors would transport, store and dispense petroleum products in accordance with applicable legislation, guidelines, best management practices and plans to minimize the risk of spills. Mitigation measures would include setback requirements from waterbodies, refuelling requirements (ex: drip pans) and provision of on-site spill response kits. Worker training programs would be included in the contractor's Spill Response Plan to ensure the proper management of hazardous substances including wastes.

Follow-up actions would include inspections of hazardous substance storage and dispensing facilities and hazardous waste storage locations, review of incident and inventory reports and records, periodic testing and evaluation of emergency response procedures. Environmental site assessments would be conducted as part of decommissioning of temporary construction facilities such as fuel storage locations and construction sites.

6.6.1.2 Fires and Explosions

There is a potential risk of fires and explosions during construction, maintenance and operation of the proposed Project. Fires have the potential to be started by construction activities associated with the malfunction of equipment, machinery and vehicles and from welding, cutting of steel, portable heaters

and burning brush. Fires during operation and maintenance may be ignited by the malfunction of maintenance equipment, machinery and vehicles. Forest fires could also result from careless smoking or campfires and natural events such as lightning. Accidental explosions could potentially occur due to the improper storing and handling of petroleum products and explosives. Planned explosions would occur with the use of explosives during roadway preparation, rock quarrying and bridge abutment construction.

The use of explosives is regulated under the *Explosives Act* and regulations and under *The Workplace Safety and Health Act* (Manitoba) and regulations. Contractors would be required to conduct work in accordance with The Code of Practice for the Use of Explosives (Manitoba Labour and Immigration Workplace Safety and Health Division 2006) which provides guidance on fulfilling obligations to protect the safety and health of workers and how to implement and maintain safe systems of work where there is a requirement or permit for workers to use explosives in the workplace. Only certified blasters would be permitted to use explosives. MI's ES 130.15.10 and ES 130.15.11 outline requirements for the use of explosives to remove beaver dams (if removal by hand is not feasible) and for blasting near watercourses (**Chapter 8, Appendix 8-3**). Contractor(s) would be required to develop an Explosives and Blasting Management Plan(s) that includes management of blasting activities and would be required to abide by applicable federal and provincial regulations regarding safe transportation, handling, storage and use of explosives (**Chapter 8, Section 8.4.2.3**).

The risk of fires resulting from construction, operation and maintenance activities would be mitigated by required adherence to various regulations and best practices. Smoking would be restricted at construction sites and camp locations on a risk-level basis. Depending on local weather conditions, the risk of forest fires is usually highest during the summer months under dry conditions. Fire prevention would be enforced through the application of appropriate fire codes during construction and maintenance activities. MI's EPs (**Chapter 8, Appendix 8-2**), ES 130s, (**Chapter 8, Appendix 8-3**) and the contractor's Emergency Response Plan(s) in the event of a wildfire would outline fire response methods and would provide emergency measures to be followed. Provincial fire hazard and risk assessments would be used to guide construction and maintenance activities during the forest fire season.

The potential for collisions will be minimized through safe road design and construction methods, posting of appropriate speed limits, snowmobile crossing and wildlife warning signage, control of dust and ice as required and restricting construction traffic to designated areas.

to federal and provincial legislation and only by trained, certified and licenced workers.

6.6.1.3 Accidental Collisions

During construction, maintenance and operation phases of the Project, the potential exists for collisions that can result in accidents potentially causing serious injury and death to workers from collisions. Collisions can occur between construction equipment and vehicles and between construction equipment, vehicles and wildlife. Measures to reduce the risk of collisions during

construction would include appropriate construction warning signage, construction speed limits, speed control signage and the use of flag persons near work areas along the all-season road.

The potential for collisions during operation and maintenance would be minimized through safe road design, posting of appropriate speed limits, warning signage, road surface controls (ex: dust, ice) and the use of appropriate maintenance vehicles and equipment (**Chapter 8, Appendix 8-3**). Following construction, the all-season road would become a PR under *The Highways and Transportation Act* and MI would be responsible for road safety, operations and stewardship.

6.6.1.4 Accidental Encroachments

During the construction phase of the Project, there is a potential for accidental encroachment on sensitive sites such as watercourses or areas of cultural importance. Contractors would adhere to MI's ES 130s during construction including but not limited to specifications relating to work within or around water (ES 130.15), clearing and grubbing (ES 130.17) and designation of areas and access (ES 130.08). To mitigate the potential for accidental encroachment into sensitive sites during construction, careful layout and clear demarcation of the limits of temporary and permanent working areas would be made. As appropriate, buffers would be established to support the protection of sensitive sites from accidental encroachment. Buffers would be clearly identified to designate limits of activities such as vegetation clearing. Following construction, reclamation of encroachment areas would be completed.

6.6.1.5 Emergency Measures

Several of MI's ES 130s, such as Designated Areas and Access (ES 130.08), Materials Handling, Storage and Disposal (ES 130.09), Spills, Remediations and Emergency Response (ES 130.10), Planned and Unplanned Shutdowns (ES 130.13) and Wildfires (ES 130.20) have sections that describe emergency measures that would be implemented in the event of an accident or malfunction.

Under MI's ES 130.3.2, the contractor(s) would be required to submit to MI for review and approval, prior to initiating work on the Project, the following Emergency Response Plans:

- Environmental Emergency Plan for Spill Response and Remediation
- Material Management Plan in the event of an unplanned shutdown
- Evacuation and Emergency Preparedness Plan in the event of a wildfire

The contractor(s) responsible for Project construction and maintenance would have designated and qualified Emergency Response Coordinators and back-up Coordinators on-site while work is being conducted. The Emergency Response Coordinator would have the authority to redirect workers and equipment to respond quickly and efficiently in the event of an accident, malfunction or another environmental emergency. Follow-up actions would include inspections of construction/maintenance sites and work locations, review of incident and inventory reports and records and periodic testing and evaluation of emergency response procedures.

6.6.1.6 Risk Assessment

Should an accident or malfunction occur, there is a risk that soil, surface water or groundwater resources may be affected resulting in potential disruption and effects on fish and fish habitat, vegetation, fen and bog complexes and wildlife and wildlife habitat. This could also result in effects on human health and safety. As a result of the unpredictable (unplanned) nature and hence unknown magnitude, frequency and extent of potential of accidents and malfunctions, an assessment of the probability of such events occurring is provided below. This is based on MI's experience with the construction of other all-season road projects on the east side of Lake Winnipeg such as Project 1 PR304 to Berens River, which was recently constructed.

The risk of accidents and malfunctions occurring would be minimized by contractor(s) adherence to MI's MI's ES 130s (**Chapter 8**; **Appendix 8-3**), *The Workplace Safety and Health Act* of Manitoba, other mitigation measures outlined in this EIS, referenced environmental management and protection plans (**Chapter 8**), best management practices and regulatory requirements of required licences and permits to be implemented by MI and its contractors. Risks to the environment, should accidents and malfunctions occur, would be minimized through the application of emergency measures (**Section 6.6.1.5**) described in MI's ES 130s.

A list of the most likely potential accidents or malfunctions that may occur (assuming plausible worst case scenarios) are provided in **Table 6.44** along with the mitigation measures and standard practices that would be followed throughout the life of the Project to minimize the risk of such events from occurring. An evaluation of the potential magnitude of risk to the environment is also provided with consideration of applied mitigation measures to reduce the likelihood of such events occurring. With the design of the all-season road, application of mitigation measures, standard practices and Emergency Response Plans, no residual adverse effects are anticipated due to accidents and malfunctions.

With the application of MI's ES 130s, EPs and other best management practices, the risk of accidents and malfunctions occurring and risk to the environment is low.

6.6.2 Effects of the Environment on the Project

The determination of potential effects of the environment on the proposed Project is based on the ability of the Project to withstand normal and potential extreme environmental events. Normal and potential extreme environmental events that have the highest risk of occurring within the Project region include but are not limited to weather conditions, forest fires and climate change. The potential effects of the environment on the Project are assessed in **Sections 6.6.2.1** to **6.6.2.6** and summarized in **Table 6.43.** The assessment includes:

- the risk of extreme environmental events occurring
- mitigation inherent in the road design and related components (ex: bridges) to withstand normal environmental conditions and atypical natural hazard events

- environmental protection plans and emergency response procedures for the Project (**Chapter 8**)

6.6.2.1 Weather Conditions

The proposed Project would be subject to occasional severe or extreme weather events such as heavy snow falls, blizzards, extreme winds and intense rain storms. Tornadoes, however, are relatively uncommon in the vicinity of the Project. There is less than one tornado occurrence per 10,000 km^2 with a return period of 105 years (Cheng *et al*. 2013). In addition, Canada tornado watch reported no tornados in northern Manitoba in the vicinity of the Project for the period between 1922 and 2013 (Manitoba Tornado Watch 2018).

During construction, severe weather events could adversely affect the Project resulting in cost overruns, Project completion delays and adverse effects to the environment in the LAAs (ex: erosion of road bed and downstream sedimentation). During operation and maintenance, severe weather events could force closure of the road for extended periods of time due to heavy snow accumulations during winter and stream washouts during the high-risk spring and summer seasons. Severe weather events can also lead to vehicle accidents which may result in fuel and other hazardous liquid releases and temporary road closures.

Table 6.43: Potential Accidents and Malfunctions, Mitigation Measures and Evaluation of Environmental Risk

Potential Accident or Malfunction	Potential Effects	Preventative / Contingency Mitigation Measures	Probability of Occurrence[a]	Emergency Response Procedures[b]	Magnitude (degree or intensity of change)[c]
Risk of accidental release of hazardous substances	▪ Adverse effects on fish and fish habitat due to introduction of deleterious substances into waterbodies (ex: leaked fuel and oil). ▪ Adverse effects on wildlife and wildlife habitat due to introduction of deleterious substances into aquatic and terrestrial habitats (ex: leaked fuel and oil). ▪ Loss /alteration of vegetation. ▪ Soil, surface water and groundwater contamination and potential effects on human health.	▪ Adherence to provincial regulations and guidelines regarding hazardous substance storage, use and handling. ▪ Contractor(s) to ensure a copy of the Material Safety Data Sheets is in a location accessible to all workers, including MI personnel, on the work site, for each hazardous product that is used and/or kept on-site. ▪ Adherence to MI's ES 130s.	Low	▪ Application of MI's ES 130.10 (Spills, Remediation and Emergency Response). ▪ Application of contractor's Environmental Emergency Plan for Spill Response and Remediation.	Low
Risk of fire or explosion	▪ Potential mortality of wildlife and /or disturbance of wildlife (including migratory birds). ▪ Destruction of wildlife habitat. ▪ Risk of death or injury from explosives used during construction.	▪ Adherence to federal regulations for the storage of explosives. ▪ Adherence to provincial Code of Practice and legislative regulations / requirements for the use of explosives. ▪ Contractor(s) to prepare Emergency Response Plan(s) for fires and explosives. ▪ Contractor(s) to prepare Safe Work Plan(s). ▪ Blasting contractor(s) will be certified. ▪ Provide notice to local communities when working near the communities. ▪ Provide warning signs prior to detonation. ▪ Presence and maintenance of on-site fire suppression equipment.	Low	▪ Application of MI's ES 130.20 (Wildfires). ▪ Application of contractor's Evacuation and Emergency Preparedness Plan in the Event of a Wildfire. ▪ Application of MI's ES 130.13 (Planned and Unplanned Shutdowns), as required. ▪ Application of contractor's Materials Management Plan in the event of an Unplanned Shutdown, as required.	Low

Potential Accident or Malfunction	Potential Effects	Preventative / Contingency Mitigation Measures	Probability of Occurrence[a]	Emergency Response Procedures[b]	Magnitude (degree or intensity of change)[c]
Risk of forest fires during construction and operation	▪ Potential mortality and /or disturbance of wildlife. ▪ Destruction of wildlife habitat. ▪ Risk of injury or death to workers.	▪ Maintain on-site fire suppression equipment when working under high fire conditions. ▪ Establish procedures to close the road due to proximity to wildfires.	Low	▪ Application of MI's ES 130.20 (Wildfires). ▪ Application of contractor's Evacuation and Emergency Preparedness Plan in the event of a Wildfire. ▪ Application of MI's ES 130.13 (Planned and Unplanned Shutdowns), as required. ▪ Application of contractor's Materials Management Plan in the event of an Unplanned Shutdown, as required.	Low
Increased risk of vehicle collisions during construction, operation and maintenance	▪ Wildlife mortality due to collisions. ▪ Risk of death or injury to workers and/or road users.	▪ Contractor(s) to provide Safe Work Plan(s). ▪ Provide warning signage, speed control, flag persons near work areas along all-season road, as required. ▪ Adherence to provincial highway safety regulations and codes. ▪ Posting of appropriate speed limit, crossing and wildlife warning signage. ▪ Incorporation of standard safe road design configurations and construction methods in the detailed all-season road design. ▪ Regular construction progress updates to the local communities to communicate which areas along the all-season road route will be under construction and will ensure that emergency service providers are aware of the Project construction schedule.	Low	▪ N/A – preventative measures will minimize potential effects.	Low

Notes: a Probability of accident or malfunction after application of preventative / contingency mitigation measures.
b Refer to **Chapter 8 Appendix 8-3** for MI's ES 130s and required Emergency Response Plans.
c Degree of intensity of the change considering both preventative measures and application of emergency response measures.

Information regarding climate normals and climate extremes was previously provided in **Section 6.1.1.1**. Excessive rainfall and/or snowfall events may increase the probability of flooding and the potential of localized effects to the road. The Project design, as detailed in **Chapter 3**, has incorporated standard design measures (ex: design standard of 1:50 year flood event for stream crossings) that are expected to mitigate potential effects of typical and predictable weather events and severe/extreme weather events expected to occur in the LAAs. Sufficient depth of rock base layer in the roadbed design coupled with the placement of large-diameter (greater than or equal to 900 mm) culverts for stream crossing and appropriately spaced equalization culverts in fen and bog complexes are key elements in the road design that are expected to mitigate the probability of washout/erosion and sedimentation events.

Mitigation measures that would be implemented in the event of less predictable and more extreme events due to flooding and forest fires are discussed in **Sections 6.6.2.2** and **6.6.2.3**. Drought conditions are not anticipated to significantly affect the integrity of Project components although drought conditions can affect vegetative communities and increase the potential for forest fires. Drought conditions and associated factors such as forest fires would not affect the integrity of Project components (ex: bridge; roads).

With proper road design, good construction practices and implementation of associated mitigation measures, emergency response plans and environmental protection plans, the potential effects from extreme weather events on the Project are expected to be limited. Periodic inspection and maintenance of the Project would be conducted and repairs would be completed on an as-needed basis to reduce the potential for effects on the Project associated with extreme weather events.

6.6.2.2 Flooding

There is some potential for the proposed Project to be affected by flooding due to seasonal flood events resulting from the rapid melting of high snow volumes and/or heavy rain events. The Project design standard of 1:50 year flood event for stream crossings is intended to limit the potential for flood damage and washouts at crossings and along the all-season road. In addition, the road design includes stream crossing culverts and equalization culverts placed at regular intervals in bog and fen areas to accommodate seasonal drainage flows. Should ice jams result in a threat to the integrity of Project components due to flooding and scouring of banks, feasible methods to breakup ice jams would be considered. The large diameter (greater than or equal to 900 mm) of proposed culverts used in the Project are intended to minimize the probability of ice jams at culverts. Should flooding occur, contingency procedures will be coordinated with Indigenous communities in communication with the RCMP regarding RCMP's decisions to close roads due to unsafe conditions.

Local beaver populations in the vicinity of the Project may cause damage to the Project due to the construction of beaver dams and the blocking of culverts. This may result in erosion at culvert locations and localized flooding. The use of large diameter culverts and beaver cones in the road design would minimize culvert blockage due to beaver activity. Regular inspections and maintenance activities, such as

culvert clean-outs and targeted beaver activity control where necessary, would minimize the potential for damage to the road and culvert crossings. MI implements a Nuisance Beaver Management Program (NBMP) as part of the maintenance program as a supplementary measure where standard beaver control structures, such as beaver cones, are ineffective at reducing the risk of road washout. The NBMP, as described in **Chapter 3 Appendix 3-6**, includes measures for removal of nuisance beaver as well as for the removal of beaver dams and intends to involve local trappers to assist MI staff in road maintenance activities within their registered trap line areas.

6.6.2.3 Forest Fires

Long-term trends in boreal forest fire statistics suggest that boreal forest fire occurrence may be increasing in Canada and possibly linked to climate change (Weber and Stocks 1998). However, local area fire predictions are more dependent on short-term local weather (ex: dry spells and wind events) rather than longer-term seasonal weather patterns (Flannigan *et al.* 2003). The greatest forest fire activity in this area occurred during the 1950s, as previously discussed in **Section 6.1.4.1.2**, with 12.7% of the land within the Vegetation RAA cumulatively burned between 1950 and 1959 (**Figure 6-10** and **Table 6.4**). Whereas, from the 1960s to the present, comparatively less fire activity has been documented with fires affecting between 0 to 2% of the land base in the Project Footprint, LAA and RAA. Approximately 28% of the road ROW occurs within low-lying fen and bog complexes, exposed land or sparsely-forested areas (**Table 6.3**) and is therefore less susceptible to forest fires. There is a potential for more densely forested portions of the all-season road ROW to be subject to forest fire events during the operational phase of the Project.

In the event of a forest fire in the vicinity of the Project, mitigation procedures outlined in the Contractor's Emergency Response Plan would be implemented (**Chapter 8**). This may include temporary closure of the all-season road, as required, to minimize the potential for vehicle collisions due to reduced visibility caused by smoke. Substantial damage to Project components as a result of forest fires is not anticipated considering most Project components are made from materials that are not easily affected by fire (ex: rock/gravel road fill; steel and concrete bridge structures).

Should a forest fire burn with extreme intensity in the vicinity of Project water crossings, there may be the potential for some structural damage to culverts and/or bridges; however, the likelihood is considered to be very low. Project components such as bridges, culverts and signage would be inspected following a forest fire event along the all-season road to determine the presence and extent of damage and repairs would be initiated as required. In the event of a forest fire in the vicinity of the Project, the proposed road would provide a benefit of increased access to firefighting resources given that the proposed Project links the communities in the region.

6.6.2.4 Subsidence Risk

The risk of ground subsidence in the LAA may result from washout (erosion) events, changes to soil moisture content due to removal of vegetation and variations in seasonal and annual precipitation.

Installation of stream crossing and equalization culverts, as discussed in **Chapter 3**, **Section 3.3.2** would minimize the potential for erosion and scouring that can compromise the integrity of the road base and embankment and result in potential ground subsidence and road damage. An additional measure that would be implemented to mitigate the potential for subsidence includes use of appropriate geosynthetic material (geotextile) as required. Geotextile would be used to separate the road structure from areas with unsuitable soils to protect road structure integrity and provide for road and culvert reinforcement by containing road fill material at fen and bog crossing locations in consideration of the latest effective techniques for road construction in boreal wetland areas (**Chapter 3**, **Figure 3-3**).

As part of operational activities, the condition of the all-season road would be regularly inspected for maintenance planning purposes and to identify potential safety hazards. In the event of minor subsidence, additional aggregate would be added to the road surface. In more extreme instances, a culvert installation may be deemed necessary.

6.6.2.5 Geological Hazards

6.6.2.5.1 Seismic Activity

While earthquakes occur in all Canadian regions, the relative hazard risk varies greatly. The RAAs and the Province of Manitoba as a whole is in a region rated as the lowest hazard for earthquakes in Canada (Natural Resources Canada 2017b). There is less than a 1% chance that a strong earthquake would occur in the RAAs within 50 years (Natural Resources Canada 2017b). No record of seismic activity in the Project region could be found. Therefore, all-season road design standards in Manitoba do not incorporate mitigation for potential effects of seismic activity associated with earthquakes.

6.6.2.5.2 Isostatic Rebound

Isostatic rebound is the slow natural mechanical rebound (rise) of land masses that were depressed by the weight of ice sheets during glaciation. A Canadian Base Network station at God's Lake Narrows shows that vertical isostatic rebound in the area is approximately 6 mm/year (Henton *et al.* 2006; Natural Resources Canada 2017a). This natural rebound would be consistent throughout the Project Footprint with no differential shifting and therefore there would be no effect on the Project.

6.6.2.5.3 Landslides, Slope Erosion and Ground Instability

Landslides can pose a risk to people and infrastructure by slope failures and the downward movement of rock and sediment. The topography in the vicinity of the Project is relatively flat and there are no records of major landslides. Small scale slope erosion can occur along watercourses depending on sediment composition and water conditions. While the all-season road has 53 crossings, most are flat grassy wetland areas with little to no flow. Erosion mitigation is a standard construction best management practice (**Section 6.4.3**). Ground stability would be addressed as part of the geotechnical investigations to be completed during detailed design to confirm the geotechnical characteristics along the all-season road alignment and of the construction materials.

6.6.2.6 Climate Change

Science conclusively shows that the world's climate is changing and that human activities are accelerating these changes (Government of Manitoba 2017a). While fluctuations in climate have occurred in the past over long periods of time, the current accelerated rate is attributed to massive increases in carbon dioxide and other GHGs to the atmosphere. It is generally acknowledged that warming trends due to climate change can put northern road systems at risk by affecting road structures that overlie permafrost and by shortening the duration of winter roads built on ice or seasonally frozen ground (McGregor *et al.* 2008).

MSD, Climate Change and Air Quality Branch states that Manitoba will face earlier and more severe climate change effects due to its northerly latitude and location in the centre of the continent (Government of Manitoba 2017a). Information regarding climate normals and climate extremes was previously provided in **Section 6.1.1.1.** A general discussion of climate change is provided in **Section 6.1.1.3**, which notes that the GHG emissions for the current, undeveloped state of the Project are estimated at 2,481 tonnes of CO_2e per year (Dillon Consulting Limited 2017). The magnitude of change in GHG emissions, as discussed in **Section 6.2.1.2**, would be an approximate increase of 14,807 tonnes of CO_2e per year during construction (less than 0.003% of Canada's 2030 target CO_2 emission rate of 523 Mt/year) and an approximate decrease of 112 CO_2e per year during operation (Dillon Consulting Limited 2017).

The Project is within an area which consists of sporadic discontinuous permafrost (10% to 50%) and low (less than 10%) ground ice content in the upper 10 to 20 m of the ground (Heginbottom *et al*. 1995) with the permafrost most widespread in peatlands and poorly drained clayey soils. It has been predicted that climate change may result in the complete thawing of discontinuous permafrost (University of Manitoba Transport Institute 2003). In regions of discontinuous permafrost, thawing may produce thickening of the active layer, settlement and terrain instability (Batenipour 2012).

Further geotechnical investigations would be completed as part of detailed design of the road to identify areas, degree (ice content) and the extent (depth) of permafrost along the proposed alignment. The road through these areas would be designed to minimize the disturbance to the subgrade soils/peat moss to protect the frozen soils from permafrost degradation.

It is important that proper drainage of the road alignment is achieved to avoid ponding water which act as a "heat sink" and accelerate the thawing process. Appropriate construction strategies would be implemented to minimize the potential for ground thawing such as removing the layer of permafrost (if shallow), limiting the removal of peat moss from the subgrade, timing of construction (building permafrost affected areas in winter), air-convection/ventilated embankment and other methods. The proper design and mitigation measures are dependent on the degree and extent of the permafrost in each area identified. If following construction there are areas that thaw and settle, these would be addressed with road maintenance.

Existing seasonal winter roads have experienced less predictable safe seasonal use days due to intermittent years of considerably shorter winter road use seasons as compared to the average trend experienced in the past. The proposed Project can be viewed as a mitigation response to the effects of climate change on the transportation needs of the local communities. The Project would provide all-season road access among the communities rather than the communities having to rely on temporary and less predictable winter road access and costly air transportation. It is possible that without the Project and if future climate change trends continue to adversely affect the reliability of the winter road, there would be a greater reliance on air transportation resulting in increased GHGs and higher goods and services costs.

6.6.2.7 Assessment Summary

The all-season road design standards incorporate mitigation into the Project design to avoid or minimize adverse effects of normal environmental conditions of the area. Due to the unpredictable (unplanned) and therefore unknown nature, timing, scope and extent of the potential occurrence of extreme environmental events, an assessment of the risk to the Project from such events occurring is provided.

Taking into consideration the possibility and risk of weather events and the implementation of mitigation measures and follow-up actions, no residual adverse effects of the environment on the Project are anticipated. The risk analysis for the effects of the environment on the Project and analysis of the potential for residual effects on the environment in consideration of mitigation measures is summarized in **Table 6.44**. Additional mitigation information can be found in **Appendix 8-2** EPs (ex: EP16 Erosion and Sediment Control) and **Appendix 8-3** ES 130s (ex: ES 130.16 Erosion and Sediment Control, ES 130.20 Wildfires).

6.6.3 Cumulative Effects Assessment

The purpose of the Cumulative Effects Assessment (CEA) is to identify and assess adverse residual Project effects on VCs that may become significant when they interact with potential effects of past, present and future physical activities in the region. The proposed Project's cumulative effects were identified and assessed following the Agency's Operational Policy Statement for addressing cumulative environmental effects under the *Canadian Environmental Assessment Act*, 2012 (Canadian Environmental Assessment Agency 2015a) and the Technical Guidance for Assessing Cumulative Environmental Effects Under the *Canadian Environmental Assessment Act*, 2012 (Canadian Environmental Assessment Agency 2014).

Table 6.44: Evaluation of Effects of the Environment on the Project

Potential Effects of the Environment on the Project	Mitigation Measures	Evaluation of Potential Risk to the Project	Evaluation of Residual Effects of the Environment on the Project
Construction Phase			
Risk of Project component damage, cost overruns and Project schedule delays due to extreme weather events during construction.	▪ Design road to withstand 1:50 year weather events. ▪ Suspend construction activities during extreme weather events (summer/winter storms). ▪ Provide additional erosion protection and sediment control as required. ▪ Emergency response plans for road construction will include response to extreme weather events. ▪ Inspect and repair Project components as required after extreme weather events.	Low	Not Significant
Risk of Project component damage, cost overruns and Project schedule delays due to flooding during construction.	▪ Suspend construction activities during flooding events. ▪ Install additional erosion protection and sediment control as required. ▪ Emergency response plans for road construction will include response to flood events. ▪ Inspect and repair Project components as required after flood events.	Low	Not Significant
Risk of Project component damage, cost overruns and Project schedule delays due to forest fires during construction.	▪ Enforce no smoking by workers during high and extreme fire conditions; provide designated smoking areas for workers under all other conditions. ▪ Burn windrows during winter. ▪ Emergency response plans for road construction will include response to forest fire events. ▪ Inspect and repair Project components as required after forest fire event.	Low	Not Significant

Potential Effects of the Environment on the Project	Mitigation Measures	Evaluation of Potential Risk to the Project	Evaluation of Residual Effects of the Environment on the Project
Operation and Maintenance Phase			
Risk of damage to road and crossing structures and potential road closures due to extreme weather events during operation and maintenance.	▪ Design road to withstand 1:50 year weather events. ▪ Coordinate contingency procedures with Indigenous communities in communication with the Royal Canadian Mounted Police (RCMP) regarding RCMP's decisions to close roads due to unsafe conditions. ▪ Inspect and repair Project components as required after extreme weather events.	Low	Not Significant
Risk of damage to road infrastructure and road closures due to flooding during operation and maintenance.	▪ Project designed to withstand 1:50 year flood events. ▪ Prepare Emergency Response Plan for road operation that includes flooding. ▪ Coordinate contingency procedures with Indigenous communities in communication with the RCMP regarding RCMP's decisions to close roads due to unsafe conditions. ▪ Inspect and repair Project components as required after flood events.	Low	Not Significant
Risk of damage to road infrastructure and road closures due to forest fires during operation and maintenance.	▪ Manage vegetation along road shoulders. ▪ Prepare Emergency Response Plan for road operation that includes extreme weather events. ▪ Coordinate contingency procedures with Indigenous communities in communication with the RCMP regarding RCMP's decisions to close roads due to unsafe conditions. ▪ Inspect and repair Project components as required after forest fire event.	Low	Not Significant

The Agency notes that cumulative effects may result if:

- Implementation of the Project may cause direct residual adverse effects on the VCs taking into account the application of technically and economically feasible mitigation measures.
- The same VCs may be affected by other past, present or reasonably foreseeable physical activities (Canadian Environmental Assessment Agency 2017a).

The Agency's Operational Policy Statement for the assessment of cumulative effects follows a five-step approach.

Step 1 – Scoping of the assessment of cumulative effects to determine the VCs to be considered in the analysis (Step 2) and to orient and focus the CEA.

Step 2 – Analysis of how physical activities of the proposed Project, combined with past, present and reasonably foreseeable physical activities, may affect selected VCs (identified in Step 1) within the spatial and temporal boundaries of the CEA.

Step 3 – Identification of technically and economically feasible mitigation measures to eliminate, reduce or control adverse cumulative effects. Mitigation can include elimination, reduction or control. Where that is not possible, restitution measures such as compensation or replacement can be identified.

Step 4 – Determining the significance of adverse cumulative effects remaining after the application of mitigation measures (ex: residual effects) that are likely to result from the proposed Project in combination with other physical activities.

Step 5 – Development of a follow-up program to verify the accuracy of the EA and effectiveness of mitigation measures applied to address both Project-specific environmental effects and cumulative effects.

6.6.3.1 Step 1 - Scoping

Scoping helps to orient and focus the CEA by determining the VCs to be considered. Scoping for the Project-specific assessment of cumulative effects was undertaken following the assessment of potential environmental effects from the proposed Project and the identification of predicted residual effects on VCs. Specifically, the scoping of the CEA included the following:

- Identifying VCs for which adverse residual environmental effects from the proposed Project are expected (**Appendix 6-5**).
- Determining and justifying the spatial and temporal boundaries to capture potential cumulative effects on VCs that may experience adverse residual effects.
- Identifying sources of potential cumulative effects, which includes past, present and future physical activities that are anticipated to contribute to the residual environmental effects of the Project on VCs.

6.6.3.1.1 Valued Components

As per the Agency's guidelines for the proposed Project (Canadian Environmental Assessment Agency 2017a), the CEA includes, but is not limited to, consideration of cumulative effects for the following VCs:

- fish and fish habitat, including valued fish species
- Species at Risk
- migratory birds
- Indigenous people
- VCs associated with sub-section 5(2) of CEAA, 2012 (ex: health and socioeconomic conditions, physical and cultural heritage, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance)

The VCs listed above are the same VCs identified during the VC selection process for the assessment of potential effects of the proposed Project as described in the **Chapter 4** (**Section 4.5.1**). The CEA focuses on potential adverse cumulative effects on VCs that are expected to experience adverse residual environmental effects caused by the proposed Project (Canadian Environmental Assessment Agency 2017a) regardless of whether those residual environmental effects are predicted to be significant (Canadian Environmental Assessment Agency 2014). In accordance with the Agency guidelines for the proposed Project, VCs that would be affected positively by the proposed Project were omitted from the CEA (Canadian Environmental Assessment Agency 2017a). Residual adverse environmental effects of the proposed Project following the application of mitigation were identified as potential VCs for the CEA through the assessment of Project effects on VCs including potential effects of accidents and malfunctions (**Section 6.6.1**) and potential effects of the environment on the Project (**Section 6.6.2**).

To determine if there is the potential for adverse cumulative effects to VCs that would warrant further assessment, scoping criteria were applied (**Figure 6-23**). In reference to the criteria outlined in the Agency guidance document (Canadian Environmental Assessment Agency 2014), for a VC to be carried forward for further cumulative effects analysis the VC must be:

- affected by adverse residual effects of the proposed Project
- likely to be adversely affected by other past, present or future physical activities within the spatial and temporal boundaries defined below
- warranted by one or more screening criteria such as the potential for significant adverse cumulative effects to the VC, feedback from the IPEP, level of uncertainty in predictions of cumulative effects and/or the need for mitigation measures or follow-up[12]

VCs that would experience adverse residual Project effects (**Appendix 6-5**) were evaluated using the scoping and screening process illustrated in **Figure 6-23**. All VCs identified for the proposed Project are expected to have some residual environmental effects. However, not all of the VCs are likely to be affected

[12] The answer to this question would be 'yes' if additional mitigation measures or follow-up beyond what is proposed for the proposed Project is required to reduce the potential for significant adverse cumulative effects within the spatial and temporal boundaries of the CEA.

by the past, present or future physical activities within the spatial and temporal boundaries. In particular, physical activities that are certain and reasonably foreseeable would not overlap temporally with the proposed Project with the possible exception of on-reserve community access roads in Manto Sipi Cree Nation and God's Lake First Nation to connect the Project to existing community roads. However, past experience with road construction on the east side of Lake Winnipeg has shown that funding and timelines of federal and provincial projects differ greatly and the projects would likely not overlap temporally. Project construction would not begin until 2030, whereas the physical activities associated with other certain and reasonably foreseeable projects/activities are anticipated to be in-service prior to the construction of the road.

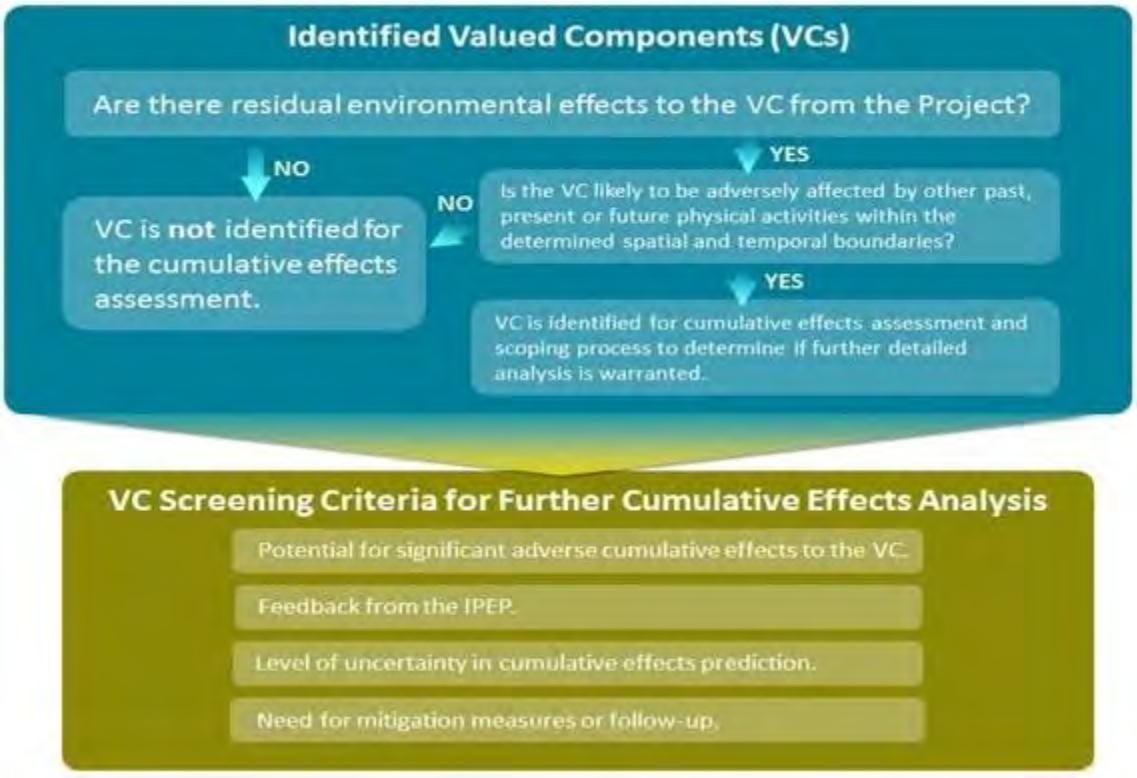

Figure 6-23: Approach to Scoping and Screening of VCs for further Cumulative Effects Analysis

In addition, many of the certain and reasonably foreseeable physical activities would occur in the local Indigenous communities (ex: proposed new schools in Bunibonibee Cree Nation and Manto Sipi Cree Nation, new school and nursing home currently under construction in God's Lake First Nation) and would be no closer to the all-season road than residences previously identified (**Section 6.1.9.1)**. It is assumed that the existing schools and nursing home will be demolished following the construction of the new facilities and therefore there would be no change or potential cumulative GHG effect.

The exception to certain and reasonably foreseeable physical activities would be potential diamond exploration associated with a recent agreement between Bunibonibee Cree Nation and Altius Resource

Inc. Activities would involve drilling small exploratory holes and providing access either via access roads or helicopters. The extent and timing of potential diamond mining exploration is unknown and is an uncertainty in the CEA. The remote nature of the region has resulted in the limitation of past, present and reasonably foreseeable physical activities.

While the ESTI outlined plans for other all-season roads in the vicinity of the proposed Project, at this time the Province of Manitoba has no plans or schedule to proceed with Project 2 (PR 373 to Wasagamack First Nation) and Project 5 (Anderson Junction to Bunibonibee Cree Nation) that would link the proposed Project to the all-season road network in Manitoba. These other all-season roads are not included in the Cumulative Effects Assessment as they are currently uncertain and likely will not occur in the foreseeable future.

The approach and level of effort applied to assess cumulative effects for the VCs selected was established on a case-by-case basis taking into consideration the (Canadian Environmental Assessment Agency 2015a):

- characteristics of the proposed Project
- risks associated with the potential cumulative environmental effects
- state (health, status or condition) of VCs that may be affected by the cumulative effects
- potential for mitigation and the extent to which mitigation measures may address potential cumulative environmental effects
- level of concern expressed by Indigenous People and the public

6.6.3.1.2 Spatial and Temporal Boundaries

The Indigenous RAA (**Figure 6-2**) was selected as the spatial boundary to assess VCs identified for the CEA. The CEA spatial boundary encompasses the Traditional Territories of Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation. This CEA spatial boundary considers changes to the environment that cumulatively may indirectly affect the health and socio-economic conditions and traditional use areas and resources of the local Indigenous communities and people in the region. This includes fish and fish habitat upstream and downstream of the Project Footprint for the all-season road that are connected to watercourses potentially affected by the proposed Project and would be harvested by the Indigenous communities.

The Indigenous RAA was also selected for the CEA spatial boundary as it contains the smaller Wildlife RAA, addressing Species at Risk and migratory birds. The Wildlife RAA was determined using a multi-disciplinary approach incorporating both biophysical and social factors to ensure home ranges of large ranging species (ex: caribou) and areas of traditional use were considered. Because the Indigenous RAA is larger than the Wildlife RAA, potential cumulative effects to VCs may be limited to only a small portion of the CEA spatial boundary.

The temporal boundary for the CEA extends over an approximate 48-year period commencing in 2000 with the initial Large Area Transportation Network planning initiatives for the east side of Lake Winnipeg and concluding in 2048. Considering that construction of the proposed Project is anticipated to be completed in 2038 (Project Description **Chapter 3, Section 3.5**), it is expected that the 48-year period, which includes 10 years post-construction of the proposed Project, is an adequate temporal boundary to assess whether significant adverse cumulative effects may potentially occur for the selected VCs.

6.6.3.1.3 Physical Activities

The CEA has considered past and existing physical activities, as well as future physical activities that are certain and reasonably foreseeable, in consideration of the spatial and temporal bounds of the CEA. Current baseline conditions represent the cumulative effects from previous and existing land use practices and natural processes that have shaped the biophysical, cultural and socio-economic components of the area during the period of human settlement. Past, present and future physical activities known to occur, that have occurred or would occur within the cumulative effects spatial and temporal boundaries are listed in **Table 6.45** and are described below.

6.6.3.1.3.1 Past and Present Physical Activities

The past and present physical activities that are anticipated to potentially contribute to cumulative effects on VCs carried forward for assessment are listed in **Table 6.45**. The remote nature of the region has resulted in the limitation of past and present physical activities to the following:

- existing infrastructure on and immediately adjacent to the local Indigenous communities (**Figure 6-18, 6-19** and **6-20**)
- existing winter road use and maintenance (**Figure 6-6**)
- mineral dispositions (ex: quarries **Figure 6-6**)
- Manitoba Hydro transmission and sub-transmission lines (**Figure 6-6**)
- traditional land and resource use activities including hunting and trapping, fishing and gathering

Additional information on activities in the Indigenous RAA, including land and resource use is provided in **Section 6.1.9**.

6.6.3.1.3.2 Future Physical Activities

The future physical activities that are certain and reasonably foreseeable and that are anticipated to potentially contribute to cumulative effects on VCs carried forward for assessment are also listed in **Table 6.45**. Future physical activities with potential to contribute to cumulative environmental effects include:

- On-reserve community access roads in Manto Sipi Cree Nation and God's Lake First Nation to connect the Project to existing community roads
- Bell/MTS commitment to provide wireless and wireline broadband services to God's River and God's Lake Narrows
- Indigenous Services Canada (ISC) plans to construct new schools in Bunibonibee Cree Nation and Manto Sipi Cree Nation

Table 6.45: Past, Present and Future Physical Activities Considered in the Cumulative Effects Assessment

Category of Physical Activities	Specific Physical Activity	Description of Physical Activity
Past or Present Physical Activities that have been Carried Out		
Infrastructure	Existing winter road operation and maintenance.	The winter road is built every winter and connects the local Indigenous communities. It is only operational during the winter months and is maintained by MI (**Figure 6-6**).
	Manitoba Hydro transmission and sub-transmission lines.	A Manitoba Hydro sub-transmission line from God's Lake to God's River provides power to Manto Sipi Cree Nation. The Kelsey to Oxford House 138 kV transmission line, which originates outside of the area, provides power to Bunibonibee Cree Nation, God's Lake First Nation and God's Lake Northern Affairs Community (**Figure 6-6**). Manitoba Hydro maintains the transmission and sub-transmission lines.
	A new school and nursing station are being constructed in God's Lake First Nation.	Both are located in the community on God's Lake First Nation Reserve Lands. The facilities will be constructed prior to the proposed Project.
Mining and quarry activities	Mineral dispositions related to mining and quarry activities.	The four quarry withdrawals that overlap the all-season road alignment (**Section 6.3.4.1.7**) are used for maintenance at the airports and the Northern Affairs Community.
Hunting and Trapping	Traditional/subsistence hunting and domestic/commercial trapping activities.	Refer to **Section 6.1.9.1**
Fishing	Traditional/subsistence and recreational fishing.	Refer to **Section 6.1.9.1**
Gathering	Traditional/subsistence gathering.	Refer to **Section 6.1.9.1**
Future Physical Activities that are Certain and Reasonably Foreseeable		
Infrastructure	Bell/MTS has committed to providing wireless and wireline broadband services to God's River and God's Lake Narrows.	This is expected to occur in advance of construction of the proposed Project.
	ISC is planning to construct new schools in Bunibonibee Cree Nation and Manto Sipi Cree Nation.	The new schools with be located on Reserve lands and are expected to be constructed prior to the proposed Project.
	ISC is proposing to develop a landfill site for Bunibonibee Cree Nation.	The existing landfill will be upgraded (likely completed in 2019) in the interim with plans for a new landfill to be developed within 10 years depending on funding.
Mining	Bunibonibee Cree Nation has partnered with Altius Resources Inc. to explore diamond claims in the Oxford House area.	No timeframe has been set for exploration. According to a statement from Altius and Bunibonibee Cree Nation regarding the agreement, the potential to develop a mine is about 1:10,000.
Hunting and Trapping	Traditional/subsistence hunting activities and domestic/commercial trapping activities	Refer to **Section 6.1.9.1**
Fishing	Traditional/subsistence and recreational fishing.	Refer to **Section 6.1.9.1**
Gathering	Traditional/subsistence gathering.	Refer to **Section 6.1.9.1**

- ISC plans to develop a landfill site for Bunibonibee Cree Nation
- exploration of diamond claims in the Oxford House area as a result of a partnership between Bunibonibee Cree Nation and Altius Resources Inc.
- continued traditional land and resource use activities (ex: hunting, trapping, fishing, gathering)

6.6.3.2 Step 2 - Analysis

The sources of potential cumulative effects were identified considering other projects or activities that have been or that are likely to be carried out that could cause effects on each selected VC within the boundaries defined and whose effects would act in combination with the residual effects of the proposed Project.

The CEA effects summary for each VC having the potential to combine with Project effects and potential effects of those past, present and future physical activities are outlined in **Table 6.46**. The criteria used in **Table 6.47** are those defined in **Chapter 4, Tables 4.4** and **4.5**. Physical activities that are certain and reasonably foreseeable would not overlap temporally with effects of the proposed Project given that construction of the all-season road would not begin until 2030. Likewise, the physical activities associated with other projects/activities are anticipated to be in-service prior to the construction of the road. The exceptions would be on-reserve community access roads in Manto Sipi Cree Nation and God's Lake First Nation to connect the Project to existing community roads, the continued traditional land and resource use and potential diamond exploration as a result of an agreement between Bunibonibee Cree Nation and Altius Resource Inc. The effects of the on-reserve community access roads would be the same as or less than the Project, depending on VC. The extent and timing of potential diamond mining exploration is unknown and is an uncertainty in the CEA.

An adverse residual cumulative effect associated with the selected VCs is significant if it meets both of the following criteria:

- a Level III rating result for ecological and social context
- a Level II or III rating result for each of the effect attributes of duration, magnitude, timing, extent, frequency and reversibility

6.6.3.2.1 Fish and Fish Habitat

The residual effects of the proposed Project on aquatic resources are expected to be minor given the limited potential for and short-term duration of Project aquatic environment interactions. Under the *Fisheries Act*, DFO requires fish habitat offsetting for the proposed Project and other present and future physical activities that result in "serious harm" (ex: permanent alteration to, or destruction of) fish habitat. Therefore, the potential for adverse cumulative effects to fish and fish habitat would be prevented through habitat offsetting plans, if required.

Table 6.46: Summary of Cumulative Residual Environmental Effects on VCs

VC	Cumulative Residual Effects								Significance	Likelihood of Significant Effect
	Direction	Duration	Magnitude	Timing	Extent	Frequency	Reversibility	Ecological and Social Context		
Fish and fish habitat	Negative	Short-term	Low	Moderate Sensitivity	LAA	Infrequent	Reversible – long-term	Low	Not Significant	N/A
Migratory birds	Negative	Short-term	Low	Moderate Sensitivity	RAA	Continuous	Reversible – long-term	Low	Not Significant	N/A
Species at Risk	Negative	Short-term	Low	N/A	LAA	Infrequent	Irreversible	Moderate	Not Significant	N/A
Indigenous People including health and socio-economic conditions (ex: use of navigable waters, recreational use, commercial fishing, hunting, trapping and gathering activities)	Negative	Short-term	Low	N/A	RAA	Infrequent	Reversible – short-term	Low	Not Significant	N/A
Physical and cultural heritage and structures, sites or things of historical, archaeological, paleontological or architectural significance	Negative	Short-term	Low	N/A	N/A	Infrequent	Reversible – short-term	Low	Not Significant	N/A

There are no plans to incorporate boat ramps, docks or other structures or modifications to the all-season road to facilitate access to fish-bearing watercourses. Hence, convenient fishing opportunities at fish-bearing water crossings along the all-season road would be limited by the design of the all-season road. The decommissioning of the winter road as the new all-season road is completed would reduce potential damage to the fish habitat and harvested fish species where winter roads cross watercourses. MSD is responsible for the management and enforcement of fishing and control of invasive aquatic species in Manitoba. Other activities or projects that could overlap with the proposed Project do not indicate the potential to result in cumulative adverse effects that would require further mitigation other than those identified in **Appendix 6-4**.

6.6.3.2.2 Migratory Birds

Cumulative effects are not anticipated to result in environmental effects where the habitat for migratory birds and bird mortality would result in a change in the migratory bird populations. The proposed Project in combination with past, current and reasonably foreseeable future projects is not likely to have a definable, detectable or measurable potential effect above baseline (ex: potential effect is within a normal range of variation). Other activities or projects that could overlap with the proposed Project do not indicate the potential to result in cumulative adverse effects that would require further mitigation other than those identified in **Appendix 6-4**.

6.6.3.2.3 Species at Risk

The proposed Project in combination with past, current and reasonably foreseeable future projects is not likely to have a definable, detectable or measurable potential effect to Species at Risk populations above baseline (ex: potential effect is within a normal range of variation). Other activities or projects that could overlap with the proposed Project do not indicate the potential to result in cumulative adverse effects that would require further mitigation other than those identified in **Appendix 6-4**. The proposed Project is not expected to have significant adverse environmental effects on the biophysical environment (habitat) including air quality, surface and groundwater quality and quantity, soils and terrain and habitat with the implementation of mitigation measures.

The proposed Project is anticipated to have predictable and mitigatable effects on vegetation Species at Risk. There are an estimated 14 vegetation Species at Risk that occur within the Vegetation RAA and surroundings (Szwaluk Environmental Consulting Ltd. *et al.* 2017a). None of these 14 Species at Risk are listed federally under the COSEWIC or SARA, or are provincially protected under the ESEA.

The proposed Project is anticipated to have predictable and mitigatable effects on mammal Species at Risk. Mammal Species at Risk identified in the project area include woodland caribou (Boreal Woodland and Eastern Migratory ecotypes), wolverine and little brown bat (Joro Consultants 2018b). There are Recovery Strategies in place for Boreal Woodland caribou and little brown bat. At present, there is only a COSEWIC assessment for the Eastern Migratory woodland caribou. By the time the Project is built, the Eastern Migratory caribou may be listed under SARA.

The objective of the recovery plan for Boreal Woodland caribou is to maintain the current status of self-sustaining local population, with a maximum disturbance threshold of 35% (65% undisturbed). Critical habitat for Boreal Woodland caribou is found within a small portion of the Wildlife RAA (outside of the LAA) where the RAA overlaps with the Molson Boreal Caribou Management Unit and the Norway House range. A disturbance analysis was conducted for two scenarios, the first scenario looked at the 2015 landscape with the winter road and the second scenario looked a future landscape with the constructed Project and revegetated sections of winter road. For both scenarios, the disturbed habitat within the Molson Management Unit is 28% (Joro Consultants 2018b), is below the 35% threshold identified in the recovery plan.

For the Eastern Migratory caribou, a recovery strategy has not been developed and critical habitat has not been defined. Eastern Migratory caribou are known to use to the Wildlife RAA during the winter months, with a few females remaining during the summer months. A disturbance analysis was conducted on available data for the area on the Penn Islands range within Manitoba for the 2015 landscape with the winter road and a second scenario that looked at the landscape with the future constructed Project[13]. For both scenarios, the disturbed habitat within the Penn Islands range within Manitoba is 23% (Joro Consultants 2018b).

The objective of the recovery plan for the little brown bat is to maintain and where feasible increase the population compared to its current levels and maintain distribution to its pre-White Nose Syndrome extent. No critical habitat (bat hibernacula) for little brown bat was identified in the Wildlife RAA; the closest is concentrated in the northwest of Lake Winnipeg, north of Grand Rapids (Joro Consultants 2018b).

The proposed Project is anticipated to have predictable and mitigatable effects on aquatic Species at Risk. The Southern Hudson Bay-James Bay population of Lake Sturgeon is designated as Special Concern by COSEWIC (COSEWIC 2006b) and is currently under consideration for protection under SARA (North/South Consultants Inc. 2017a).

6.6.3.2.4 Indigenous Peoples

The all-season road is anticipated to have predictable and mitigatable effects on local Indigenous communities. Changes to community life, traditional lifestyles and individual well-being are not expected to dramatically change with the all-season road given the mitigation measures and because the road only connects the four local Indigenous communities that already have access to each other by winter roads and waterways. Traditional land and resource use patterns may be altered due to increased access, which could be a benefit. The all-season road and on-reserve community access roads in Manto Sipi Cree Nation and God's Lake First Nation to connect the Project to existing community roads are anticipated to benefit local community members by increasing access for resource users and providing improved year round interaction among the local communities connected by the road. Other activities or projects that could

[13] All-season road disturbance analysis assumes unoccupied portions of the winter road being revegetated

overlap with the proposed Project do not indicate the potential to result in cumulative adverse effects that would require further mitigation other than those identified in **Appendix 6-4**.

6.6.3.2.5 Heritage and Archaeological Resources

Loss and impairment of heritage and archaeological resources and areas of cultural importance are unlikely due to the avoidance of the all-season road alignment through TK studies, the HRIA and implementation of mitigation measures and the unlikely potential to overlap with other physical activities.

6.6.3.3 Step 3 - Mitigation

Other activities or projects that could overlap with the proposed Project do not indicate the potential to result in cumulative adverse effects that would require further mitigation other than those already identified in **Appendix 6-4**.

6.6.3.4 Step 4 - Significance

Adverse cumulative effects are not expected to be significant based on the CEA criteria, as shown in **Table 6.46**, the analyses and descriptions of expected cumulative effects and the mitigation measures outlined in **Appendix 6-4** applied for each of the VCs assessed. Although there may be some overlap in spatial boundaries between the proposed Project and physical activities anticipated to occur in the CEA RAA, there is no overlap in temporal boundaries with the exception of on-reserve community access roads in Manto Sipi Cree Nation and God's Lake First Nation to connect the Project to existing community roads, continued traditional land and resource use throughout the area and the potential exploration for diamonds in the Bunibonibee Cree Nation traditional territory.

6.6.3.5 Step 5 - Follow-Up

Considering no significant adverse cumulative effects are anticipated from past, present and reasonably foreseeable future physical activities, it is not expected that additional follow-up studies would be required other than follow-up studies proposed in **Chapter 9** to verify the accuracy of the EA for the proposed Project and to determine the effectiveness of mitigation measures incorporated into the design, construction and operation and maintenance phases of the Project. If unexpected adverse cumulative effects are identified in the future, then additional measures can be discussed with MSD, the Agency and or appropriate federal or provincial regulators and communities where appropriate.

CHAPTER 6 APPENDICES

Appendix 6-1: Plant Species Observed in the Vegetation Local Assessment Area

Source: Szwaluk Environmental Consulting Ltd. *et al*. 2017b

APPENDIX III. Flora of Project 6 Field Studies

Scientific Name	Common Name	Rank
VASCULAR SPECIES		
Ferns and Allies		
DRYOPTERIDACEAE	**WOOD FERN FAMILY**	
Woodsia ilvensis	Rusty Woodsia	S5
EQUISETACEAE	**HORSETAIL FAMILY**	
Equisetum arvense	Common Horsetail	S5
Equisetum fluviatile	Swamp Horsetail	S5
Equisetum scirpoides	Dwarf Scouring-rush	S4S5
Equisetum sylvaticum	Wood Horsetail	S5
LYCOPODIACEAE	**CLUB-MOSS FAMILY**	
Diphasiastrum complanatum	Trailing Club-moss	S3S4
Lycopodium annotinum	Stiff Club-moss	S5
PTERIDACEAE	**MAIDEN-HAIR FERN FAMILY**	
Cryptogramma acrostichoides	American Parsley Fern	S3S4
Gymnosperms		
CUPRESSACEAE	**CYPRESS FAMILY**	
Juniperus communis	Common Juniper	S5
Juniperus horizontalis	Creeping Juniper	S5
PINACEAE	**PINE FAMILY**	
Larix laricina	Tamarack	S5
Picea mariana	Black Spruce	S5
Pinus banksiana	Jack Pine	S5
Angiosperms - Monocotyledons		
CYPERACEAE	**SEDGE FAMILY**	
Carex aquatilis	Water Sedge	S5
Carex capillaris	Hair-like Sedge	S5
Carex chordorrhiza	Prostrate Sedge	S4S5
Carex concinna	Beautiful Sedge	S4S5
Carex disperma	Two-seeded Sedge	S5
Carex foenea	Hay Sedge	S5
Carex gynocrates	Bog Sedge	S5
Carex lacustris	Lakeshore Sedge	S5
Carex lasiocarpa	Hairy-fruited Sedge	S5
Carex leptalea	Bristle-stalked Sedge	S5
Carex magellanica	Bog Sedge	S5
Carex scirpoidea	Rush-like Sedge	S4S5
Carex trisperma	Three-seeded Sedge	S4S5

Carex utriculata	Beaked Sedge	S5
Carex vaginata	Sheathed Sedge	S5
Carex spp.	Sedge	
Eleocharis palustris	Common Spike-rush	S5
Eriophorum brachyantherum	Closed-sheathed Cotton-grass	S4S5
Eriophorum vaginatum	Sheathed Cotton-grass	S5
Trichophorum caespitosum	Tufted Clubrush	S4
JUNCACEAE	**RUSH FAMILY**	
Juncus bufonius	Toad Rush	S5
JUNCAGINACEAE	**ARROW-GRASS FAMILY**	
Triglochin maritima	Seaside Arrow-grass	S5
LILIACEAE	**LILY FAMILY**	
Maianthemum canadense	Canada May Flower	S5
Maianthemum trifolium	Three-leaved Solomon's Seal	S5
ORCHIDACEAE	**ORCHID FAMILY**	
Calypso bulbosa	Calypso	S4
Corallorhiza trifida	Early Coral-root	S5
Goodyera repens	Lesser Rattlesnake-Plantain	S4S5
Platanthera obtusata	Small Northern Bog Orchid	S5
Platanthera orbiculata	Round-leaved Bog Orchid	S3S4
POACEAE	**GRASS FAMILY**	
Agrostis scabra	Ticklegrass	S5
Calamagrostis canadensis	Canada Reed Grass	S5
Calamagrostis sp.		
Leymus innovatus	Hairy Wild Rye	S5
Oryzopsis asperifolia	Rice Grass	S5
Piptatherum pungens	Northern Rice Grass	S4S5
Poa sp.		
TYPHACEAE	**CAT-TAIL FAMILY**	
Typha latifolia	Common Cat-tail	S4S5
Angiosperms - Dicotyledons		
ARALIACEAE	**GINSENG FAMILY**	
Aralia nudicaulis	Wild Sarsaparilla	S5
ASTERACEAE	**ASTER FAMILY**	
Achillea millefolium	Yarrow	S5
Petasites frigidus var. *palmatus*	Palmate-leaved Coltsfoot	S5
Solidago hispida	Hairy Goldenrod	S5
Symphyotrichum ciliolatum	Lindley's Aster	S5
BETULACEAE	**BIRCH FAMILY**	
Alnus incana ssp. *rugosa*	Speckled Alder	S5

Alnus viridis	Green Alder	S5
Betula papyrifera	Paper Birch	S5
Betula pumila	Dwarf Birch	S5
BORAGINACEAE	**BORAGE FAMILY**	
Mertensia paniculata	Tall Lungwort	S5
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**	
Linnaea borealis	Twinflower	S5
Lonicera dioica	Limber or Twining Honeysuckle	S5
Lonicera involucrata	Black Twinberry	S3S4
Lonicera villosa	Blue Fly Honeysuckle	S5
Symphoricarpos albus	Snowberry	S4S5
Viburnum edule	Low-bush Cranberry	S5
CORNACEAE	**DOGWOOD FAMILY**	
Cornus canadensis	Bunchberry	S5
DROSERACEAE	**SUNDEW FAMILY**	
Drosera anglica	Oblong-leaved Sundew	S3S4
Drosera rotundifolia	Round-leaved Sundew	S4S5
ELAEAGNACEAE	**OLIVE FAMILY**	
Shepherdia canadensis	Canada Buffaloberry	S5
EMPETRACEAE	**CROWFOOT FAMILY**	
Empetrum nigrum	Black Crowberry	S5
ERICACEAE	**HEATH FAMILY**	
Andromeda polifolia	Bog-rosemary	S5
Arctostaphylos uva-ursi	Bearberry	S5
Arctous alpina	Alpine Bearberry	S3S4
Chamaedaphne calyculata	Leatherleaf	S5
Gaultheria hispidula	Creeping Snowberry	S4S5
Kalmia polifolia	Pale Laurel	S5
Rhododendron groenlandicum	Labrador Tea	S5
Vaccinium myrtilloides	Velvet-leaf Blueberry	S5
Vaccinium oxycoccos	Small Cranberry	S5
Vaccinium uliginosum	Bog Whortleberry	S5
Vaccinium vitis-idaea	Bog Cranberry	S5
FABACEAE	**PEA FAMILY**	
Lathyrus ochroleucus	Pale Vetchling	S5
FUMARIACEAE	**FUMITORY FAMILY**	
Corydalis sempervirens	Pink and Yellow Corydalis	S5
GROSSULARIACEAE	**CURRANT FAMILY**	
Ribes oxyacanthoides	Canada Wild Gooseberry	S5

Ribes triste	Wild Red Currant	S5
LENTIBULARIACEAE	**BLADDERWORT FAMILY**	
Utricularia intermedia	Flat-leaved Bladderwort	S4S5
Utricularia sp.		
MENYANTHACEAE	**BUCKBEAN FAMILY**	
Menyanthes trifoliata	Bog Bean	S5
MONOTROPACEAE	**INDIAN-PIPE FAMILY**	
Monotropa uniflora	Indian-pipe	S4
ONAGRACEAE	**EVENING PRIMROSE FAMILY**	
Chamerion angustifolium	Fireweed	S5
PRIMULACEAE	**PRIMROSE FAMILY**	
Primula egaliksesis	Greenland Primrose	S3
Primula mistassinica	Bird's-eye-primrose	S5
PYROLACEAE	**WINTERGREEN FAMILY**	
Orthilia secunda	One-sided Wintergreen	S5
Pyrola asarifolia	Pink Wintergreen	S5
Pyrola chlorantha	Green-flowered Wintergreen	S5
RANUNCULACEAE	**CROWFOOT FAMILY**	
Actaea rubra	Red Baneberry	S5
Aquilegia brevistyla	Small-flowered Columbine	S4
Caltha palustris	Marsh Marigold	S5
Ranunculus lapponicus	Lapland Buttercup	S4S5
RHAMNACEAE	**BUCKTHORN FAMILY**	
Rhamnus alnifolia	Alder-leaved Buckthorn	S5
ROSACEAE	**ROSE FAMILY**	
Amelanchier alnifolia	Saskatoon	S5
Comarum palustre	Marsh Cinquefoil	S5
Dasiphora fruticosa	Shrubby Cinquefoil	S5
Fragaria virginiana	Smooth Wild Strawberry	S5
Prunus pensylvanica	Pin Cherry	S5
Rosa acicularis	Prickly Rose	S5
Rubus arcticus ssp. *acaulis*	Stemless Raspberry	S5
Rubus chamaemorus	Cloud Berry	S5
Rubus pubescens	Trailing Dewberry	S5
Sibbaldiopsis tridentata	Three-toothed Cinquefoil	S5
RUBIACEAE	**MADDER FAMILY**	
Galium boreale	Northern Bedstraw	S5
Galium labradoricum	Northern Bog Bedstraw	S4S5
SALICAEAE	**WILLOW FAMILY**	

Populus balsamifera	Balsam Poplar	S5
Populus tremuloides	Trembling Aspen	S5
Salix bebbiana	Bebb's Willow	S5
Salix candida	Hoary Willow	S5
Salix maccalliana	Velvet-fruited Willow	S4
Salix myrtilifolia	Myrtle-leaved Willow	S5
Salix pedicellaris	Bog Willow	S5
Salix pellita	Satin Willow	S3S4
Salix planifolia	Flat-leaved Willow	S5
Salix pseudomonticola	False Mountain Willow	S4S5
Salix sp.	Willow	
SANTALACEAE	**SANDALWOOD FAMILY**	
Geocaulon lividum	Northern Comandra	S5
SAXIFRAGACEAE	**SAXIFRAGE FAMILY**	
Mitella nuda	Mitrewort	S5
VIOLACEAE	**VIOLET FAMILY**	
Viola adunca	Early Blue Violet	S5
Viola renifolia	Kidney-leaved Violet	S4S5
Viola spp.		
NON-VASCULAR SPECIES		
BRYOPHYTES		
Dicranum sp.	Dicranum Moss	
Hylocomium splendens	Splendid Feather Moss	S4S5
Pleurozium schreberi	Schreber's Moss	S4S5
Polytrichum sp.	Polytrichum Moss	
Ptillium crista-castrensis	Knights Plume Moss	S4S5
Sphagnum spp.	Peat Moss	
LICHENS		
Cladina mitis	Green Reindeer Lichen	S4
Cladina rangiferina	Grey Reindeer Lichen	S5
Cladina stellaris	Northern Reindeer Lichen	S5
Cladonia sp.	Cladonia	
Cladonia uncialis	Prickle Cladonia	S5
Peltigera sp.	Pelt Lichen	
Stereocaulon tomentosum	Woolly Coral Lichen	SU
Umbilicaria sp.	Rocktripe Lichen	

Appendix 6-2: Bird Species Observed in the Wildlife Regional Assessment Area

List of Potential Birds for the P6 Regional Assessment Area

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Migratory Waterfowl and Waterbirds					
Waterfowl (Anseriformes)					
Snow goose[1,6]	*Chen caerulescens*			S5B S5M	
Ross's goose[1]	*Chen rossii*			S3S4B S4M	
Greater white-fronted goose[1]	*Anser albifrons*			SUM	
Cackling goose	*Branta hutchinsii*				
Canada goose[2,3,5,6]	*Branta canadensis*			S5B	
Tundra swan[1,5,6]	*Cygnus columbianus*			S4B SUM	
Blue-winged teal[5]	*Anas discors*			S4B	
Northern shoveler	*Anas clypeata*			S5B	
Gadwall[1]	*Anas strepera*			S5B	
American wigeon[5]	*Anas americana*			S4B	
Mallard[2,3,5,6]	*Anas platyrhynchos*			S5B	
American black duck[1,6]	*Anas rubripes*			S3B	
Northern pintail[5]	*Anas acuta*			S5B	
Green-winged teal[5]	*Anas crecca*			S4B	
Ring-necked duck[3,5]	*Aythya collaris*			S5B	
Greater scaup[1,5,6]	*Aythya marila*			S5B SUM	
Lesser scaup[5,6]	*Aythya affinis*			S5B	
Surf scoter[1]	*Melanitta perspicillata*			S3B	
White-winged scoter	*Melanitta fusca*			S4B	
Black scoter[1,6]	*Melanitta americana*			S4B	
Long-tailed duck[1,6]	*Clangula hyemalis*			S4B	
Bufflehead[5]	*Bucephala albeola*			S4B	
Common goldeneye[5]	*Bucephala clangula*			S5B SUN	
Hooded merganser[1]	*Lophodytes cucullatus*			S5B	
Common merganser[5,6]	*Mergus merganser*			S5B	
Red-breasted merganser[2]	*Mergus serrator*			S4B	
Grebes (Podicipediformes)					
Pied-billed grebe[2,3]	*Podilymbus podiceps*			S5B	
Horned grebe[4]	*Podiceps auritus*	No schedule, no status	SC	S4B	Not listed

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Coots, Cranes and Rails (Gruiformes)					
Yellow rail[2]	*Coturnicops noveboracensis*	SC	SC	S3B	Not listed
Sora[3]	*Porzana carolina*			S5B	
Sandhill crane[2,3,5,6]	*Grus canadensis*			S5B	
Shorebirds (Charadriiformes)					
Black-bellied plover[1]	*Pluvialis squatarola*			SUM	
American golden-plover[1]	*Pluvialis dominica*			S4B SUM	
Semipalmated plover	*Charadrius semipalmatus*			S4B SUM	
Killdeer	*Charadrius vociferus*			S5B	
Ruddy turnstone[1]	*Arenaria interpres*			SUM	
Stilt sandpiper[1]	*Calidris himantopus*			S4B SUM	
Sanderling[1]	*Calidris alba*			SUM	
Dunlin[1]	*Calidris alpina*			S3B SUM	
Baird's sandpiper[1]	*Calidris bairdii*			SUM	
Least sandpiper[2]	*Calidris minutilla*			S4B SUM	
White-rumped sandpiper[1]	*Calidris fuscicollis*			SUM	
Pectoral sandpiper[1]	*Calidris melanotos*			S4M	
Semipalmated sandpiper[1,6]	*Calidris pusilla*			S3B SUM	
Short-billed dowitcher[1]	*Limnodromus griseus*			S4B	
Wilson’s snipe[2,3,5,6]	*Gallingo delicata*			S5B	
Spotted sandpiper	*Actitis macularius*			S5B	
Solitary sandpiper[2]	*Tringa solitaria*			S4B SUM	
Lesser yellowlegs[3]	*Tringa flavipes*			S4B SUM	
Greater yellowlegs[2,5]	*Tringa melanoleuca*			S5B SUM	
Red-necked phalarope[1]	*Phalaropus lobatus*			S4B SUM	
Bonaparte's gull[2,6]	*Chroicocephalus philadelphia*			S5B	
Ring-billed gull[3]	*Larus delawarensis*			S5B	
Herring gull[2,6]	*Larus argentatus*			S4B	
Black tern[5,6]	*Childonias niger*			S4B	
Common tern[5]	*Sterna hirundo*			S5B	
Forster’s Tern[2]	*Sterna forsteri*			S4B	
Loons (Gaviiformes)					
Red-throated loon[1]	*Gavia stellata*			S3B, SUM	
Common loon[2,3,5,6]	*Gavia immer*			S5B	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Cormorants (Suliformes)					
Double-crested cormorant[1,6]	*Phalacrocorax auritus*			S5B	
Fishing Birds (Pelecaniformes)					
American white pelican[6]	*Pelecanus erythrorhynchos*			S4B	
American bittern[2,6]	*Botaurus lentiginosus*			S5B	
Great blue heron[4,6]	*Ardea herodias*			S5B	
Migratory Raptors					
Accipiters (Accipitriformes)					
Osprey[6]	*Pandion haliaetus*			S4B	
Bald eagle[5,6]	*Haliaeetus leucocephalus*			S5B SUN	
Northern harrier[2,5]	*Circus cyaneus*			S5B	
Sharp-shinned hawk	*Accipter striatus*			S4B	
Broad-winged hawk	*Buteo platypterus*			S5B	
Red-tailed hawk[2]	*Buteo jamaicensis*			S5B	
Rough-legged hawk[1]	*Buteo lagopus*		NAR	S3B SUM	
Golden eagle[1,5,6]	*Aquila chrysaetos*		NAR	S1B S4N	
Falcons (Falconiformes)					
American kestrel	*Falco sparverius*			S4B	
Merlin[2]	*Falco columbarius*		NAR	S5B SUN	
Gyrfalcon[1]	*Falco rusticolus*		NAR	SUN	
Peregrine falcon[1,6]	*Falco peregrinus*	SC	SC	S1B	END
Owls (Strigiformes)					
Snowy owl[6]	*Bubo scandiacus*			S4N	
Long-eared owl	*Asio otus*			S4B	
Short-eared owl[1,3,6]	*Asio flammeus*	SC	SC	S2S3B	THR
Migratory Forest Birds					
Nightjars (Caprimulgiformes)					
Common nighthawk[2,3,4,6]	*Chordeiles minor*	THR	THR	S3B	THR
Vultures (Cathartiformes)					
Turkey vulture[6]	*Cathartes aura*			S4B	
Woodpeckers and Relatives (Piciformes)					
Yellow-bellied sapsucker[2,3]	*Sphyrapicus varius*			S5B	
Northern flicker[2,3]	*Colaptes auratus*			S5B	