

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT

6.1 Overview

This Chapter of the environmental assessment report identifies, describes and assesses the potential environmental effects of the proposed P7a All-Season Road Project on the biophysical environment, human health and safety and aboriginal and treaty rights as well as socio-economic effects arising from environmental effects. Published information on the effects of roads on the environment, other environmental assessments for projects on the east side of Lake Winnipeg and baseline study reports for the proposed P7a All-Season Road Project were reviewed. The environmental assessment approach including methods for environmental effects identification and assessment, site visits, use of traditional knowledge and information from the Aboriginal and Public Engagement Program is described. For context, regional issues are presented, valued environmental components (VECs) are identified and cumulative environmental effects are discussed. Environmental effects are identified and assessed and measures to mitigate adverse effects in relation to the methodology used for Project 1 PR 304 to Berens River All-Season River are discussed. The effects of accidents and malfunctions, effects of the environment and sustainability of the proposed P7a All-Season Road Project are described and any potential cumulative environmental effects are considered.

6.2 Road Environmental Effects Review

6.2.1 Literature Review

There is a large world-wide information base (scientific studies and syntheses as well as management publications) on the environmental effects of road construction and operation and maintenance on water quality, soils, fish, vegetation, wildlife, biodiversity and other related topics. Spellerberg (1988), Tsunokawa and Hoban (1997), Spellerberg and Morrison (1998), Forman and Alexander (1998), Seiler (2001), Neivelt (2002), Donaldson Bennett (2004), Colling (2007) and others have reviewed and discussed the environmental effects of road construction. Biodiversity issues in road environmental assessment were described by Byron (1999). Spinelli and Marchi (1998) reported on the environmental effects of forest road construction. Ecological effects of roads are summarized in Table 6-1, Spellerberg (1998) and Jochimsen *et al.* (2004) reviewed the literature on the environmental effects of roads on amphibians and reptiles and measures to minimize those effects.

Measures and management actions to mitigate the environmental effects of road construction on the environment have been reviewed and discussed by Daigle (2010), Switalski and Jones (2012), van der Grift *et al.* (2012), Brendad *et al.* (2010), Jackson and Griffin (2000) and Prozzi *et al.* (2006). Ruiqiang and Zhao (2003) evaluated best management practices for mitigating effects of highways on stream and wildlife ecology. The Forest Practices Guidebook (Manitoba Conservation and Water Stewardship 2012) provides general guidelines for forestry road planning and construction to manage access created for forestry while addressing the sustainability of other resource and social values.

Table 6-1: Summary of Ecological Effects of Roads (Spellerberg 1998)

<p>Potential effects during construction</p> <ul style="list-style-type: none"> • Loss of habitat and biota. • Effects beyond the immediate vicinity of the road (i.e. mining of aggregates for the road may take place in a different area).
<p>Potential short term effects (of a new road)</p> <ul style="list-style-type: none"> • Linear surface creates new microclimate at the road edge. • Newly created edge provides habitat for edge species. • Plant mortality increases along the road edge. • Mortality of plants has direct and secondary effects on other organisms. • Some fauna will move from the area of the road as a result of habitat loss and physical disturbance. • Wildlife mortalities due to collisions.
<p>Potential long term effects</p> <ul style="list-style-type: none"> • Road kills and secondary effects as carrion. • Loss of habitat or change in habitat may extend beyond the edge of the road. • Changes in the biological community may extend for varying distances from the road edge. • Fragmentation of habitat. • Edge habitat (or ecotone) and traffic facilitating dispersal for some taxa including pest species. • Associated structures such as bridges and tunnels may provide habitats for some taxa. • Runoff affecting receiving waterbodies. • Emissions, litter, noise and other physical disturbances may extend varying distances.

Potential environmental effects of road have been noted as changes to species, habitats, and physical and chemical characteristics at the site and landscape levels. In some cases, authors group road effects into direct and indirect effects (e.g., Gucinski *et al.* [editors] 2001). In another instance, Spellerberg (1998) categorized possible road effects as those common during construction, those along a newly completed road, and those with long-term effects. In most reports, researchers tend to focus directly on possible road effects; in other instances, researchers are testing for the effects of an array of variables including roads.

Daigle (2010) summarized the possible environmental effects of roads, management responses and research gaps. The possible effects of roads include spatial and temporal dimensions and biotic and abiotic components. They can be local (along a road segment) or extensive (related to a large road network). In addition to potential direct loss of habitat caused by the footprint of resource roads, another possible spatial aspect is the “road-effect zone” that can radiate out from the sides of the road and/or extend downstream where effects on aquatic conditions may be located a distance from the source. The road-effect zone also may change light conditions. Where soils are disturbed conditions may become more suitable for invasive plants.

Spatial effects of roads vary because species habitat requirements and ecosystem characteristics are diverse. For example, less mobile wildlife species tend to have smaller habitats whereas wide-ranging mammal and bird requirements tend to be spread across macro-environments. With respect to temporal dimensions, road-related negative effects may occur during road construction or from the

subsequent presence, use, and maintenance of the road. Some species (e.g., amphibian species) have seasonal life-cycle necessities and require both aquatic and terrestrial habitats to meet their needs.

Daigle (2010) grouped potential road-related effects on:

- 1) soils, water, and aquatic wildlife/habitat;
- 2) terrestrial wildlife/habitat; and
- 3) other road effects.

1. Potential Effects on Soils, Water and Aquatic Wildlife/Habitat

- Increased fish mortality caused by expanded angling pressures, poaching and management actions.
- Disrupted amphibian and reptile migration patterns and population connections and increased road kills where roads bisect wetlands.
- Displaced and compacted soils resulting in loss of biomass productivity
- Altered conditions that may change soil pH, plant growth, and the vegetative community structure (i.e., light levels and water retention; soil displacement, temperature, and compaction; and dust).
- Reconfigured landforms that may change hydrologic regimes (e.g., altered water table position; interrupt groundwater flow diverted to surface systems; increase water temperatures; change the timing of runoff; drain natural wetland habitats; create unintentional artificial wetlands; and restrict or alter channels which can result in altered streambed materials).
- Altered streamflow, particularly the timing and intensity of high and low flows.
- Restricted fish passage (as a result of road infrastructure such as culverts and bridges) that can block up-stream migration, eliminate or reduce access to spawning sites, and thus fragment fish habitat patches.
- Reduced in number, size and depth of stream pools, which may diminish habitat for fish and other aquatic organisms.
- Large organic debris input to streams, which can affect channel morphology and alter habitat.
- Reduced stream bank vegetation where roads are located in riparian areas.
- Increased likelihood of erosion leading to sediment and nutrient delivery to streams and wetlands, resulting in effects on aquatic habitats and species (e.g., fish, their prey and other species).

- Increased infiltration of non-native fish (e.g., some people use road access to intentionally stock streams and lakes with non-native fish and thus disrupt native aquatic systems).

2. Potential Effects on Terrestrial Wildlife and Habitat

- Increased opportunities for wildlife collisions (e.g., roads warm up quickly and hence are attractive to reptiles and amphibians for basking; this can increase the incidence of road kill). Road-kill carrion may become attractants to carrion-feeding wildlife and result in more collisions.
- Increased mortality (and injuries) because of expanded hunting and trapping pressures, poaching, and management actions.
- Loss of habitat and vegetation (particularly when roads are in riparian areas)
- Fragment wildlife habitat.
- Changed habitat suitability adjacent to roads caused by edge effects.
- Increased human disturbance of sensitive wildlife (e.g., from noise, traffic movement, lights) resulting in changes to habitat use.
- Increased wildlife harassment and human–wildlife conflicts.
- Modified wildlife behaviour (such as changes to animal movement, dispersal, or migration; home range shifts; reduced body mass, reproduction or survivorship; habituation to human presence; road avoidance or escape responses).
- Altered predator–prey relations along artificial “hard-edge” habitat created by roads (e.g., nest predation by jays and ravens).
- Contaminant emissions (e.g., road salt, oil, gasoline, metals, or other chemicals), noise and other disturbances may extend into roadside vegetation for varying distances, resulting in changes in species composition and contaminated soil, plants, animals and water. Road salt may attract animals which then may be killed in vehicle collisions.

3. Other Potential Environmental Effects of Roads

- Unmanaged recreation expansion (such as unauthorized snowmobiling and motorized off-road vehicle use) resulting in effects on wildlife, and degradation of soils and riparian and wetland areas.
- Invasive alien plants, animals and insects establish along the colonization corridors provided by roads; in addition, non-native plant species are often sown to stabilize slopes along roads.
- Increased fuel emissions (e.g., carbon dioxide) into the airshed.

4. Management Implications and Recommendations

Daigle (2010) grouped management recommendations under the following themes:

- Taking a strategic approach.
- Using structured assessment and planning.
- Planning and implementing access management.
- Planning and undertaking on-the-ground mitigation techniques.
- Closing and decommissioning roads.
- Following up with effectiveness monitoring.

Daigle (2010) summarized environmental values and potential mitigation techniques for road construction and maintenance. Values and mitigation relevant to the proposed All Season Road are provided in Tale 6-2.

Environmental Values	Mitigation Technique and Sources
Flora, fauna, ecosystems, soils, water	<ul style="list-style-type: none"> – Minimize the road right-of-way and roadside ditches (Roever <i>et al.</i> 2008a) – Stay away from vulnerable sites by using flexible road standards, which can expand options for locating the roadbed within the right-of-way (Furniss <i>et al.</i> 1991)
Water, soils, aquatic resources, wetlands, riparian areas	<ul style="list-style-type: none"> – Prepare for climate change (e.g., wetter and warmer winters) by maintaining or rehabilitating temporary roads to minimize sedimentation (Spittlehouse and Stewart 2003) – Identify the most serious problems by assessing road systems at watershed scale, followed by field reconnaissance (Furniss <i>et al.</i> 1991; Moore 1995; Luce and Black 1999; Lewis 2000a; Atkins <i>et al.</i> 2001; Carver 2001; Grainger 2002; Carson and Younie 2003; Fannin <i>et al.</i> 2007; Mills <i>et al.</i> 2007) – Give extensive thought to road routes, road design, drainage, and road-stream crossings such as culverts and bridges (Krag <i>et al.</i> 1986; Furniss <i>et al.</i> 1991; Harr and Nichols 1993; Skaugset and Allen 1998; Elliot and Tysdal 1999; Elliot 2000; Lewis 2000a; Carver 2001; Megahan <i>et al.</i> 2001; BC Ministry of Forests 2002a, 2002b; Grainger 2002; Carson and Younie 2003; Macdonald <i>et al.</i> 2003; Gillies 2007; Groenier and Gubernick 2007; Robichaud <i>et al.</i> 2010) – Relocate or realign roads to improve degraded wetland and riparian areas (Elliot and Tysdal 1999; US Forest Service, Riparian Roads Team 2005; Aruga <i>et al.</i> 2007) – Use appropriate construction, upgrading, and maintenance methods to manage drainage and minimize erosion and sedimentation (Toews and Brownlee 1981; Skaugset and Allen 1998; US Forest Service 1999; Carson and Younie 2003; Macdonald <i>et al.</i> 2003; Spittlehouse and Stewart 2003; Beechie <i>et al.</i> 2005; US Forest Service, Riparian Roads Team 2005; Gillies 2007; Sugden and Woods 2007; BC Ministry of Forests and Range 2009) – In wet meadows, install permeable fill under the road surface along with a culvert array (multiple culverts) to maintain subsurface water flow (US Forest Service, Riparian Roads Team 2005) – Construct lead-out ditches and rock aprons to disperse water-flow energy and reduce erosion on steep slopes (Elliot and Tysdal 1999; Carson and Younie 2003; Beechie <i>et al.</i> 2005; US Forest Service, Riparian Roads Team 2005; Gillies 2007)

Table 6-2: Site-level Mitigation Techniques to Reduce Environmental Effects of Roads

Environmental Values	Mitigation Technique and Sources
	<ul style="list-style-type: none"> – In burned areas, systematically assess values at risk, post-fire runoff potential, and other considerations (e.g., potential damaging storms, probability of success), then upgrade culverts, create water bars, and clean and armour ditches (Foltz <i>et al.</i> 2009b) – After road construction, seed, mulch, terrace, or combine treatments to control erosion (Elliot and Tysdal 1999; Megahan <i>et al.</i> 2001; BC Ministry of Forests 2002a; Gillies 2007) – After road construction, seed, mulch, terrace, or combine treatments to control erosion (Elliot and Tysdal 1999; Megahan <i>et al.</i> 2001; BC Ministry of Forests 2002a; Gillies 2007)
Water quality, microclimates, habitat, soils	<ul style="list-style-type: none"> – Provide vegetated buffer zones (e.g., along stream sides) adjacent to roads to reduce stream sedimentation and pollution, increase infiltration, slow surface water flow, and maintain microclimates and wildlife habitat (US Forest Service, Riparian Roads Team 2005)
Native plants	<ul style="list-style-type: none"> – Plant native plants to help control invasive alien plants (Tyser and Worley 1992; Steinfeld 2007a, 2007b; Roever <i>et al.</i> 2008a)
Fish, habitat connectivity	<ul style="list-style-type: none"> – Install appropriate fish-stream crossings to improve fish passage and access to up-stream habitat (Furniss <i>et al.</i> 1991; BC Ministry of Forests 2002a, 2002b; Bates <i>et al.</i> 2003)
Wildlife	<ul style="list-style-type: none"> – Limit human access off right of way to reduce wildlife mortality (McLellan and Shackleton 1989; Cole <i>et al.</i> 1997; Jalkotzy <i>et al.</i> 1997; US Forest Service 1999; Eubanks 2006; Roever <i>et al.</i> 2008a, 2008b; Fahrig and Rytwinski 2009) – During appropriate seasons, install road-closure signs to reduce road-related pressures on animals (when road decommissioning is not suitable) (Hunt and Hosegood 2008)

6.2.2 Other Environmental Assessments

Environmental assessments have been conducted for all-season road projects on the east side of Lake Winnipeg including the Rice River Road Upgrading and Extension (Manitoba Transportation and Government Services 2006), Comprehensive Study Report of the proposed New Airport and Road between St. Theresa Point and Wasagamack, Island Lake, Manitoba (Public Works and Government Services, 2001), PR304 to Berens River All-Season Road (ESRA 2010, Canadian Environmental Assessment Agency 2011) and Bloodvein Community All-Season Access Road (ESRA 2011). The environmental effects, mitigation measures and follow-up identified in these reports were considered in the identification, assessment and mitigation of environmental effects for the proposed P7a All-Season Road Project. In addition, a review of the PR304 to Berens River EA by the MMF, was also considered (Pearse, 2011)

6.2.3 Baseline Study Reports

Baseline studies were carried out for the proposed P7a All-Season Road Project. These studies were designed to provide baseline and environmental effects information on aquatic resources (North/South Consultants 2014), wildlife resources (Joro Consultants 2014), heritage and cultural resources (Northern Lights Heritage Services 2013, 2014), vegetation resources (Scatliff, Miller and Murray 2014), and geological resources (Golder Associates 2014, W.L. Gibbons & Associates Inc. (2014) in the project, local and regional study areas. The fisheries and vegetation information was provided in as well as technical reports. The heritage information was provided in a Heritage Resources Impact

Assessment, discussion paper and memos. The wildlife information was provided in a technical report and a series of memos to file that are listed in the references chapter. The information is from an ongoing wildlife research and monitoring program that covers a broad area of the east side of Lake Winnipeg. The geological information was provided in a technical report (Golder) and a memo (W.L. Gibbons & Associates Inc.) that are listed in the references chapter. Applicable baseline and TK studies conducted for the PR304 to Berens River ASR and the Large Area Network Study and the Ecoregion 90 studies were considered. The Traditional Land Use and Occupancy study for the regional study area undertaken by the MMF under contract to ESRA in 2010 – 2011 and Traditional Knowledge studies focusing on the local area were undertaken directly with Pauingassi and *Little Grand Rapids* FNs for the EIA to supplement those undertaken for the Large Area Network Study were also reviewed. In addition, the Pimachiowin Aki Cultural Landscape Atlas: Land that Gives Life was reviewed for Traditional Knowledge documented for Pimachiowin Aki. This document is a compilation of maps, images and stories that provides an opportunity to experience Pimachiowin Aki culture. Land use and interview data were collected from community members as part of their land use planning processes (Pauingassi, Bloodvein River, Little Grand Rapids, Pikangikum and Poplar River).

Information from these studies is summarized in Chapter 4 (Environment Description) while the environmental effects information is included later in this chapter.

6.3 Environmental Assessment Approach

6.3.1 Environmental Assessment Methods

The environmental assessment of the proposed P7a All-Season Road Project was carried out based on information collected for the project including baseline studies on aquatic, vegetation, wildlife, heritage resources, and geological resources, reference materials obtained from Manitoba Conservation and Water Stewardship, and library, literature and internet searches and TK studies and community engagement also provided information. Gap analyses were carried out on the baseline study reports and other available baseline information to identify any information and data deficiencies and to propose actions to address any critical information requirements. The Large Area Network Study and environmental assessments conducted on all-season road projects on the east side of Lake Winnipeg were also reviewed. Requirements of *The Environment Act* (Manitoba) and the *Canadian Environmental Assessment Act, 2012* and regulations, guidelines and policy statements were also considered in the preparation of the environmental assessment for the proposed P7a All-Season Road Project.

The assessment, as per the Environment Act Proposal Report Guidelines, focuses on potential effects of the development on the biophysical environment, including wildlife, fisheries, surface water, groundwater, forestry resources, climate change, heritage resources, human health and safety, and Aboriginal and treaty rights as well as socio-economic implications resulting from environmental impacts.

Canadian and international best environmental assessment practices were followed including those of the International Association for Impact Assessment (IAIA). The environmental effects of the proposed P7a All-Season Road Project were identified from baseline study reports carried out for the proposed P7a All-Season Road Project, published scientific literature and government reports, other environmental assessment reports conducted on All-Season road proposals, and by using professional judgement, interaction matrices and network (linkage) diagrams. Comments and concerns identified at community meetings, design workshops and public open houses were also considered under the effects assessment.

The adversity of environmental effects prior to mitigation for the biophysical, socio-economic and Aboriginal environments was determined based on the categories provided in Table 6-3.

Table 6-3: Adversity Categories for Environmental Effects Identification

Adversity Category	Biophysical Environment*	Socio-Economic Environment*	Aboriginal Communities and Land Use*
Beneficial	Net improvement to the biophysical environment expected.	Net improvement of social and economic conditions expected.	Net improvement of Aboriginal traditional values, lifestyle, culture, traditional knowledge and heritage resources.
Adverse	Net impairment to the biophysical environment expected.	Net impairment of social and economic conditions and archaeological resources expected.	Net impairment of Aboriginal traditional values, lifestyle, culture, traditional knowledge and heritage resources.
High	Effect on an entire region, population or habitat in sufficient magnitude and over a sufficient period to cause a decline in abundance and/or adverse change in distribution beyond which natural irregularities would cause. Reversibility time for population is several generations.	Effect is either long duration or affects an entire group of people in sufficient magnitude to cause unwanted changes in social and economic conditions. Reversibility time to baseline conditions is expected to be several generations.	Permanent or long-term loss or impairment of Aboriginal traditional values, lifestyle, culture, traditional knowledge and heritage resources. Area affected is regional in scale. Effects are not reversible.
Moderate	Effect on a portion of the region, population or habitat is localized, but results in a change in abundance and/or adverse distribution over one or more generations dependent upon it, but does not change the integrity of any population as a whole.	Effect is either limited to one or two generations but affects a moderate portion of the population while not necessarily affecting the integrity of the population as a whole.	Moderate loss or impairment of Aboriginal traditional values, lifestyle, culture, traditional knowledge and heritage resources. Area affected is in the local area. Effect is reversible over a moderate to long period (more than one generation).

Table 6-3: Adversity Categories for Environmental Effects Identification

Adversity Category	Biophysical Environment*	Socio-Economic Environment*	Aboriginal Communities and Land Use*
Low	Effect on a local area, specific group of individuals or habitat in the vicinity of the project and/or over a short period (one generation or less), but does not affect other trophic levels or integrity of the population as a whole.	Effect is either short-term or affects a specific community or group of people in the local area but does not necessarily affect the integrity of the entire community or group as a whole.	Small or minor impairment of Aboriginal traditional values, lifestyle and culture; minimal loss of traditional knowledge and heritage resources. Area affected is the local community or the project footprint. Effect is reversible over a short period (less than one generation).

* Direct effects on biophysical environment; indirect effects on socio-economic and Aboriginal communities and land use as a result of biophysical changes.

The significance of the residual effects for the proposed P7a All-Season Road Project was evaluated using the approach, factors and criteria provided by ESRA (Table 6-4 and Appendix E).

Table 6-4: ESRA's Significance Evaluation Factors and Criteria

Evaluation Factors	Significance Level		
	Level I Criteria	Level II Criteria	Level III Criteria
Context:			
Ecological ¹	No discernible or meaningful residual environmental effects; effects within the range of natural variation and limited to project assessment area.	Residual environmental effects outside the range of natural variation; but only involving locally common species or communities, or affecting resources of limited ecological importance.	Residual environmental effects involve locally, regionally or nationally important species, communities or resources.
Socio-economic ²	No discernible or meaningful residual socio-economic effects; effects within normal year-to-year variations and limited to project assessment area.	Residual socio-economic effects involve measurable disturbance to local residents, livelihoods, traditional land use activities, or community character or services.	Residual socio-economic effects involve measurable decrease in population, loss of livelihoods, traditional use activities, or community character or services.
Aboriginal Communities and Land Use	No discernible or meaningful residual effects; effects within normal year-to-year variations and limited to project assessment area.	Residual effects involve measurable disturbance to local residents, livelihoods, traditional land use activities, or community character or services.	Residual effects involve measurable decrease in population, loss of livelihoods, traditional use activities, or community character or services.
Extent:			
Magnitude/ Geographic Extent	Component-specific criteria in Table 6.5.	Component-specific criteria in Table 6.5.	Component-specific criteria in Table 6.5.

Duration	Group-specific criteria in Table 6.6.	Group-specific criteria in Table 6.6.	Group-specific criteria in Table 6.6.
Other:			
Frequency	Residual environmental effects expected to occur infrequently or not at all (i.e., once during construction or once per year).	Residual environmental effects expected to occur intermittently, randomly and possibly with some degree of regularity (i.e., randomly and less than once per month).	Residual environmental effects expected to occur regularly or continuously (i.e., more than once per month).
Reversibility	Residual environmental effects are readily reversible over a relatively short period (i.e., during construction period).	Residual environmental effects are reversible at substantial cost and/or over a long period (i.e., lifespan of project).	Residual environmental effects are not reversible.
Likelihood of Occurrence	Residual environmental effects are unlikely to occur or remain.	Residual environmental effects could reasonably be expected to occur or remain.	Residual environmental effects will or are likely to occur or remain.

¹Includes physical and biological environments

Table 6.5: Significance Evaluation Factors and Criteria – Magnitude and Geographic Extent (After Mitigation)

Component	Factor	Level I	Level II	Level III
Physical Environment	Air quality	Emissions above background but within federal and provincial regulations and guidelines; or if guidelines exceeded, environmental effects limited to the project assessment area.	Emissions have the potential to exceed federal or provincial guidelines for areas beyond project assessment area, resulting in potential for environmental effects on resources (land, water, biota) or residents.	Emissions are likely to exceed federal or provincial guidelines for areas beyond the local assessment area, resulting in environmental effects on resources (land, water, biota) or residents.
	Climate and meteorology	Greenhouse gas emissions of less than 0.1% of Canada's target CO ₂ emission rate reduction of 240 Mt/a.	Greenhouse gas emissions of 0.1 to 1.0% of Canada's target CO ₂ emission rate reduction of 240 Mt/a.	Greenhouse gas emissions of greater than 1.0% of Canada's target CO ₂ emission rate reduction of 240 Mt/a.
	Soils, terrain and geology	Environmental effects minor and restricted to the project assessment area. Soil contamination above background within federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project assessment area.	Environmental effects have the potential to extend beyond the project assessment area. Any soil contamination exceeds federal and provincial regulations and guidelines.	Environmental effects likely to extend beyond the project assessment area. Soil contamination exceeds federal and provincial regulations and guidelines resulting in alterations or restrictions to adjacent land uses.
	Water quality – surface	Environmental effects in receiving waters within federal and provincial regulations and guidelines; or if guidelines exceeded, no anticipated adverse effects beyond any defined mixing zones.	Environmental effects in receiving waters exceed federal and provincial regulations and guidelines and have the potential to adversely affect ¹ drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones.	Environmental effects in receiving waters adversely affect ¹ drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones, likely resulting in an unacceptable effect.
	Water quantity – surface	Change to stream flow is less than 15% of seasonal average.	Change to stream flow is 15 to 25% of seasonal average.	Change to stream flow is greater than 25% of seasonal average.
	Groundwater – quality	Groundwater quality within federal and provincial regulations and guidelines; or if guidelines exceeded, no anticipated adverse environment effects beyond any defined mixing zones	Groundwater quality exceed applicable federal and provincial regulations and guidelines and have the potential to adversely affect ¹ drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones.	Environmental effect likely to adversely affect ¹ drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones.
	Groundwater – quantity	Change to groundwater regime restricted to project assessment area.	Change to groundwater regime may extend beyond project assessment area.	Change to groundwater regime extends beyond project assessment area.
Biological Environment	Aquatic environment (fish, fish habitat and aquatic life)	In-water work or structures necessary but no net loss of the productive capacity of fish habitats ¹ ; environmental effects confined to project assessment area.	In-water work or structures necessary resulting in a net loss of the productive capacity of local fish habitat ¹ ; environmental effects may extend beyond project assessment area.	In-water work or structures necessary resulting in a net loss of the productive capacity of regional fish habitat ¹ ; environmental effects extends beyond project assessment area.
	Aquatic species at risk ²	In-water work or structures necessary but no net loss of the productive capacity of fish habitats ¹ .	In-water work or structures necessary resulting in a net loss of the productive capacity of fish habitat ¹ .	In-water work or structures resulting in a net loss of the productive capacity of fish habitat ¹ .
	Vegetation and wetlands	Environmental effects minor (i.e., only affecting common species or communities), and confined to the project assessment area.	Activity has the potential to measurably affect vegetation communities or species outside of the project assessment area but environmental effects limited to common species or communities.	Activity is likely to measurably affect vegetation communities or species outside the project assessment area and may affect species of special interest ³ or protected species.
	Vegetation species at risk	Environmental effect minor, occurring at the level of individuals and not affecting community to a degree distinguishable from natural variation. Habitat alteration/loss restricted to project assessment area and limited to non-critical	Activity has the potential to measurably affect community and/or habitat availability outside the project assessment area.	Activity is likely to measurably affect community and/or and habitat availability outside the project assessment area.

Table 6.5: Significance Evaluation Factors and Criteria – Magnitude and Geographic Extent (After Mitigation)

Component	Factor	Level I	Level II	Level III
	Wildlife and wildlife habitat ⁴	habitat. Environmental effect minor, occurring at the level of individuals and not affecting population size to a degree distinguishable from natural variation. Habitat alteration/loss restricted to project assessment area.	Activity has the potential to measurably affect population size and/or habitat availability outside the project assessment area.	Activity is likely to measurably affect population size and/or and habitat availability outside the project assessment area.
	Wildlife species at risk (e.g., boreal woodland caribou)	Environmental effect minor, occurring at the level of individuals and not affecting population size to a degree distinguishable from natural variation. Habitat alteration/loss restricted to project assessment area and limited to non-critical habitat.	Activity has the potential to measurably affect population size and/or habitat availability outside the project assessment area.	Activity is likely to measurably affect population size and/or and habitat availability outside the project assessment area and may include critical habitat.
Socio-economic Environment Socio-economic Environment	Socio-economic conditions ^{5,6}	Selected parameter changes by less than 10% from baseline conditions within project assessment area.	Selected parameter changes by 10 to 20% from baseline conditions within project assessment area.	Selected parameter changes by >20% from baseline conditions within project assessment area.
	Human health and safety ^{6,7}	Selected parameter changes by less than 10% from baseline conditions within project assessment area. Safety – Near misses, no injuries or fatalities	Selected parameter changes by 10 to 20% from baseline conditions within project assessment area. Safety – Incidents resulting in injuries	Selected parameter changes by >20% from baseline conditions within project assessment area. Safety – Incidents resulting in fatalities
	Natural heritage features ^{6,8}	No change in ecological function of the feature.	Demonstrable changes in ecological function of ASIs and candidate ASIs.	Demonstrable change in ecological function of provincial parks and candidate parks.
	Archaeological artifacts, sites, structures	Archaeological resources disturbed by the project but are recovered.	Archaeological resources of local importance are disturbed by the project but are not recoverable.	Archaeological resources of regional/national importance are disturbed by the project but are not recoverable.
Aboriginal Communities and Land Use	Traditional use of lands/resources by Aboriginal people ⁵	Selected parameter changes by less than 10% from baseline conditions within project assessment area.	Selected parameter changes by 10 to 20% from baseline conditions within project assessment area.	Selected parameter changes by greater than 20% from baseline conditions within project assessment area.
	Cultural heritage features ⁵ (i.e. ceremonial, spiritual, cemeteries, etc)	No change in cultural function of the feature.	Meaningful change in cultural function of feature.	Meaningful change in cultural function and form of feature.
	Heritage sites, areas, structures, human remains ⁵	Heritage resources disturbed by the project but are recovered.	Heritage resources of local importance are disturbed by the project but are not recoverable.	Heritage resources of regional/national importance are disturbed by the project but are not recoverable.

1 – Determined by Department of Fisheries and Oceans in consultation with Manitoba Conservation and Water Stewardship.

2 – Aquatic species of conservation concern: shortjaw cisco, lake sturgeon, maple leaf mussel.

3 – Species of Special Concern under SARA, endangered species as listed by COSEWIC and species considered rare by MBCDC but not listed by MBSESA nor in Schedule 1 of SARA.

4 – Habitat for large mammals, furbearers, migratory birds, amphibians and reptiles

5 – Tourism, hunting and fishing outfitters & lodges, recreation, trapping.

6 – Indirect effect resulting from a change in the natural environment

7 – Human health (noise, air quality, drinking and recreational water quality, and country foods). Safety (near misses, incidents, fatalities)

8 – Includes heritage rivers, provincial parks, candidate parks, ASIs and candidate ASIs.

Table 6.6: Significance Evaluation Factors and Criteria – Duration (After Mitigation)

Component	Level I	Level II	Level III
Biophysical environment	Short-term – Residual environmental effects not measurable beyond construction period.	Medium-term – Residual environmental effects likely to persist though first 10 years of project operation and maintenance.	Long-term – Residual environmental effects likely to persist beyond 10 years of project operation and maintenance.
Socio-economic environment and Aboriginal communities and land use	Short-term – Residual environmental effects will occur during construction and less than five years after construction.	Medium-term – Residual environmental effects likely to persist though first 10 years of project operation and maintenance.	Long-term – Residual environmental effects likely to persist beyond 10 years of project operation and maintenance.

The determination of significance of residual effects involved the consideration and evaluation of specific criteria based on characteristics or attributes of the effects. The attributes examined included ecological, socio-economic and Aboriginal communities and land use context; magnitude and geographic extent; frequency of occurrence and their duration; reversibility; and likelihood of occurrence. Significance evaluation involved the evaluation of each residual environmental effect attribute against a three-level significance ranking scale:

- Level I: negligible or limited potential to contribute to a significant environmental effect;
- Level II: moderate potential to contribute to a significant environmental effect; and
- Level III: high potential to contribute to a significant environmental effect.

A residual environmental effect would be determined to be significant if it meets both of the following criteria:

- A Level III rating is attained for both ecological and socio-economic context factors; and
- A Level II or III rating is attained for all the factors involving magnitude/extent, duration and frequency.

A Level I rating for any of the attributes involving magnitude/geographic extent, duration, or frequency; or, if a Level I rating is achieved for both ecological and socio-economic contexts (where applicable), then the effect is considered to be “not significant”. Effects are also assessed as to their likelihood, recognizing that there is some overlap in the concepts of duration, frequency and likelihood.

This environmental assessment report conforms to Manitoba’s guideline for preparing an “Environment Act Proposal” report (Manitoba Conservation and Water Stewardship 2014).

6.3.2 Traditional Environmental Knowledge

Traditional knowledge studies, traditional knowledge mapping workshops and design workshops were held in the communities of Little Grand Rapids and Pauingassi communities from 2009 to 2014. These occurred during the PR304 to Berens River Environmental Impact Assessment (2010), the Large Area Transportation Network Study (2011), and for the Environmental Assessment of the P7a All-Season Road Project. A traditional use and knowledge study was also undertaken with the Manitoba Métis covering the regional study area (MMF 2011). In addition, land use studies were completed by Little Grand Rapids, Pauingassi, and Poplar River First Nations as a part of the Manitoba’s Ecosystem Based Management Pilot Project (Ecoregion 90) and traditional knowledge studies were completed by Little Grand Rapids and Pauingassi First Nations in conjunction with Manitoba Conservation to support traditional land use planning and Pimachiowin Aki World Heritage Site Nomination.

Traditional environmental knowledge used in the environmental assessment of the proposed P7a All-Season Road Project was collected through interviews at community meetings, workshops and interviews with knowledgeable members of Little Grand Rapids and Pauingassi First Nations. The MMF also contacted its membership and conducted interviews with individuals who engaged in traditional use activities within the regional study area. Information relevant to the project area was referenced for this EIA. In addition, information available from the traditional land use studies completed by Little Grand Rapids and Pauingassi First Nations for Manitoba’s Ecosystem Based Management

Pilot Project and as a part of the Pimachiowin Aki World Heritage Site Nomination were also considered.

Objectives of the studies and workshops were to: provide and describe information about the proposed P7a All-Season Road Project including proposed routes, construction methods and scheduling; obtain relevant traditional knowledge information to be used in the design of the proposed P7a All-Season Road Project; identify potential environmental effects and mitigation measures for the environmental assessment; build long-term relationships between ESRA and the Aboriginal communities; and contribute to the building of TK base within the First Nation communities. Furthermore, information was gathered on biophysical conditions to support wildlife, vegetation and aquatic studies as well as heritage resource studies.

Information from the meetings, studies and workshops was used in refining the road alignment, road design and construction specifications, and preparing this environmental assessment report.

6.3.3 Site Visits

Site visits, reconnaissance surveys, and field work were carried out for the baseline studies and the project design team. Wildlife study field methods included aerial surveys, collaring, aerial telemetry and ground tracking. The heritage resources baseline field study involved mapping workshops in the communities with selected Elders and an archaeological field survey along the proposed alignment. Aquatic field study methods included fish and mollusc sampling, riparian and instream habitat assessments, and water quality measuring. Vegetation field study methods included field observations and sample plot analysis. Site visits to Pauingassi and Little Grand Rapids First Nations as part of the Aboriginal and Public Engagement Program were conducted. Information gathered during TK studies was used to inform investigations. Local guides were also used to assist with the field investigation and provided local knowledge.

6.3.4 Aboriginal and Public Engagement

An Aboriginal and Public Engagement Program (APEP) was initiated for the proposed P7a All-Season Road Project and associated project components on provincial Crown land and Community Access Roads on First Nations Reserve land. Information used to compile the Engagement Chapter (Chapter 5.0). Participants in the Public Engagement Program for the proposed P7a All-Season Road Project included Aboriginal Leadership, First Nation communities, other Aboriginal groups (Little Grand Rapids and Pauingassi Stewardship Boards, MMF), regulators, trappers, outfitters and other stakeholders.

An additional source of input to project planning is a Trapper's Program which includes trapper involvement in research and monitoring activities on furbearers on the east side of Lake Winnipeg. The Trapper's Program helped to acquire baseline data and assess the potential effects of construction and operation and maintenance activities of the proposed P7a All-Season Road Project on furbearer distribution and trapline harvest. Program initiatives were developed with the specific intent of incorporating local trapper knowledge in monitoring and research activities, and to promote collaboration with the trapping community.

6.4 Regional Factors

Regional environmental issues for the proposed P7a All-Season Road Project were identified from various regional and local land use and management plans, planning initiatives and environmental assessments carried out for the east side of Lake Winnipeg, and from the Aboriginal and Public Engagement Program carried out by ESRA for the east side Lake Winnipeg Large Area Transportation Network Study (SNC Lavalin, JD Mollard and AECOM 2010) and the proposed P7a-All Season Road Project. The regional environmental issues are described in the following:

6.4.1 Regional Transportation

The existing transportation system currently servicing communities on the east side of Lake Winnipeg includes year round air service to communities that have public airports, summer barge and boat service on Lake Winnipeg and winter road service to all communities. An All-Season road is currently under construction from PR 304 to Berens River. Winter road access is only available during winter months under frozen conditions and the seasonal lifespan of the winter road depends on the weather and when freeze up and break up occurs. Airports provide year round transportation, except during severe weather conditions. In the case of Pauingassi and Little Grand Rapids, access to the airport is limited to boat in the late spring, summer and early fall, and vehicle during winter road season. Snowmobile transport and helicopter services provide access during the thaw and freeze up periods. The delivery of goods and services to the northern communities is costly due to the limited transportation services. Based on feedback received from the communities over the past two decades, the communities are interested in an All-Season road that connects the communities to the Little Grand Rapids Airport with an expectation that a road will decrease the costs of goods in the community, provide an alternate more reliable means of transportation, decrease the cost of living and will bring employment and training opportunities to the community.

6.4.2 Economic Development and Employment Opportunities

Economic development and employment opportunities are major issues for residents the east side of Lake Winnipeg. The east side Lake Winnipeg Large Area Transportation Network Study (SNC Lavalin, et. al 2010) reported that the economy of the east side of Lake Winnipeg consists of wage, cash and traditional economic activities. The wage economy encompasses most labour market activities and transactions including all jobs which are within a structured company or government agency. Participation in the wage economy for First Nations and Northern Affairs Communities is often undertaken to support and supplement traditional economic activities. Approximately 31% of the experienced labour force in Pauingassi First Nation works in educational services, followed by 19% in “other services”, and 12.5% in each of the construction, services, retail trade services, healthcare/social services and business services sectors. In Little Grand Rapids, approximately 30% of the experienced labour force works in the “other services” sector, and 21% in each of the healthcare/social services and educational services sectors. The reported median income in the Aboriginal communities on the east side of Lake Winnipeg ranged between \$3,665 (Berens River) and \$11,531 (Poplar River), and was \$9,056 for Pauingassi and \$7,376 for Little Grand Rapids, compared to a provincial median income of \$24,194.

6.4.3 Cost of Goods and Services

Transportation within the east side of Lake Winnipeg is severely limited with communities depending on air, marine or winter road service. All of these forms of transportation tend to have higher operational costs or are severely limited, thereby resulting in increased costs for goods and services. During winter months, most communities are able to use winter roads to travel from one community to another or to travel to a larger centre such as Thompson or Winnipeg. Remote communities bring in most of their supplies for the year into their communities over the winter since road transportation is generally cheaper than air transportation. It is estimated that approximately 2,500 shipments of staple items such as fuel, groceries, construction materials and general freight are transported each year by commercial trucks on the provincial winter road system.

6.4.4 Aboriginal and Community Development

“Promises to Keep” (East Side Planning Initiative 2004) identified Aboriginal and community development as a major issue facing Aboriginal communities on the east side of Lake Winnipeg. The community development issues included the increasing population of First Nation peoples and the lack of economic opportunities, non-local ownership of businesses and cash flow, difficulty in starting and running businesses, too few training and local employment opportunities, and a seemingly lack of interest and support from government. A number of recommendations were made in the “Promises to Keep” report including that the government of Manitoba must support joint ventures, partnerships and local ownership creating the means for communities to gain benefits from resource initiatives and economic activities within communities and traditional territories.

6.4.5 Country Foods

Country food refers to the traditional diets of Aboriginal people, especially in remote northern regions where western food is an expensive import, and traditional foods are still relied upon to some extent. Traditional country foods are those that originate from local plant or animal resources through gathering or harvesting, and which possess cultural meaning as a traditional food. Historical Aboriginal diets comprised of traditional foods were high in animal protein and nutrient-rich. Animal fat procured from nutritious marrow & organs was extremely important to maintain the high energy levels required for subsistence hunting (Virginia Petch, personal communication, January 2015). The energy spent in obtaining traditional foods was significant given the very physical demands of hunting, fishing, trapping, growing and gathering. Country food used in the local assessment area includes plants for berries, roots and grains, mammals (e.g., moose), birds (e.g., ptarmigan), fish (e.g., lake whitefish and northern pike) and others.

6.4.6 Caribou Population

Boreal woodland caribou are a species of conservation concern and are listed as Threatened under both *The Endangered Species and Ecosystems Act* (Manitoba) and the federal *Species at Risk Act*. Manitoba’s boreal woodland caribou recovery strategy (2015) provides a framework for development and implementation of boreal caribou action plans. The proposed P7a All-Season Road Project lies within the Atikaki-Berens Management Unit and this area constitutes the regional assessment area for

the proposed P7a All-Season Road Project. The conservation status assessment for the Atikaki-Berens management unit is medium (Manitoba Boreal Woodland Caribou Management Committee 2014; Manitoba's Boreal Woodland Caribou Recovery Strategy 2015, with the following assessments:

- The population size is acceptable, each delineated range within a management unit has a population estimate of greater than 100 animals;
- The population trend of the management unit is under review; on-going data collection to assess population trend of delineated ranges is currently underway;
- The natural disturbance of the management unit is limited, the total anthropogenically disturbed habitat ≤ 50 years old is less than 20%;
- The anthropogenic disturbance of the management unit is moderate, the total anthropogenic disturbance to habitat ≤ 50 years old is between 5% and 15%;
- The planned development within the management unit during the life of the recovery strategy (10 years) is moderate as determined by an assessment considering the various types and the number of developments, extensiveness and likelihood of occurrence.

6.4.7 Brainworm

Manitoba's Boreal Woodland Caribou Management Strategy (2015) notes that roads and other linear corridors with packed winter trails and off-road vehicle trails for recreational or other uses may offer enhanced access to caribou habitats by both predators and white-tailed deer, thereby facilitating predation and the spread of potentially lethal parasites and diseases. Brainworm or meningeal worm (*Parelaphostrongylus tenuis*) is a nematode parasite common to white-tailed deer which causes damage to the central nervous system. Moose, caribou and other cervid species are susceptible to the parasite but are abnormal hosts and are infected in neurological instead of meningeal tissue.

6.4.8 Protected Areas

Pauingassi and Little Grand Rapids First Nations have developed land management plans to protect their traditional land area and provide for appropriate development and uses (Pauingassi First Nation and Government of Manitoba 2012, Little Grand Rapids First Nation and Government of Manitoba 2012). Complementary land use plans have been developed for their traditional lands in Ontario (Pauingassi First Nation and Government of Ontario 2011, and Little Grand Rapids First Nation and Government of Ontario 2011). The plans identify three main areas including a protected area, commercial area and enhanced management area. Protected areas are managed to maintain and enhance traditional uses, and protect cultural and natural lands, and natural resources. Additional protected areas for Little Grand Rapids First Nation include the Mishipawitigong cultural waterway, Pigeon River and planning area portion of Atikaki Provincial Park. The management plans provide for the development of an All-Season road network on the east side of Lake Winnipeg.

Atikaki Provincial Park is located immediately south of and adjacent to Little Grand Rapids First Nation. The Atikaki Provincial Park and Bloodvein Canadian Heritage River Management Plan classifies Atikaki as a wilderness park, in which, the preservation of representative areas of a natural region is the main

function. The park purposes are to preserve physical features and biological communities representative of the Lac Seul Upland portion of the Precambrian Boreal Forest Natural Region; provide opportunities for a range of outdoor recreational experiences from canoeing and whitewater rafting, that depend on a pristine environment, to lodges and outcamps; and promote public appreciation and understanding of the park's natural features and cultural heritage.

6.4.9 Mining Exploration and Development

"Promises to Keep ..." (East Side Planning Initiative 2004) reported that mineral exploration and development on the east side of Lake Winnipeg is manageable within established procedures and approval mechanisms, but requires more attention to local communications and co-operation. Exploration is ongoing to a limited extent, and the mineralized belts are generally well identified. Also, a process has been developed between the government and the minerals sector through which new protected area proposals are screened. Where no conflicts arise, there is a green light from the sector. Where conflicts arise, a resolution is negotiated, which sometimes requires more detailed information about the mineral potential and the area of special interest. The "Promises to Keep ..." report recommended that the East Side First Nations Council develop a consultation process regarding potentially affected peoples and licensees prior to the approval of mineral exploration programs, permits and staking activity.

6.4.10 Forestry Resources

The east side round table (Government of Manitoba 2002) provided advice on protecting the values of the boreal forest, its sustainability, and sustainable use including, but not limited to: maintaining biological diversity and ecological functions; role in carbon storage; non-timber forest products; ecotourism; and sustainable forest harvesting activities. Forest resources on the east side of Lake Winnipeg are valuable, including commercial logging and processing operations, and were reported in "Promises To Keep ..." (East Side Planning Initiative 2004) to constitute an important economic activity. The forest provides more than wood; it is habitat for hundreds of species and provides valuable ecological services. It is also the focus of interest for First Nations and the Métis Nation on the east side, because of their ancestral habitation of the area, use of the forest for food, furs, medicines, spiritual and ceremonial purposes, and economic interests. The priority for the future is on the sustainability of these values and services, and where there are commercial operations, on making the economic benefits available to local communities. Because there are multiple users of the forest, and multiple interests competing to have their interests met, finding the right balance is an ongoing challenge. The "Promises To Keep ..." report recommended that any permitted or licensed forestry development or activity must investigate, identify and mitigate effects on other licensed or permitted activities such as trapping, wild rice propagation, and lodges and outfitters.

6.4.11 Aesthetic Values

The east side of Lake Winnipeg is a unique region of Manitoba that contains vast stands of boreal forests, an abundance of fish and wildlife and a vibrant traditional Aboriginal culture – all of which combine to make the east side a remarkable part of the province. The east side is an area approximately 83,000 km² that represents approximately one eighth the size of Manitoba. Throughout

the region, there are approximately 3,100 lakes and approximately 30 major river systems including the Berens and Poplar rivers. The region is also home to a wide array of wildlife including boreal woodland caribou, moose, lynx, wolves, bear and many more. The east side of Lake Winnipeg contains a provincial wilderness park (Atikaki), provincial natural park (Nopiming), Poplar/Nanowin Rivers Park Reserve, Canadian heritage river (Bloodvein) and a proposed World Heritage Site (Pimachiowin Aki).

6.4.12 Tourism and Recreation

Tourism is an important component of the east side of Lake Winnipeg and numerous recreational opportunities exist in the region including ecotourism, backcountry camping, wildlife viewing, hiking, snowmobiling, snowshoeing, canoeing, kayaking, fishing, and hunting. “Promises to Keep...” (East Side Planning Initiative 2004) reported that there is a high potential for tourism and recreation in the planning area. Further development of this potential appeared to be wanted and needed, and that the focus should be on creating improved local capacity and benefits. “Promised to Keep ...” also noted that more tourism development in the area is linked to the transportation network. More local benefits in this sector would flow from the development of all-season roads.

6.5 Valued Environmental Components

Valued environmental components are components of the environment that are identified in an environmental assessment to have scientific, social, cultural, economic, historical, archaeological or aesthetic importance or represent the broad environment as an indicator species. The value of an environmental component may be determined on the basis of ecosystem value, scientific concern, cultural ideals, economic importance or other means. Valued environmental components that have the potential to be adversely affected by project activities receive special consideration in the assessment of project-specific and cumulative environmental effects. As part of baseline studies, valued environmental components were identified for aquatic resources by North/South Consultants (2013, 2014), wildlife resources by Joro Consultants (2014), vegetation by Scatliff+Miller+Murray (2014), and heritage resources by Northern Lights Heritage Services (2013, 2014).

As part of ESRA’s Aboriginal and Public Engagement Program¹, valued environmental components were identified or confirmed during traditional knowledge studies, traditional knowledge mapping workshops and design workshops held in the communities of Little Grand Rapids and Pauingassi communities from 2009 to 2014; as well as community meetings that occurred during the Large Area Transportation Network Study (2011); the PR304 to Berens River Environmental Impact Assessment (2010) and for the Environmental Assessment Report for the P7a All-Season Road Project. Studies that were also undertaken with the Manitoba Metis (Manitoba Metis Traditional Use and Knowledge of the Berens River Road Project Area and Assessment of Impacts 2011) helped to identify valued environmental components. Valued environmental components selected for the environmental

¹ Traditional knowledge studies, traditional knowledge mapping workshops and design workshops were held in the communities of Little Grand Rapids and Pauingassi communities from 2009 to 2014. These occurred during the Large Area Transportation Network Study (2011), the PR304 to Berens River Environmental Impact Assessment (2010) and the P7a All-Season Road Project Environmental Assessment. A Traditional Land Use Study was also undertaken with the Manitoba Metis (Manitoba Metis Traditional Use and Knowledge of the Berens River Road Project Area and Assessment of Impacts 2011). In addition, traditional knowledge studies were completed by Little Grand Rapids and Pauingassi First Nations for Manitoba’s Ecosystem Based Management Pilot Project and as a part of the Pimachiowin Aki World Heritage Site Nomination..

assessment of the proposed P7a All-Season Road Project environmental assessment are summarized in Table 6-7.

Table 6-7: Valued Environmental Components		
Valued Environmental Components	Description	Rationale/Authority
Biophysical Environment		
Water Quality (pristine)	Important for animal and plant species, economy, tourism, human health	Manitoba Water Quality Standards, Objectives and Guidelines
Aquatic Species at Risk	Lake sturgeon: subsistence value, cultural importance	Protected under the <i>Fisheries Act</i> and identified for protection under the <i>Species at Risk Act</i>
	Shortjaw cisco: Threatened Mapleleaf mussel: Endangered	Protected under the <i>Species at Risk Act</i>
Fish and Fish Habitat	Fish: harvested species, spawning locations in streams	Protected under the <i>Fisheries Act</i> Fisheries Protection Policy Statement (2013)
Boreal Woodland Caribou	Threatened under provincial and federal legislation, and cultural importance	Protected under <i>The Endangered Species and Ecosystems Act (MB)</i> and <i>Species at Risk Act (Canada)</i>
Forest Songbirds	Eastern whip-poor-will: Threatened, Canada warbler: Threatened, Common nighthawk: Threatened, Olive-sided flycatcher: Threatened,, Rusty blackbird: Special Concern	Protected under <i>The Endangered Species and Ecosystems Act (MB)</i> and <i>Species at Risk Act (Canada)</i>
Birds of Prey	Cultural importance	Protected under <i>The Wildlife Act (MB)</i>
Marsh Birds	Yellow Rail: Special Concern	Listed under the <i>Species at Risk Act</i>
Migratory Birds	Subsistence and cultural value	Protected under the <i>Migratory Birds Convention Act, 1994</i>
Owls	Short-Eared Owl: Threatened	Listed under the <i>Species at Risk Act</i> and <i>Endangered Species and Ecosystems Act</i>
Bats	Little Brown Myotis, Northern Myotis : Endangered	Protected under the <i>Species at Risk Act</i>
Amphibians	Green frog: Rare	Identified by Manitoba Conservation Data Centre
Reptiles	Snapping turtle: Special Concern	Listed under the <i>Species at Risk Act</i>
Plants	Tesselated Rattlesnake Plantain: Rare	Identified by Manitoba Conservation Data Centre
Socio-Economic Environment		
Tourism/Recreation	Regional importance, proximity to Atikaki Provincial Park	Commercial value, local employment Manitoba trapping regulations
Hunting and Fishing Outfitters and Lodges	Little Grand Rapids Lodge	Commercial value, local employment
Trapping	Regional importance, registered traplines	Commercial value, local revenue, cultural importance
Human Health and Safety		

Table 6-7: Valued Environmental Components

Valued Environmental Components	Description	Rationale/Authority
Heritage Resources	Heritage resources	Protected under <i>The Heritage Resources Act</i>
Aboriginal Communities and Land Use		
Moose	Harvested/managed species	Subsistence value, cultural importance
Furbearers	Martin, fisher, lynx, wolverine	Harvested species, economic importance
Fish	Harvested species, spawning locations in streams	Subsistence value, cultural importance
Birds of Prey and Waterfowl	Eagles, hawks, mallards, geese etc.	Subsistence value, cultural importance, delineation of season
Forest Songbirds	Robins, chickadee, etc.	Cultural importance
Medicinal and Culturally Important Plants	Plants used by Aboriginal people for medicinal, food and cultural purposes	Cultural and subsistence value
Heritage Resources	Burial sites and Thunderbird nests	Cultural importance
Water	Waterbodies	Important for animal and plant species,
Cultural heritage	Ceremonial /spiritual practices and sites	Cultural importance
Travel Routes	Trails and navigation routes to access hunting, fishing, cultural and medicinal plant and gathering areas	Provides access to resource and cultural areas

6.6 Design Mitigation

Design mitigation involves modifying the design of a proposed project to mitigate potential adverse environmental effects at the environmental assessment stage prior to completion of the final design and commencement of construction. Design mitigation is accomplished by various means including complying with legislation, adopting national and international standards and codes, adhering to established guidelines and following best management practices, as well as implementing mitigation measures identified from the environmental assessment process including baseline studies, engagement programs, and environmental effects identification, assessment and mitigation.

6.6.1 Legislation, Guidelines and Best Practices

The design of the proposed P7a All-Season Road Project will incorporate applicable environmental legislative requirements as well as the following provincial and federal environmental standards, codes, guidelines and best practices:

- Best Practices Manual for Small Drinking Water Systems (Manitoba Office of Drinking Water 2007)
- Environmental Assessment Best Practice Guide for Wildlife at Risk In Canada (Canadian Wildlife Service 2004)
- Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada (Environment Canada, 2012).

- Fisheries Protection Policy (Department of Fisheries and Oceans Canada, 2013).
- Forest Management Guidelines for Riparian Management Areas (Manitoba Conservation and Water Stewardship 2009)
- Forest Management Guidelines for Terrestrial Buffers (Manitoba Conservation and Water Stewardship 2010)
- Forestry Road Management (Manitoba Conservation and Water Stewardship 2012)
- Freshwater Intake End-of Pipe Fish Screen Guidelines. (Department of Fisheries and Oceans Canada, 1995)
- Guidelines for the Use of Explosives In or Near Canadian Fresh Waters (Department of Fisheries and Oceans, 1998)
- Recovery Strategy for Boreal Woodland Caribou (Manitoba Conservation, 2015)
- Brush Disposal Guidebook (Manitoba Conservation, 2005)
- Dismantling and Removal of Petroleum Product and Allied Product Storage Tank Systems (Manitoba Conservation and Waters Stewardship, 2014)
- Contaminated Sites Guidelines (Manitoba Conservation and Water Stewardship, 2014, 2015)
- Homeowner's Manual for Onsite Wastewater Management Systems.(Manitoba Conservation and Water Stewardship, 2006).
- Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat (Manitoba Department of Natural Resources and the Department of Fisheries and Oceans, 1996).
- Manitoba Water Quality Standards, Objectives, and Guidelines (Manitoba Conservation, 2011)
- Standard Construction Specifications (Manitoba Infrastructure and Transportation, 2008)

6.6.2 Manitoba East Side Road Authority

The design of the proposed P7a-All Season Road Project will incorporate applicable environmental legislative requirements as well as the following polices, practices and specifications established by the ESRA:

- Environmental Protection Policy (2015)
- Safety Policy (2013)
- Environmental Protection Requirements for Construction Contracts (2015)
- Safety Requirements for Construction Contracts (2013)
- Environmental Protection Procedures (2015)
- All Season Road Construction Activities What Can You Expect? (2014)

The requirements and specifications form part of tender packages and construction contracts let by ESRA for road and other related projects. These contract documents provide a suite of general requirements (GR) for a variety of typical topics encountered for most road construction projects. The environmental protection requirements are listed in the GR130s; the GR140s address safety requirements as well as safe work planning, emergency procedures, blasting, explosive storage and

transportation, and incident reporting; the GR120s cover maintenance aspects including site drainage, traffic control and protection of infrastructure. The general requirements are not an exhaustive list of all possible topics that may be encountered.

ESRA prepared an Environmental Protection Procedures document based on mitigation identified in legislation, supporting documents, guidelines, best practices and applicable permits, authorizations, approvals and licences ESRA has received for similar works in the past. The document serves to illustrate practices that should be applied during the construction, operation and maintenance to mitigate adverse effects of road-related projects. It is a “dynamic living document” that will be updated and revised from time to time as new environmental protection information becomes available.

6.6.3 Community Initiated Design Mitigation

During the APEP that was held for the proposed P7a All-Season Road Project, the community provided feedback and comments regarding mitigation for the road and bridges that was considered and incorporated into the design of the Project resulting in:

- Design of the crossing to provide for the existing permanent portage adjacent to Root Creek for community members to safely travel under the road
- Design of access ramps where key portages and snowmobiles intersect the roadway. The access ramps will allow for skidoos and quads to safely cross the road.
- More thorough understanding of the seasonal and historic fluctuation of water levels of the watercourses community members use for more accurate bridge and culvert design.

6.6.4 Mitigation Measures

Example mitigation measures to be incorporated into the design of the proposed P7a All-Season Road Project to mitigate potential adverse effects on the environment include the following:

- Align road to minimize or avoid sensitive areas or features of concern (archaeological, heritage or cultural sites, sensitive wildlife habitat, etc.);
- Optimize alignment to minimize the need for fill materials and capitalize on cut and fill opportunities (road constructability);
- Optimize location of quarries, borrow pits, construction camps, construction staging areas and construction access roads to minimize environmental effects;
- Design to allow for safe traffic operation and snow clearing in accordance with Manitoba Infrastructure and Transportation standards for All-Season highways in remote areas as well as other appropriate design standards and guidelines;
- Place geotextile matting and scrub trees/brush where beneficial to reduce the effect of peat compression;
- Design of wildlife deterrents such as access controls in area of identified wildlife-vehicular collisions;
- Target the use of single span bridges with bridge abutments located above the high water mark to avoid direct effects on aquatic habitat. Clear span bridge design does not require any

construction work, including bank armouring (i.e. riprap) or excavation for bridge abutments or wing walls, below the high water mark to avoid disruptions to aquatic habitat;

- Locate roads a minimum of 100 m from waterbodies except when crossing a watercourse. Where this is not feasible, a buffer of undisturbed vegetation equal to 10 m plus 1.5 times the slope gradient is to be left between the road and adjacent waterbody;
- Implement erosion and sediment control measures to prevent water quality degradation of receiving streams;
- Schedule construction activities to minimize adverse environmental effects on valued environmental components such as the timing of in stream work to avoid sensitive spawning periods in the spring, the timing of blasting activities to avoid calving periods, etc;
- Road salt (NaCl) for de-icing is not planned for use as it is known to attract wildlife to the roadway;
- Re-vegetate and minimize disturbances in areas with erosion potential and required habitat protection;
- Re-vegetate along road shoulders will involve natural process and planting of native species, and the shoulders will be mowed regularly to discourage wildlife from foraging along the roadway;
- Decommission, block and re-vegetate temporary access roads, rock quarries and borrow areas along the road right-of-way no longer needed after construction to discourage access by hunters;
- Store and handle petroleum and hazardous products in accordance with regulatory requirements and best management practices;
- Avoid designing pull-offs to discourage vehicles stopping along the road for the purpose of hunting and other reasons;
- Establish construction exclusion windows and zones to control construction activities around locations or areas where physical or sensory disturbance is to be avoided. Examples of construction exclusion windows include known caribou calving, bird nesting and fledging, and furbearer denning areas;
- Design bridges and culverts to effectively handle surface water drainage during periods of high run-off (1 in 100 year storm) to permit efficient passage of storm water and to minimize the potential for backwater ponding and flooding;
- Design for adequate number of equalization culverts to maintain natural hydrological processes of the landscape.
- Design watercourse crossing structures to meet Department of Fisheries and Oceans criteria for fish passage;
- Design stream crossings to minimize or avoid serious harm to fish such as clear-span bridges over wide spans that minimize the need for pier structures in the watercourse;
- Develop an offsetting plan if required by Department of Fisheries and Oceans; and
- Provide snowmobile ramps where the P7a All-Season Road crosses existing key snowmobile trails

6.7 Biophysical Environment

Environmental effects, mitigation measures, residual environmental effects, and significance evaluations are listed in tabular form for biophysical environment components in the following sections and are summarized along with full significance evaluation ratings in Appendix E.

6.7.1 Air Quality

Vehicle engines including construction equipment and machinery produce air pollutants that may pose a risk to the environment and human health where pollutants occur in elevated concentrations. The effects of roads and vehicle use of roads on the environment have been reviewed by numerous authors including Tszmokawa and Hoban (1997), Spellerberg (1998) Spellerberg and Morrison (1998) and Daigle (2010). The main products of the combustion of motor fuels are carbon dioxide and water, but inefficiencies and high temperatures inherent in engine operation can result in the production of other pollutants such as nitrogen oxides (NO_x), hydrocarbons (HC), carbon monoxide (CO), sulphur dioxide (SO₂), particulates, aldehydes and secondary pollutants. Other possible sources of air pollution include the transport, storage and dispensing of fuels (gasoline, diesel, propane), and operation of staging areas and construction camps. Accidental releases of fuels and other hazardous substances are also sources of air contaminants including volatile organic hydrocarbons. In addition to emissions from vehicle exhaust, dust can also have effects on roadside air quality, particularly in the case of unpaved roads.

The environmental assessment report for the Rice River Road Upgrading and Extension (Manitoba Transportation and Government Services 2006) identified the primary concerns air quality concerns to be dust caused by construction activities, and gaseous and particulate emissions from construction equipment (construction) and from vehicles (operation and maintenance). Due to the remote location of the road and distance from communities, no adverse effects on the environment or human population were anticipated. The PR304 to Berens River All-Season Road environmental assessment report (ESRA 2010) considered the environmental effects of the road project on air quality. It was concluded that any effects of the project on air quality will be localized to the immediate area around the construction activity and that the effects will be short-term in nature. The effect of the project on air quality was expected to be not significant. The Bloodvein Community All-Season Access Road environmental assessment report (ESRA 2011) considered the effects of the project on air quality, including fugitive dust and greenhouse gasses from road construction and operation and maintenance activities. The effects of the Bloodvein access road project on air quality were determined to be not significant.

The proposed P7a All-Season Road Project has the potential to result in a nominal increase in fugitive dust, nitrogen oxides, sulfur dioxide, volatile organic compounds and greenhouse gases in the local assessment area during the construction and operation and maintenance phases. Potential effects of the proposed P7a All-Season Road Project on air quality include local increases in particulates, nitrogen oxides, sulphur dioxide and greenhouse gases as a result of using heavy equipment and vehicles during construction, and vehicles during operation and maintenance. Localized increases in volatile organic compounds may occur at fuel storage and dispensing sites, and as a result of accidental releases of fuels and hazardous substances. The effects on air quality were determined to

be low in adversity. No exceedances of Manitoba Ambient Air Quality Criteria (Manitoba 2005) are anticipated to occur in the local assessment area. Mitigation measures include equipping rock crushers, gravel sorters and concrete batch plants with dust control, using acceptable dust control measures such as water or approved dust suppression agents, curtailing dust creating activities during high wind conditions, posting speed limits, limiting unnecessary equipment and vehicle idling, using low sulphur-containing fuels, routine maintenance of equipment and vehicles, adhering to regulations for fuel storage and handling, educating contractors and workers on storage and handling of fuels and hazardous substances, and ensuring that emergency spill response plans are up to date. Sections of ESRA Environmental Protection Requirements that relate to air quantity protection are GR130.6-General, GR130.11-Dust and Particulate Control, and GR130.9.2.5 Petroleum Handling and Storage. The residual environmental effects of the proposed P7a All-Season Road Project on air quality after the application of mitigation measures were evaluated to be not significant. Valued environmental components will not be adversely affected with the application of mitigation measures including inspections to ensure that mitigation is implemented and effective. The environmental effects analysis for air quality is summarized in Table 6-8.

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Nominal increased fugitive dust levels in the local assessment area due to construction activities during construction	<ul style="list-style-type: none"> • Conduct work by methods that minimize raising dust • Apply dust control measures such as water or approved dust suppressants • Curtail construction work during high wind conditions • Cover truckloads of rock and gravel with tarpaulins • Maintain stockpiles to minimize wind erosion Enforce posted construction speed limits <i>GR130.11 Dust and Particulate Control</i>	Minor increase in dust levels	Not significant
Nominal increased fugitive dust levels in the local assessment area due to vehicle traffic and maintenance activities during operation and maintenance	<ul style="list-style-type: none"> • Use granitic rock as the source of aggregate and impose size specifications for aggregate and monitor to ensure quality control. • Apply dust control measures such as water as or an approved dust suppressant • Post speed limits <i>GR130.11 Dust and Particulate Control</i>	Minor increase in dust levels	Not significant
Increased SO ₂ , NO _x , CO and particulate levels in the local assessment area due to vehicle traffic and equipment use during operation and maintenance	<ul style="list-style-type: none"> • Limit unnecessary idling of equipment and vehicles • Encourage use of low sulphur-containing fuels • Routine maintenance of construction equipment and vehicles • Post speed limits 	Minor increases in pollutant levels	Not significant
Increased VOC emissions in the local assessment area due to storage, dispensing and release of	<ul style="list-style-type: none"> • Limit unnecessary idling of equipment and vehicles • Enforce posted speed limits • Contractors and workers be trained in 	Minor increase in VOC emissions	Not significant

Table 6-8: Summary of Environmental Effects Analysis for Air Quality

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
fuels and hazardous substances during construction and operation and maintenance	storage and dispensing of fuels • Emergency spill response plan to be prepared and kept up to date <i>GR130.9.2.5 Petroleum Handling and Storage</i>		
Increased greenhouse gas emissions in the local assessment area due to burning vegetation from clearing activities during construction	• Obtain burning permits for burning between November 16 and September 30 • Advise NRO prior to burning between April 1 to November 15	Minor increase in greenhouse gases	Not significant
Increased particulate emissions in the local assessment area due to burning vegetation from clearing activities during construction	• Work with community to identify opportunities for salvaging timber for alternate use. • Obtain burning permits for burning between November 16 and September 30 • Advise NRO prior to burning between April 1 to November 15 • Burn under non-windy conditions	Minor increase in particulates	Not significant
Increased greenhouse emissions in the local assessment area due to equipment and vehicle use during construction and operation and maintenance	• Routine maintenance of construction and maintenance vehicles and heavy equipment • Limit unnecessary idling of equipment and vehicles	Minor increase in greenhouse gases	Not significant

6.7.2 Noise and Vibration

Noise in its broadest sense can be defined as unwanted sound. This definition includes transportation noise as well as industrial and domestic noise sources. Noise effects are related to increases or decreases in traffic or construction noise in relation to pre-existing noise levels within the area affected. Vibration is an oscillatory motion which can be described in terms of the displacement, velocity or acceleration. Because the motion is oscillatory, there is no net movement of the vibration element and the average of any of the motion descriptors is zero. Displacement is the easiest descriptor to understand.

Noise is measured using decibels (dB) that are established on a logarithmic scale because the human ear reacts to logarithmic changes in noise levels. The term "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. Sound is vibratory disturbance capable of being detected by the ear while noise is considered unwanted sound that may interfere with normal activities. A change of 3 dB(A) is a barely perceivable change in noise, while an increase of 10 dB(A) is perceived as being twice as loud. Noise is measured on a logarithmic scale so sound levels cannot be added or subtracted by ordinary arithmetic methods. For example, exposure to two 60 dB(A) noise sources does not correspond to a 120 dB(A) noise level. Rather, due to

the logarithmic scale, two sources of equal noise added together result in an increase of 3 dB(A). That is, 60 dB(A) plus 60 dB(A) yields a total noise level of 63 dB(A). Applying this to traffic noise, doubling traffic volumes will increase the noise level by 3 dB(A). The term "Lex" 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). Comparative examples of noise levels are provided in Table 6-9.

Noise Source	Decibel Level	Decibel Effect
Construction site at the source (100 dB).	100	8 times louder than 70 dB. Serious damage possible in 8 h exposure.
Power mower (96 dB).	90	4 times louder than 70 dB. Likely damage in 8 h exposure.
Diesel truck at 40 mph at 9 m (84 dB), ESRA requires hearing protection at 80 dB.	80	2 times louder than 70 dB. Possible damage in 8 hr exposure. Noisy office.
Passenger car at 65 mph at 8 m (77 dB).	70	Arbitrary base of comparison. Upper 70s are annoyingly loud to some people.
Air conditioning unit at 31 m.	60	Half as loud as 70 dB.
Large electrical transformers at 31 m.	50	One-fourth as loud as 70 dB.
Forest ambient sound (40 dB).	40	One eighth as loud as 70 dB.

Some decibel levels obtained from ESRA 2014. MFESRA COR Audit Documentation: Guideline to Interpretation of Sound Monitoring Results.

The PR304 to Berens River All-Season Road environmental assessment report (ESRA 2010) and the Bloodvein Community All-Season Access Road environmental assessment report (ESRA 2011) identified effects of noise and vibration during road construction, operation and maintenance on wildlife, birds, human health, and individual and community well-being. Complying with any community noise by-laws, notifying local area residents, providing warning signals prior to detonating explosives, and restricting construction activities to daytime hours when working near communities were identified as mitigation measures. The residual effects were determined to be insignificant with the application of mitigation.

The construction and operation and maintenance of the proposed P7a All Season Road Project will create noise and vibration or displacement. Sources of noise and vibration during construction include operation of construction equipment, machinery and vehicles, bedrock drilling and blasting, rock crushing, gravel sorting, concrete batching and bridge assembly as well as operation of staging areas and construction camps. Noise and vibration sources during operation and maintenance include operation of maintenance equipment and vehicles, passenger vehicles, all-terrain vehicles and snowmobiles. These noises are attenuated by surrounding vegetation cover (up to 32dB/30.5m) and the undulating landscape (up to 27dB/49m) (Wenger, 1984). The effects of noise and vibration on the environment, mitigation measures to minimize any adverse effects and any required follow-up actions are discussed in subsequent sections of this Chapter under the headings of biophysical, socio-economic and Aboriginal environment. ESRA Environmental Protection Requirements (GR 130.12- Noise and Noise Limitations) specify that as a result, construction noises will dissipate with increased distance from the work site at varying rates, depending on site conditions.

6.7.3 Geology and Surficial Materials

Geologic processes, geologic materials and geologic structures control or influence a host of ecological factors, such as slope aspect, slope steepness, extent of landforms and associated vegetation, distribution and composition of soil parent material, structure and composition of vegetation, physical character of floodplains, wetlands, riparian area, and stream substrates, quantity and quality of stream water and groundwater, natural disturbance regimes, and nature and condition of watersheds. Geological diversity is the foundation of ecosystem diversity and biological diversity. Surficial geologic processes are an important part of the natural disturbance regime in the Boreal forest. These processes include: the erosion, transport and deposition of sediment; mass wasting or landslides; flooding; stream processes; groundwater movement; and the formation of caves, sinkholes and other karst features. These processes are part of the natural disturbance regime and affect the forest in varying degrees every year. Management activities that involve ground disturbance, such as construction of roads and other infrastructure, communities and facilities, have the potential to adversely affect geologic resources. Effects of developments on geological features and surficial materials are generally confined to the immediate vicinity of the development and do not normally result in widespread effects.

Various authors have reported on the environmental effects of roads including the effects on bedrock geology surficial materials. Spellerberg (1998) reported on studies on the effects of roads on the physical environment including the effects on geology, water run-off, pollution and sediment load in streams (e.g., Watkins 1981 and Ball, Jenks and Aubourg 1998). Seiler (2001) reviewed the ecological effects of roads including habitat disturbance and loss, and noted that the total area designated for transport is several times larger than the road surface when all associated features including roadsides, embankments and other ancillary features are taken into account. Daigle (2010) cited a number of references on slope failures, sediment production and transport. Coffin (2007) reviewed the literature on the ecological effects of roads including erosion and sediment transport. Reconfigured landforms can result in changed hydrologic regimes (e.g., altered water table position; interrupted groundwater flow diverted to surface systems; increased water temperatures; changes in the timing of runoff; drained natural wetland habitats; unintentional artificial wetlands; and restricted or altered channels which can result in altered streambed materials).

Proper planning provides for efficient and environmentally responsible quarry operation. The development objective is to maximize the use of granular resources while minimizing negative environmental effects with the assistance of a quarry development plan. Table 6-10 outlines common environmental concerns that may be encountered during site development or operation phases and related mitigation options for pits and quarries.

Table 6-10: Pit and Quarry Mitigation Techniques

Development Phase	Activities	Environmental Concerns	Possible Mitigation Techniques
Site design and development	<ul style="list-style-type: none"> • Timber and vegetation clearing • Overburden 	<ul style="list-style-type: none"> • Habitat loss • Soil erosion • Sediment 	<ul style="list-style-type: none"> • Minimize project footprint • Identify and avoid environmentally sensitive areas • Locate the development in a well-drained area

Table 6-10: Pit and Quarry Mitigation Techniques

Development Phase	Activities	Environmental Concerns	Possible Mitigation Techniques
	removal	deposition	<ul style="list-style-type: none"> • Maintain natural drainage patterns • Retain vegetation buffer zones to maintain slope stability and protect water bodies • Construct ditches to direct runoff away from the site • Salvage and properly store organics, topsoil and overburden for use during reclamation
Operations and monitoring	<ul style="list-style-type: none"> • Blasting • Excavating • Crushing • Piling material • Access road maintenance 	<ul style="list-style-type: none"> • Soil erosion • Sediment deposition 	<ul style="list-style-type: none"> • Limit sediment movement using erosion controls (e.g., silt fence) • Use rip-rap to reinforce drainage channel corners and water discharge points • Use settling ponds before discharging water • Re-vegetate where required to stabilize slopes
		<ul style="list-style-type: none"> • Fuel spills • Blasting residue 	<ul style="list-style-type: none"> • Use proper fuel containment and explosives handling techniques
		Dust generation	<ul style="list-style-type: none"> • Use water and dust skirts on conveyors to minimize dust

The PR304 to Berens River All-Season Road environmental assessment report (ESRA 2010) determined that the effects of construction activities on surface and subsurface soils and bedrock will generally be limited to areas that are physically disturbed (i.e., lands within the right-of-way, temporary access roads, staging areas, and crushed rock supply facilities), and soil and rock materials will be removed from within identified rock quarry and borrow pit locations. The overall significance of environmental effects on soils and bedrock was considered to be not significant with the implementation of mitigation measures. The Bloodvein Community All-Season Access Road environmental assessment report (ESRA 2011) identified potential adverse effects to terrain and soils may occur as a result of alterations from road construction and borrow pits, and loss of granular or lacustrine soils for use in construction and maintenance. The effects were considered likely not significant with mitigation measures.

The proposed P7a All-Season Road Project will affect bedrock geology and surficial materials in a number of ways, including establishment of roadway grades, development of rock quarries and borrow pits, and formation of bridge abutments. Rock quarries will involve clearing, drilling, blasting, excavating, rock crushing, stockpiling and transporting to the project sites. These activities will modify bedrock outcrops in the area and may impair the aesthetic value of these features for local people. Borrow pits involve clearing, excavating, sorting, stockpiling and transporting. Potential environmental effects of the proposed Road Project include modification of bedrock features and surficial materials, removal and relocation of rock and granular materials, creation of steep, unstable and unsafe rock and gravel slopes, and changes to the landscape profiles.

The effects of the proposed P7a All-Season Road Project on bedrock geology and surficial materials were determined to be low in adversity. Mitigation measures include minimizing the surface extent of

bedrock and surficial materials removal, locating quarries and pits away from the road right-of-way, leaving treed buffers between the roadway and the pits and quarries, contouring abandoned quarries and pits for stability and safety, posting warning signage, restoring pits and quarries upon abandonment, and re-vegetating and blocking access roads. The residual environmental effects of the proposed P7a All-Season Road Project on geology and surficial materials after the application of mitigation measures were evaluated to be not significant. Follow-up actions include inspections to ensure that mitigation is implemented and effective. The environmental effects analysis for geology and surficial materials is summarized in Table 6-11.

Table 6-11: Summary of Environmental Effects Analysis for Geology and Surficial Materials

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Modification of rock outcrops and surficial materials in the project assessment area during construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Minimize surface extent of bedrock and surficial material removal 	Cut and fill sections along P7a All-Season Road	Not significant
Modification or removal of bedrock outcrops at rock quarries in the project assessment area during construction.	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Minimize surface extent of bedrock and surficial material removal • Maintain treed buffer between quarries and road right-of-way where possible 	Restored quarry areas not visible from road	Not significant
Possible formation of steep, unstable and unsafe rock slopes at quarries during construction	<ul style="list-style-type: none"> • Contour abandoned rock quarries to provide stable and safe slopes • Post no entry warning signs to active quarry areas • Block and re-vegetate access roads upon abandonment 	Restored quarry areas with stabilized and safe slopes	Not significant
Removal of aggregate materials at borrow pits in the project assessment area during construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Minimize the surface extent of granular material removal • Block and re-vegetate access roads upon abandonment 	Restored borrow areas not visible from road	Not significant
Possible formation of steep, unstable and unsafe gravel slopes at borrow pits	<ul style="list-style-type: none"> • Contour abandoned borrow pits to provide stable and safe slopes • Post no entry warning signs to borrow areas • Block access roads upon abandonment 	Restored borrow areas with stabilized and safe slopes	Not significant
Unstable slopes resulting in erosion	<ul style="list-style-type: none"> • Engineer slopes for stability at rock cuts and at bridge sites • Stabilize during construction where warranted 	Stabilized slopes	Not significant

6.7.4 Soils and Terrain

Effects of roads on soils has been documented by a variety of authors including Bilby (1989), Daigle (2010), Noss (2002) Senes Consultants Ltd. (2005), Swift (1988) and Trombulak *et al.* (1999). Effects of road construction on soils include erosion, compaction, contamination of soils from a variety of pollutants such as lead, heavy metals and carbon dioxide, vehicle emissions, loss of biomass productivity, and changes in chemical properties such as pH. Environment effects for the PR 304 to Berens River All Season Road on the east side of Lake Winnipeg have been compiled in the environmental assessments completed by the ESRA (2010) and the Canadian Environmental Assessment Agency (2011).

Environmental effects of the PR304 to Berens River All-Season Road Project have been reported to include contamination of soils from accidental spills and fuel released (ESRA 2010 and 2011; Canadian Environmental Assessment Agency 2011), soil compaction (Canadian Environmental Assessment Agency 2011), loss of granular/lacustrine soils (sand and gravel) for use as construction and maintenance materials (ESRA 2011), loss of native soils (Canadian Environmental Assessment Agency 2011), soil erosion which can lead to sedimentation of adjacent watercourses and alter fish and fish habitat (Canadian Environmental Assessment Agency 2011 and ESRA 2010), and the modification of terrain and local drainage conditions (ESRA 2010).

The proposed P7a All-Season Road Project was determined to affect soils in the project area during pre-construction, construction and operation and maintenance stages for the road and associated project components. Potential effects of the proposed P7a All-Season Road Project on soils and terrain include the loss of soils from clearing, grubbing and stripping, water and wind erosion in disturbed areas and at stockpiles, compaction of soils by construction equipment, loss of soil properties, decreased biomass productivity, change in moisture regime and impaired soil quality from contaminant. The adversity of the effects on soils was determined to be low. Measures identified to mitigate adverse effects on soils include stockpiling soils for use in re-vegetating the road shoulders and other locations, minimizing the amount of soil stripped, maintaining soil properties to the extent possible, providing surface drainage around soil stockpiles, providing erosion protection and sediment control around disturbed areas, providing hydraulic equalization culverts along roads, storing hydrocarbon containing substances in approved containers, providing secondary containment for fuel storage, using drip trays when transferring fuel, providing an approved emergency response plan that includes fuel spills, conducting regular inspections of fuel storage locations and other sources of contaminants and controlling the use of herbicides along road shoulders. Measures to mitigate the effects of road construction and operation and maintenance on soils have been reported by Daigle (2010) and ESRA (2010, 2011). Management guidelines, best practices and environmental protection requirements for all season and forestry roads provide mitigation measures relevant to the proposed P7a All-Season Road Project (Manitoba Conservation 2010 and ESRA 2015). The residual environmental effects of the proposed P7a All-Season Road Project on soils and terrain after the application of mitigation measures were evaluated to be not significant. Follow-up actions identified include inspections to ensure that mitigation is implemented and effective. The environmental effects analysis for soils and terrain is summarized in Table 6-12.

Sections of the ESRA Environmental Protection Requirements that relate to soil quantity and quality protection are as follows:

- GR130.6 General
- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.11 Dust and Particulate Control
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.21 Cement Batch Plant and Concrete Wash-Out Area

Table 6-12: Summary of Environmental Effects Analysis for Soils and Terrain

Potential Environmental Effects	Mitigation Measures	Residual Effects	Evaluation
Loss of soils in the project assessment area due to clearing, grubbing and stripping during construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Minimize amount of organic soil materials stripped at construction sites • Stockpile organic materials stripped for re-vegetating road shoulders and other restoration areas <i>GR130.17 Clearing and Grubbing</i>	Minimal loss of soils	Not significant
Loss of soil properties in the project assessment area due to clearing, grubbing and stripping during construction	<ul style="list-style-type: none"> • Conduct grubbing just in advance of construction <i>GR130.17 Clearing and Grubbing</i>	Minimal loss of soil properties	Not significant
Compaction of soils in the project assessment area due to heavy equipment use during construction	<ul style="list-style-type: none"> • Carry out construction during winter months to the extent possible • Minimize compaction of soils by heavy equipment in construction areas by using tracked or large-tired vehicles 	Minimal compaction of soils	Not significant
Loss of soil in the project assessment area due to erosion of cleared areas during construction	<ul style="list-style-type: none"> • Manage surface drainage at construction locations • Provide erosion protection and sediment control around construction areas <i>GR130.16 Erosion and Sediment Control</i>	Minimal risk of soil erosion	Not significant
Loss of soil in the project assessment area due to water and wind erosion of soil stockpiles during construction	<ul style="list-style-type: none"> • Cover soil stockpiles if conditions warrant <i>GR130.16 Erosion and Sediment Control</i>	Minimal risk of soil erosion	Not significant
Loss off soils in the project assessment area	<ul style="list-style-type: none"> • Identify construction exclusion zones on right-of-way mapping for construction contractors 	Minimal risk of soil erosion	Not significant

Table 6-12: Summary of Environmental Effects Analysis for Soils and Terrain

Potential Environmental Effects	Mitigation Measures	Residual Effects	Evaluation
due to presence of highly erodible soils	<ul style="list-style-type: none"> • Provide erosion protection and sediment control around highly erodible soils • <i>GR130.16 Erosion and Sediment Control</i> 		
Modification of soil moisture regime in the local assessment area along road right-of-way during operation and maintenance	<ul style="list-style-type: none"> • Provide hydraulic equalization culverts to prevent ponding of water at upstream locations and drying at downstream locations 	Minimal impairment to soil moisture regime	Not significant
Loss of biomass productivity in the project assessment area due to displaced and compacted soils during construction and into operation and maintenance	<ul style="list-style-type: none"> • Stockpile soil stripped from construction location • Maintain stockpiled soil in productive condition by limiting erosion and preventing ponding • Use stockpiled organic soil for re-vegetation of restored construction locations 	Minimal loss of biomass productivity of soils	Not significant
Impaired soil quality in the local assessment area due to accidental releases of fuel or hazardous substances during construction	<ul style="list-style-type: none"> • Store fuel in approved containers provided with secondary containment • Drip trays, blankets or pads to be used when transferring fuel at construction sites • Spills to be reported to ESRA, and to Manitoba Conservation as required, and are to be cleaned up immediately • Emergency spill response plan to be prepared and kept up to date at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Construction workers to be adequately trained in hazardous materials handling, storage and disposal, and emergency spill response and clean-up <p><i>GR130.9 Handling and Storage of Waste</i> <i>GR130.10 Spills and Remediation and Emergency Response</i></p>	Minimal risk of impaired soil quality from hydrocarbon releases	Not significant
Impaired soil quality in the local assessment area due to accidental releases of fuel or hazardous substances during operation and maintenance	<ul style="list-style-type: none"> • Road operation and maintenance facility to have spill response and clean-up equipment and materials • Remove contaminated soil and transport to an approved land farm facility • Road operation and maintenance facility to have an approved emergency response plan that includes fuel spills and clean-up procedures 	Minimal risk of impaired soil quality from hydrocarbon releases	Not significant
Impaired soil quality in the local assessment area due to accidental releases of sewage	<ul style="list-style-type: none"> • Conduct regular inspections of sewage retention facility for leaks • Construction sites to have an approved emergency response plan that includes 	Minimal risk of impaired soil quality from sewage releases	Not significant

Table 6-12: Summary of Environmental Effects Analysis for Soils and Terrain

Potential Environmental Effects	Mitigation Measures	Residual Effects	Evaluation
during construction camp operation and maintenance	sewage releases • Construction sites to have spill response and clean-up equipment and materials		
Impaired soil quality in the local assessment area due to herbicide application during road operation and maintenance	• Apply herbicides in accordance with manufacturers guidelines • Prohibit application within 30 m of any watercourse/waterbody • Avoid application beyond road shoulder • Adhere to permit terms and conditions <i>GR130.9. Materials Handling, Storage and Disposal</i>	Minimal risk of impaired soil quality from herbicide application	Not significant

6.7.5 Surface Water

The effects of roads on hydrological systems has been reported on by various authors including Thrasher (1983), King and Tennyson (1984), Findlay and Houlihan (1997), Findlay and Borudages (2000) and others. Sutherland (1994) reviewed the ecological effects of highway projects on the environment including aquatic systems and provided measures to mitigate adverse effects. Roads and their major biological effects including those from water runoff, sediment and chemical transport were reviewed by Forman and Alexander (1998). The ecological effects of roads and traffic on aquatic systems and biota were reviewed by Spellerberg (1998). Spellerberg and Morrison (1998) reviewed the literature on the ecological effects of new roads. Coffin (2007) reviewed the ecological effects of roads, including changes to hydrology and water quality, erosion and sediment transport and introduction of chemical contaminants. Daigle (2010) reviewed the environmental effects of roads, including effects on water, aquatic wildlife and habitat, and described techniques for mitigating road-related effects.

The environmental assessment report for the Rice River Road Upgrading and Extension (Manitoba Transportation and Government Services 2006) identified environmental effects of the road project on surface waters including water quality and stream flows at crossings. The effects of the road project on water quality were expected to be negligible with adherence to design parameters and mitigation measures. The PR304 to Berens River All-Season Road environmental assessment report (ESRA 2010) determined that the effects of construction activities on water quality from suspended sediments and hazardous substances and altered stream flows at watercourse crossings. The overall residual effect of the project on water quality and stream flows was considered to be low and not significant. The overall significance of environmental effects on soils and bedrock was considered to be not significant with the implementation of mitigation measures. The Bloodvein Community All-Season Access Road environmental assessment report (ESRA 2011) identified potential adverse effects on water quality and stream flows. The effects were considered likely not significant with mitigation measures.

North/South Consultants (2013) carried out a detailed aquatic environmental study in fall 2013 and spring 2014 to identify and describe aquatic habitats potentially affected by the proposed P7a All-

Season Road Project and to assess the potential effects of the project on these habitats. Erosion and sedimentation of streams, introduction of deleterious substances (cast-in-place concrete, construction equipment, stormwater runoff and explosives) and temporary stream crossings were identified as the main effects of the proposed P7a All-Season Road Project on surface water quality. Following the application of proven mitigation measures the residual effects on water quality expected to result from the proposed P7a All-Season Road Project include the introduction of total suspended sediments in streams. The potential effects on riparian habitats and in-stream habitats are considered under Fish and Fish Habitat in Section 6.7.9.

The proposed P7a All-Season Road Project can potentially affect surface water quality and stream flows by modifying surface water drainage at construction sites and at stream crossings, increasing suspended solids from in-stream work and clearing riparian and vegetation introduction of deleterious substances. The adversity of the effects was determined to be low to moderate. Mitigation measures identified included minimizing surface disturbance, winter construction, erosion protection and sediment control measures, keeping construction vehicles above the high water mark, preventing deleterious substances from entering watercourses, maintaining vegetated buffers adjacent to watercourses, using drip pans under stationary equipment and when re-fueling and controlling herbicide use. The residual environmental effects of the proposed P7a All-Season Road Project on surface water after the application of mitigation measures were evaluated to be not significant. Valued environmental components will not be adversely affected with the application of mitigation measures and implementation of follow-up. Follow-up inspections and monitoring was identified by North/South Consultants (2014) including inspections during pre-construction, construction and post-construction to ensure that mitigation measures are implemented and are effective. Monitoring is recommended for total suspended solids during the pre-construction stage to establish a TSS-Turbidity relationship for the project area to facilitate the use of turbidity as a proxy for TSS allowing for rapid on-site assessment of potential water quality impacts during the construction phase of the project. Turbidity monitoring including transect and plume monitoring, and cofferdam construction and removal is recommended during the construction stage in streams that provide or are directly connected to fish habitat. The environmental effects analysis for surface water is summarized in Table 6-13.

Sections of ESRA Environmental Protection Requirements that relate to surface water and water quality protection are as follows:

GR130.6	General
GR130.8	Designated Areas and Access
GR130.9	Materials Handling, Storage and Disposal
GR130.10	Spills and Remediation and Emergency Response
GR130.15	Working Within or Near Water
GR130.16	Erosion and Sediment Control
GR130.17	Clearing and Grubbing
GR130.21	Cement Batch Plant and Concrete Wash-Out Area

Table 6-13: Summary of Environmental Effects Analysis for Surface Water

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Water Drainage/Stream Flows			
Modified surface drainage patterns in the local assessment area due to construction activities during construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Minimize extent of area cleared along roads and around facilities and structures • Retain organic soil materials from cleared areas to the extent possible for use on road shoulders • Provide erosion protection and sediment control as required • <i>GR130.17 Clearing and Grubbing</i> 	Minor alteration of surface drainage during construction	Not significant
Modified stream flow at stream crossing locations in the local assessment area due to in-stream work during construction	<ul style="list-style-type: none"> • Conduct in-stream work during winter months or low flow conditions • In-stream construction to be conducted in isolation of flowing water • Maintain existing/natural alignment and gradient of watercourse • <i>GR130.15.3 Disturbance to Stream Bed and Stream Banks</i> • <i>GR130.15.5 Stream Crossings</i> • <i>GR130.15.6 Base flow Diversion & Fish Passage</i> 	Minor modification of stream flow at crossings	Not significant
Modified stream flow at stream crossing locations in the local assessment area due to culvert installation during construction	<ul style="list-style-type: none"> • Install culverts during winter months or low flow conditions • Install culverts in isolation of flowing water • Embed culverts • Maintain existing/natural alignment and gradient of watercourse • <i>GR130.15.2 Timing of Work</i> • <i>GR130.15.5 Stream Crossings</i> • <i>GR130.15.9 Culvert Maintenance & Replacement</i> 	Minor modification of stream flow at crossings	Not significant
Modified stream flow at stream crossing locations in the local assessment area due to culvert replacement during operation and maintenance	<ul style="list-style-type: none"> • Replace culverts during winter months or low flow conditions • Maintain existing/natural alignment and gradient of watercourse • Maintain existing/natural alignment and gradient of watercourse • Install culverts of sufficient size to accommodate 1:100 flows • <i>GR130.15.5 Stream Crossings</i> • <i>GR130.15.9 Culvert Maintenance & Replacement</i> 	Minor modification of stream flow at crossings	Not significant
Water Quality			
Impaired surface water quality in the local assessment area due	<ul style="list-style-type: none"> • Store and dispense fuels and other hazardous substances at least 100 m from the high water mark of waterbodies 	Minor impairment to water quality during construction	Not significant

Table 6-13: Summary of Environmental Effects Analysis for Surface Water

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
to introduction of hazardous substances during construction and operation and maintenance	<ul style="list-style-type: none"> • Store fuel in approved containers provided with secondary containment • Drip trays, blankets or pads to be used when transferring fuel at construction sites • Spills to be reported to ESRA, and to Manitoba Conservation as required, and are to be cleaned up immediately • Emergency spill response plan to be prepared and kept up to date at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Construction workers to be adequately trained in hazardous materials handling, storage and disposal, and in emergency spill response and clean-up • <i>GR130.9 Handling and Storage of Waste</i> • <i>GR130.10 Spills and Remediation and Emergency Response</i> 	Low risk of accidental releases	
Impaired surface water quality in the local assessment area due to sewage and grey water releases during construction	<ul style="list-style-type: none"> • Sewage and grey water to be collected by provision of a wastewater management system • <i>GR130.9.2 Handling and Storage of Wastes</i> 	Minor impairment of surface water quality	Not significant
Impaired surface water quality in the local assessment area due to herbicide use during operation and maintenance	<ul style="list-style-type: none"> • Herbicides to be applied in accordance with manufacturers guidelines • Prohibit application within 30 m of any watercourse/waterbody • Avoid application beyond road shoulder • Adhere to permit terms and conditions <i>GR130.9. Materials Handling, Storage and Disposal</i> 	Minimal risk of impaired surface water quality	Not significant
Impaired surface water quality in local assessment area due to release of nitrates from the use of explosives during construction	<ul style="list-style-type: none"> • Undetonated explosive materials to be removed from blast rock prior to placement in or near watercourses • Ammonium nitrate-fuel oil mixtures are not to be used in or near watercourses • Avoid blasting in or on shorelines of watercourses • <i>GR130.15.10 Blasting Near a Watercourse</i> 	Minimal risk of impaired surface water quality	Not significant
Impaired water quality and fish habitat in the local assessment area due to structural repairs during operation and maintenance	<ul style="list-style-type: none"> • In-water work to be timed to avoid periods of fish spawning, incubation and migration. • Appropriate erosion and sediment control measures to be implemented prior to commencement of repair work and to be regularly inspected to ensure their effectiveness. • Repairs and reinforcements to be conducted in 	Minor temporary impairment of water quality and fish habitat	Not significant

Table 6-13: Summary of Environmental Effects Analysis for Surface Water

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<p>a manner that prevents bridge materials from entering the watercourse.</p> <ul style="list-style-type: none"> • Waste materials to be stabilized and/or disposed of in an appropriate manner that prevents entry into the watercourse. • Disturbed areas to be restored and re-vegetated to mitigate erosion and sediment introduction into the watercourse. • <i>GR130.15 Working Within or Near Water</i> • <i>GR130.16 Erosion and Sediment Control</i> 		
<p>Impaired surface water quality in the local assessment area due to leaks and releases of petroleum products from equipment and vehicles during construction</p>	<ul style="list-style-type: none"> • Construction vehicles and equipment to arrive on site clean and free of leaks • Construction vehicles and equipment be maintained in good working order and inspected daily for leaks • Vehicle and equipment fueling and maintenance to be conducted a minimum of 100 m from the high water mark • Drip trays, pads or sheets to be used when transferring fuel • Machinery to remain above the high water mark except where temporary fording of a watercourse is required • <i>GR 130.6 General</i> • <i>GR130.10 Spills and Remediation and Emergency Response</i> 	<p>Minor impairment of surface water quality</p>	<p>Not significant</p>
<p>Impaired surface water quality in the local assessment area from accidental releases of concrete and concrete wash water during construction</p>	<ul style="list-style-type: none"> • Uncured or partly cured concrete to be kept in isolation from watercourses • Concrete wash out areas shall be a minimum of 100 metres from a watercourse • Equipment used in concrete work to be washed away from watercourses to prevent wash water from entering waterways • <i>GR130.21 Cement Batch Plant and Concrete Wash-Out Area</i> 	<p>Minor impairment of surface water quality</p>	<p>Not significant</p>
<p>Increased suspended sediments in the local assessment area watercourses due to heavy equipment use during construction</p>	<ul style="list-style-type: none"> • Install erosion and sediment control measures prior to the commencement of construction. • Inspect erosion and sediment control measures to be inspected regularly and repaired as required • Clearing and earthworks near watercourses to be conducted under favourable weather conditions and to be temporarily suspended during storm events • Undertake construction under frozen conditions during winter months to the extent possible • Overburden to be adequately stabilized and stored well above the high water mark • Disturbed areas to be stabilized through re- 	<p>Net increase in suspended solids subject to offset plan</p>	<p>Not significant</p>

Table 6-13: Summary of Environmental Effects Analysis for Surface Water

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<ul style="list-style-type: none"> vegetation with native plant species or erosion protection and sediment control measures • Riprap placed below the high water mark to be clean and free of debris. • Erosion and sediment control measures to remain in place until all disturbed area are re-vegetated • <i>GR130.16 Erosion and Sediment Control</i> 		
Increased suspended sediments in local assessment area watercourses due to clearing during construction	<ul style="list-style-type: none"> • Vegetation to be retained as long as possible to minimize the time exposure of disturbed/bare soils to potential erosion • Clearing limits to be clearly marked prior to riparian vegetation removal to avoid any unnecessary damage to or removal of vegetation • Erosion and sediment control measures to be in place prior to the start of clearing • Riparian vegetation clearing within the right-of-way to be limited to removal of select vegetation that is required to maintain line of sight safety requirements • Vegetation clearing in riparian areas to be conducted by hand if possible and just in advance of construction activities • Low-growing/shrub vegetation to be maintained • <i>GR130.17 Clearing and Grubbing</i> 	Net increase in suspended solids subject to offset plan	Not significant

6.7.6 Groundwater

Sutherland (1994), Spellerberg (1998), Forman and Alexander (1998), Seiler (2001) and Daigle (2010) and others have reviewed the effects of roads on the environment including the effects on the groundwater regime and groundwater quality. Road construction affects the immediate environment due to the need to clear, level, fill and cut. Road construction work changes soil density, landscape relief, surface and groundwater flows, and, in turn, can affect ecosystems, vegetation and fauna in the wider landscape. In addition, groundwater contamination along roads can occur from surface runoff, accidental releases of hydrocarbons or other substances, and the use of road salt as a de-icing agent or herbicides to control shoulder vegetation. Kahklen and Moll (1999) examined the effects of roads on groundwater in case studies and demonstrated elevated or depressed groundwater levels on upslope and downslope sides of the road. Various authors have reviewed the effects of salt and other de-icing substances on surface water, groundwater, soils and vegetation (Liu and Jin 2006, Seawell, D'Itri 1992 and Agbenowisi 1996). An environmental code of practice by Environment Canada (2004) provides for the development of salt management plans and the implementation of best management practices.

The environmental assessment report for the Rice River Road Upgrading and Extension (Manitoba Transportation and Government Services 2006) identified environmental effects of the road project on surface water and groundwater, including contaminated groundwater from accidental spills or leakage of stored fuels or chemicals. The risk to groundwater was expected to be negligible with adherence to design parameters and mitigation measures. The PR304 to Berens River All-Season Road environmental assessment report (ESRA 2010) determined that the effects of construction activities on surface and groundwater quality from accidental releases of hazardous substances such as fuels and hydraulic fluids. The effects on surface and groundwater were considered mitigable with the implementation of best management practices. Inspection and monitoring of surface and groundwater during construction and operation was identified to ensure that mitigation is effective. The residual effects were considered low and overall significance is rated as not significant. The Bloodvein Community All-Season Access Road environmental assessment report (ESRA 2011) identified potential adverse effects of road construction and operation on surface and groundwater regime and quality. With the implementation of mitigation measures, and inspection during construction and operation and maintenance, it was determined that adaptive management would address accidental spills of hazardous substances and any effects on surface and groundwater.

The proposed P7a All-Season Road Project may modify the groundwater along the proposed road right-of-way and at excavation sites including borrow areas, staging areas and construction camps. Groundwater along the road and at construction sites may become contaminated due to accidental releases of hazardous substances including fuels, hydraulic fluids, and lubricating oils. The adversity of the effects on groundwater was determined to be low and unlikely. Mitigation measures include carrying out construction activities during winter to the extent possible, minimizing surface disturbance, providing hydraulic equalization culverts, decommissioning water wells upon abandonment, training construction crews in handling hazardous substances, reporting spills of hazardous substances, preparing emergency response plans, providing spill kits, maintaining construction equipment in good working order, keeping hazardous substances 100 m from waterbodies and water wells, using drip trays during fueling and controlling herbicide use. The residual environmental effects of the proposed P7a All-Season Road Project on groundwater after the application of mitigation measures were evaluated to be not significant. Follow-up actions include inspections to ensure that mitigation is implemented and effective. The environmental effects analysis for groundwater is summarized in Table 6-14.

Sections of ESRA Environmental Protection Requirements that relate to surface water and water quality protection are as follows:

GR130.6	General
GR130.8	Designated Areas and Access
GR130.9	Materials Handling, Storage and Disposal
GR130.10	Spills and Remediation and Emergency Response
GR130.21	Cement Batch Plant and Concrete Wash-Out Area

Table 6-14: Environmental Effects Analysis for Groundwater

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Modification of groundwater regime in the local assessment area during construction	<ul style="list-style-type: none"> • Minimize surface disturbance adjacent to cleared areas • Provide hydraulic equalization culverts to minimize modification of groundwater regime along road right-of-way • <i>GR130.15 Working Within or Near Water</i> • <i>GR130.17 Clearing and Grubbing</i> 	Minimal risk of groundwater regime modification	Not significant
Impaired groundwater quality in the local assessment area due to accidental release of deleterious substances during construction and operation and maintenance	<ul style="list-style-type: none"> • Store fuel in approved containers provided with secondary containment • Drip trays, blankets or pads to be used when transferring fuel at construction sites • Spills to be reported to ESRA, and to Manitoba Conservation as required, and are to be cleaned up immediately • Emergency spill response plan to be prepared and kept up to date at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Construction workers to be adequately trained in hazardous materials handling, storage and disposal, and in emergency spill response and clean-up • <i>GR130.9 Materials Handling, Storage and Disposal</i> • <i>GR130.10 Spills and Remediation and Emergency Response</i> 	Minimal risk of groundwater regime modification	Not Significant
Impaired groundwater quality in the local assessment area due to leaks and releases from equipment and vehicles during construction	<ul style="list-style-type: none"> • Construction vehicles and equipment to arrive on site clean and free of leaks • Construction vehicles and equipment be maintained in good working order and inspected daily for leaks • Drip trays, pads or sheets to be used when transferring fuel • <i>GR 130.6 General</i> • <i>GR130.10 Spills and Remediation and Emergency Response</i> 	Minimal risk of impairment of groundwater quality	Not significant
Impaired groundwater quality in the local assessment area from sewage and grey water releases during construction	<ul style="list-style-type: none"> • Sewage and grey water to be collected by provision of a wastewater management system • Collected sewage to be removed from the site • Transportation of sewage to a licenced wastewater treatment system • <i>GR130.9.2.3 Domestic Sewage and Grey Water</i> 	Minimal risk of impairment of groundwater quality	Not significant
Impaired groundwater quality from herbicide use	<ul style="list-style-type: none"> • Herbicide to be applied in accordance with manufacturers guidelines 	Minimal risk of impaired	Not significant

Table 6-14: Environmental Effects Analysis for Groundwater

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
during operation and maintenance	<ul style="list-style-type: none"> • Prohibit application within 30 m of any watercourse/waterbody • Avoid application beyond road shoulder • Adhere to permit terms and conditions • <i>GR130.9. Materials Handling, Storage and Disposal</i> 	groundwater quality	

6.7.7 Vegetation

Effects of roads on vegetation and terrestrial ecosystems have been reported by Angold (1997), Forman and Alexander (1998), Trombulak and Frissell (1999), Hui *et al.* (2003), Noss (2002), Watkins *et al.* (2003) and others. The effects include direct habitat loss, altered interior forest conditions, destruction of natural vegetation along road sides, reduction in biomass and decreased primary productivity, introduction of non-native plant species, increased erosion potential and increased abundance of grass species. Mitigation measures to address vegetation effects have been reported by Forman and Alexander (1998) and Daigle (2010). Management guidelines, best practices and environmental protection specifications for all-season and forestry roads provide mitigation measures relevant to the proposed P7a All-Season Road Project (Manitoba Conservation 2010, ESRA 2013).

Potential environmental effects of all-season road projects on the East Side of Lake Winnipeg on vegetation have been identified in the Environmental Assessment Reports to include the spread of non-natives and invasive plant species during construction activities (ESRA 2010) and the loss of forest and wetland vegetation through clearing (Canadian Environmental Assessment Agency 2011). The potential effects identified on forest and wetland communities included loss of area and loss of function associated with invasive species introduced to upland sites.

The proposed P7a All-Season Road Project was determined to affect vegetation and terrestrial ecosystems during pre-construction, construction, and operation and maintenance stages. Potential environmental effects include loss of trees and shrubs due to clearing, loss of medicinally and culturally important species, increased risk of spread of invasive and non-native species introduction, increased risk of forest insect and diseases, loss or impairment of vegetation from accidental releases hazardous substances and use of herbicides, and increased risk of forest fire. The adversity of the effects on vegetation was determined to be low. Measures identified to mitigate adverse effects on vegetation include limiting clearing to designated areas, restoring ground cover vegetation using natural means augmented with planting and seeding as required, maintaining treed buffers, routing road and siting construction activities to avoid loss of plant species of cultural importance, cleaning construction equipment and vehicles prior to bringing them into the construction area, undertaking construction activities including burning during winter months to the extent possible, and controlling herbicide use. The residual environmental effects of the proposed P7a All-Season Road Project on vegetation after the application of mitigation measures were evaluated to be not significant. Vegetation valued environmental components will not be adversely affected with the application of mitigation measures

and implementation of follow-up. Follow-up actions identified include inspections to ensure that mitigation is implemented and effective. The environmental effects analysis for vegetation is summarized in Table 6-15.

Sections of ESRA Environmental Protection Requirements that relate to vegetation protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.20 Wildfires
- GR130.21 Cement Batch Plant and Concrete Wash-Out Area

Table 6-15: Summary of Environmental Effects Analysis for Vegetation.

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Loss of trees and shrubs in the project assessment area due to clearing activities during construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Limit clearing to designated areas within the right-of-way and other designated areas • Restrict equipment and vehicle use outside the designated cleared areas • Grubbing activities to end 2 metres from any standing timber to avoid disturbing the root system of standing trees • Maintain vegetated buffers between borrows and the road where possible • Restore ground cover vegetation along road shoulders using natural means augmented with planting and seeding of native species as required • <i>GR130.17 Clearing and Grubbing</i> 	Tree and shrub clearing confined to the right-of-way	Not significant
Loss of medicinally and culturally important species in the project assessment area due to clearing vegetation during construction	<ul style="list-style-type: none"> • Adjust road alignment and construction sites to avoid medicinal and cultural plants • Flag 100 m construction exclusion areas around medicinal and cultural plant areas • Identify construction exclusion zones on right-of-way mapping for construction contractors • Limit clearing to designated areas within the right-of-way and other designated areas • Prohibit use of equipment and vehicles outside the designated areas • <i>GR130.17 Clearing and Grubbing</i> 	Minimal risk of vegetation mortality	Not significant
Increased risk of spread of invasive and non-native	<ul style="list-style-type: none"> • Clean construction equipment and vehicles prior 	Minimal risk of invasive and	Not significant

Table 6-15: Summary of Environmental Effects Analysis for Vegetation.

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
species introduction in the regional assessment area due to use of contaminated construction equipment during construction	to bringing them into the construction site	non-native species introduction	
Loss or impairment of vegetation in the local assessment area from accidental releases of fuels or hazardous substances during road construction and operation and maintenance	<ul style="list-style-type: none"> • Store fuel in approved containers provided with secondary containment • Drip trays, blankets or pads to be used when transferring fuel at construction sites • Spills to be reported to ESRA and to Manitoba Conservation as required, and are to be cleaned up immediately • Emergency spill response plan to be prepared and kept up to date at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Construction workers to be adequately trained in hazardous materials handling, storage and disposal, and in emergency spill response and clean-up • <i>GR130.9 Handling and Storage of Waste</i> • <i>GR130.10 Spills and Remediation and Emergency Response</i> 	Minimal risk of vegetation mortality	Not significant
Loss/impairment of desirable plant species in the local assessment area from herbicide application road operation and maintenance	<ul style="list-style-type: none"> • Apply herbicides in accordance with manufacturers guidelines • Avoid application beyond road shoulder • Adhere to permit terms and conditions <i>GR130.9. Materials Handling, Storage and Disposal</i> 	Minimal risk of vegetation mortality	Not significant
Increased risk of forest fire in the local and regional assessment area during construction and operation and maintenance	<ul style="list-style-type: none"> • Undertake construction and burning during the winter months to the extent possible • Obtain burning permits for burning between November 16 and September 30 • Prohibit burning of windrow piles during high/extreme forest fire conditions • All fires will be monitored for the duration of burning activities and no fire will be left unattended • Prohibit smoking by construction workers during high/extreme fire conditions • <i>GR130.20 Wildfires</i> 	Minimal risk of forest fires	Not significant

6.7.8 Fish and Aquatic Habitat

6.7.8.1 Fish and Fish Habitat

There have been many studies, reviews, reports and scientific papers on the effects of roads on fish and fish habitat and an almost equal compliment of guidelines, best practices and operational statements. The effects of roads on the environment, ecosystems and biodiversity including aquatic ecosystems have been reviewed by Spellerberg (1998), Nietvelt (2002), Donaldson and Bennett (2004), Coffin (2007), Daigle (2010) and others. The environmental effects of roads on fish and fish habitat are direct and indirect, short- and long-term and local and widespread. North/South Consultants (2014) provided a review of the literature on erosion and sedimentation of streams, loss of fish habitat, introduction of deleterious substances, use of explosives, temporary crossings and improved access.

Previous environmental assessments on all season roads on the east side of Lake Winnipeg (ESRA 2010, 2011) identified environmental effects on fish and fish habitat. Environmental effects identified included habitat sedimentation, loss of fish habitat, blockage of fish passage and reduced fish populations. With the implementation of mitigation measures including follow-up, the effects of the road projects on fish and fish habitat were determined to be not significant.

The potential effects of the proposed P7a All-Season Road on fish and fish habitat were described and assessed by North/South Consultants (2014) based on the project description, literature review and results from field investigations. Erosion and sedimentation of streams, loss of in-stream habitat and riparian vegetation, introduction of deleterious substances (cast-in-place concrete, construction equipment, stormwater runoff and explosives), disruption of habitat due to blasting, temporary stream crossings and improved access to sensitive locations were identified as the main potential effects of the proposed P7a All-Season Road Project on aquatic resources. These effects were determined to be adverse. Proposed mitigation includes locating roads, quarry and borrow areas, staging areas and construction camps at least 100 m waterbodies, minimizing surface disturbance, leaving vegetated buffers between the road and waterbodies, using clear span bridges with no work below the high water mark, avoiding in-stream work during fish spawning and egg incubation periods, conducting fish salvage, notching ice bridge and removing snow fill crossings, rehabilitating disturbed areas, applying erosion protection and sediment controls and controlling access to sensitive areas. The adversity of effects was determined to be low to moderate. Following the application of mitigation measures, the adverse residual effects expected to result from the proposed P7a All-Season Road Project include the introduction of total suspended solids to streams, alteration or destruction of riparian habitats, and destruction of in-stream habitat. Although there will be permanent loss of habitat that support a commercial, recreational and Aboriginal fishery, the impacts are localized and are not expected to affect the ongoing productivity of the fish species. The residual environmental effects of the proposed P7a All-Season Road Project on fish and fish habitat after the application of mitigation measures were evaluated to be not significant. Aquatic valued environmental components will not be adversely affected by the proposed P7a All-Season Road Project with the application of mitigation measures, and implementation of follow-up. Follow-up actions include: inspections during pre-construction, during construction and post-construction to ensure that mitigation measures are implemented, adequately maintained, and effective; and monitoring to ensure that environmental protection and mitigation measures perform as intended, and also to identify where adaptive management is required. Water

quality monitoring will be carried out in accordance with GR130.15.8 Water Quality Monitoring. The environmental effects analysis for fish and fish habitat is summarized by construction stage in Table 6-16.

Sections of ESRA Environmental Protection Requirements that relate to fish and fish habitat protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.15 Working Within or Near Water
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.21 Cement Batch Plant and Concrete Wash-Out Area

Table 6-16: Summary of Environmental Effects Analysis for Fish and Fish Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Construction			
Impairment of fish habitat in the project assessment area due to in-stream activities during construction	<ul style="list-style-type: none"> • In-stream construction activities conducted in fish bearing watercourse to be timed to avoid fish spawning and incubation periods • In-stream construction to be conducted in isolation of flowing water to mitigate downstream sediment transfer • Fish salvage to be conducted within the isolated work area prior to the commencement of in-stream work • Construction vehicles and machinery to remain above the high water mark during in-stream construction activities to the greatest extent possible • Temporary diversion channels will be constructed to allow for fish passage during in-water construction activities • Carry out construction activities in accordance with timing windows in <i>GR130.15.2 Timing of Work</i> • <i>GR130.15.3 Disturbance to Stream Bed and Stream Banks</i> • <i>GR130.15.5 Stream Crossings</i> • <i>GR130.15.7 Fish Stranding</i> • <i>GR130.16 Erosion and Sediment Control</i> 	<ul style="list-style-type: none"> • Temporary increase in total dissolved solids • Minor injury to fish • Loss of in-stream fish habitat, no serious harm to fish that are part of a commercial, recreational or Aboriginal fisheries, or to fish that support such a fishery 	Not significant
Mortality and injury to fish in the local assessment area due to stranding during culvert and cofferdam construction			
Impaired fish movements in the local assessment area due to stream blockage during construction			

Table 6-16: Summary of Environmental Effects Analysis for Fish and Fish Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
<p>Loss or damage to riparian vegetation, and erosion and sedimentation of streams due to construction of temporary crossings in the project assessment area during construction</p> <p>Disruption of sensitive fish life stages, such as spawning and incubation periods, resulting decreased reproductive success due to temporary crossings, such as fords</p>	<ul style="list-style-type: none"> • Whenever possible, existing trails, roads and cut lines to be used as access to temporary crossings • Temporary crossings to be located within the 60 m cleared right-of-way to avoid riparian effects where possible • Placement and removal of temporary crossing structures will be timed to avoid high fish migration periods • Approaches to be stabilized as required to protect stream banks (e.g., swamp pads, logs) • Temporary crossing structures to be removed when no longer required and the crossing site will be restored to its original conditions • Carry out construction activities in accordance with timing windows in <i>GR130.15.2 Timing of Work</i> • Construction activities shall not occur within 100 metres of a watercourse; where this is not possible, a buffer zone of undisturbed vegetation between the construction activities and the watercourse shall be established • <i>GR130.15.1 General</i> • <i>GR130.15.5 Stream Crossings</i> 	<ul style="list-style-type: none"> • Loss of riparian habitat and its contribution to fish habitat • Temporary increase in total dissolved solids • Loss of in-stream fish habitat, no serious harm to fish that are part of a commercial, recreational or Aboriginal fisheries, or to fish that support such a fishery 	<p>Not significant</p>
<p>Impaired fish habitat in the project assessment area due to fording streams during construction</p>	<ul style="list-style-type: none"> • Fording in flowing waters to avoid periods of fish spawning, incubation and migration • Fording to avoid known fish spawning and rearing areas • Carry out construction activities in accordance with timing windows in <i>GR130.15.2 Timing of Work</i> • <i>GR130.15.5 Stream Crossings</i> 	<p>Minor impairment of fish habitat</p>	<p>Not significant</p>

Table 6-16: Summary of Environmental Effects Analysis for Fish and Fish Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Impaired fish habitat in the project assessment area due to use of ice bridges and snow fills during construction	<ul style="list-style-type: none"> • Ice bridges to be constructed of clean water, ice and snow only and not block naturally occurring flows • The withdrawal of water used in the construction of ice bridges not to exceed 10% of the instantaneous flow • When an ice bridge no longer required or the crossing season has ended, ice bridges to be notched at the centre to prevent the obstruction of fish movement • Snow fills to be constructed of clean snow and not restrict stream flows • When a snow fill is no longer required or the crossing season has ended, compact snow to be removed prior to freset • <i>GR130.15.5 Stream Crossings</i> 	Minor impairment of fish habitat	Not significant
Impairment of fish habitat in the project assessment area due to use of explosives adjacent to waterways during construction	<ul style="list-style-type: none"> • Explosive materials to be handled and stored in manner to minimize accidental spills or releases into watercourses • Explosive materials to be stored a minimum of 100 m from the high water mark • Storage and transport containers to be regularly inspected and maintained to prevent spills • All crew members working with explosives to be trained in spill containment and clean-up procedures • Ammonium nitrate-fuel oil mixtures are not to be used in or near watercourses. • Blasting is not to be conducted in watercourses • Explosives to be detonated and/or weighted of explosive charge at sufficient distance from the watercourse to ensure that overpressure levels do not exceed 100 kPa at the land-water interface <p><i>GR130.15.10 Blasting Near a Watercourse</i></p>	<ul style="list-style-type: none"> • Minor impairment of fish habitat • No mortality or injury to fish, no serious harm to fish that are part of a commercial, recreational or Aboriginal fisheries, or to fish that support such a fishery 	Not significant
Mortality and injury to fish adults, young and eggs in the project assessment area due to use of explosives adjacent to waterways during construction			
Impairment of water quality and fish habitat in the local assessment area from improved access by construction workers during construction	<ul style="list-style-type: none"> • Decommission and rehabilitate construction access roads and winter roads • Prohibit unnecessary access to sensitive areas by work crews • Restrict access to major watercourse crossings using measures such as slope treatment and fencing 	<ul style="list-style-type: none"> • Minor impairment of water quality and fish habitat • Minor increasing fish harvest 	Not significant
Increased fish harvest in the local assessment area due to improved access by workers during construction			

Table 6-16: Summary of Environmental Effects Analysis for Fish and Fish Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Post Construction			
Impaired fish movements in the local assessment area due to improperly installed culverts during operation and maintenance	<ul style="list-style-type: none"> Stream crossings to be inspected following the first storm event and first freshet to ensure that there are no visible signs of bank and channel instability Disturbed areas to be re-vegetated following completion of works 	<ul style="list-style-type: none"> Minor temporary impairment of fish movements Minor impairment of water quality 	Not significant
Impaired water quality and fish habitat in the local assessment area due to suspended sediments from cleared areas during operation and maintenance	<ul style="list-style-type: none"> Stream crossings to be inspected to ensure that adequate levels of vegetation are established in disturbed areas adjacent to watercourses. <i>GR130.15.9 Culvert Maintenance and Replacement</i> <i>GR130.16 Erosion and Sediment Control</i> <i>GR130.15.5 Stream Crossings</i> 		
Operation and Maintenance			
Impairment of fish habitat in the local assessment area due to removal of debris on bridges during operation and maintenance	<ul style="list-style-type: none"> Unless considered an emergency work, debris removal to be timed to avoid periods of fish spawning, incubation and migration Debris removal to be conducted by machinery operating from shore above the high water mark or by hand 	Improvement of fish habitat with removal	Not significant
Impairment of water quality in the local assessment area due to removal and application of protective coatings during operation and maintenance	<ul style="list-style-type: none"> Removal and application of protective coatings to be conducted in a way that prevents deleterious substances (e.g., paint, paint flakes, blasting abrasives, solvents, etc.) from entering the watercourse (e.g., use of barges or shrouding) Paints, solvents and other deleterious substances to be stored and mixed on land (i.e., not on bridge decks) to prevent accidental releases into watercourses Equipment to be cleaned where wash water will not enter the watercourse Waste materials (e.g., paint flakes, abrasives, etc.) will be properly contained and disposed 	No impairment of water quality, no serious harm to fish that are part of a commercial, recreational or Aboriginal fisheries, or to fish that support such a fishery	Not significant

Table 6-16: Summary of Environmental Effects Analysis for Fish and Fish Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Impaired water quality and fish habitat in the local assessment area from culvert maintenance and replacement during operation and maintenance	<ul style="list-style-type: none"> • Carry out culvert maintenance in accordance with timing windows in <i>GR130.15.2 Timing of Work</i> • Limit removal of accumulated material to the area of the culvert • Install erosion controls in accordance with <i>GR130.16 Erosion and Sediment Control</i> • Remove accumulated material slowly • Replacement of culverts to occur in isolated and dewatered worksites • Water quality monitoring shall be required for in-water work in fish-bearing watercourses and may be required when working near fish-bearing watercourses or tributaries to fish-bearing watercourses to demonstrate that non-deleterious are not entering into watercourse • <i>GR130.15.8 Water Quality Monitoring</i> • <i>GR130.15.9 Culvert Maintenance and Replacement</i> 	Minor temporary impairment of water quality and fish habitat	Not significant
Impaired water quality and fish habitat in the local assessment area due to vegetation clearing, windrowing and burning during operation and maintenance	<ul style="list-style-type: none"> • Vegetation management required to maintain line of sight safety requirements within the right-of-way will include the removal of trees and tall shrubs • Low-growing vegetation is to be retained • Slash or debris piles to be stabilized and stored above the high water mark until disposal • Vehicle maintenance to be carried out a minimum of 100 m from the high water mark • Clearing and grubbing shall not occur between April 1 and September 1 of any year to minimize disturbance to wildlife and habitat • <i>GR130.17 Clearing and Grubbing</i> 	Minor impairment of water quality Minor destruction of in-stream habitat, no serious harm to fish that are part of a commercial, recreational or Aboriginal fisheries, or to fish that support such a fishery	Not significant
Impaired water quality in the local assessment area due to leaks and releases of from heavy equipment and vehicles during operation and maintenance			

Site-specific mitigation measures for watercourse crossings containing harvested fish species are presented in Table 6-17 below.

Table 6-17: Site-Specific Mitigation Measures for Watercourse Crossings

Culvert No.	Watercourse/ (Structure)	Sensitivity	Mitigation Measures
2	Unnamed Fishing Lake Tributary (Culvert)	Potential northern pike spawning and rearing area downstream of crossing site	<ul style="list-style-type: none"> • In-water construction to avoid spawning and incubation periods for spring spawning fish (April 1-June 15) • In-water work to be conducted in isolation of

Table 6-17: Site-Specific Mitigation Measures for Watercourse Crossings

Culvert No.	Watercourse/ (Structure)	Sensitivity	Mitigation Measures
			flowing water to mitigate sediment transfer to downstream habitats
7	Fishing to Family Lake Channel	Sloping bedrock shorelines provide little buffer for spills increasing the risk of accidental spills entering the fish –bearing watercourse; in water work could potentially disrupt fish during sensitive periods including spawning and egg incubation	<ul style="list-style-type: none"> • Ensure appropriate fueling/hazardous chemical buffers are implemented • In-water activity, including construction of instream piers or placement of rip rap below the high water mark will avoid spawning and incubation periods in spring (April 1-June 15) summer (May 1 – June 30) • In water work to be conducted in isolation of flowing water to mitigate sediment transfer to downstream habitats
8	Unnamed Family Lake tributary (Culvert)	Potential northern pike spawning area downstream of crossing site	<ul style="list-style-type: none"> • In-water construction to avoid spawning and incubation periods for spring spawning fish (April 1-June 15) • In water work to be conducted in isolation of flowing water to mitigate sediment transfer to downstream habitats
9	Root Creek (Single span Acrow panel bridge)	Spawning area immediately downstream from the crossing; potential disruption of fish during spawning and incubation; areas of bedrock shorelines provide little buffer for spills, increasing the risk of accidental spills entering the watercourse	<ul style="list-style-type: none"> • Establish marshaling area well away from watercourses • If a temporary crossing is required, place upstream from the proposed bridge site (i.e., away from spawning areas) • In-water activity, such as fording in flowing waters, to avoid spawning and incubation periods for spring (April 1-June 15) • Ensure appropriate fueling/hazardous chemical buffers are implemented
12	Unnamed Creek	Potential northern pike spawning area downstream of crossing site	<ul style="list-style-type: none"> • In-water construction will avoid spawning and incubation periods for spring spawning fish (April 1-June 15) • In-water work will be conducted in isolation of flowing water to mitigate sediment transfer to downstream habitats

6.7.8.2 Aquatic Invertebrates

The effects of roads on aquatic invertebrate have been reported in the scientific literature by various authors, including Runde and Hellenthal (2000), Logan (2007) and Wiitala (2013). There are numerous papers on forestry or logging roads (Campbell and Doeg 1989, Davies and Nelson 1994 and Gravelle 2009). The variation of abundance and structural composition of planktonic and benthic communities that are a source of food for fish populations reflects the natural and anthropogenic disturbances affecting aquatic life (St-Onge *et al.* 2001). Changes in allochthonous organic debris (logging debris rather than leaves and twigs), increase in sedimentation (loss of habitat) and changes in primary production are accountable for those changes (Roberge 1996).

North/South Consultants (2014) reported that there are multiple negative effects associated with increased levels of suspended and deposited sediment, including effects on 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. North/South Consultants (2014) also reported that 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. In many streams, terrestrial insects contribute a significant portion 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).

Potential environmental effects of the proposed P7a All-Season Road Project on aquatic invertebrates were identified to include destruction or disturbance of habitats due to surface disturbances and in-stream activities, habitat impairment from suspended sediments, and mortality and habitat impairment from accidental releases of hazardous substances, road surface drainage and use of herbicides. The adversity of the effects was determined to be low to moderate. Mitigation measures identified included minimizing the extent of clearing, leaving vegetated buffers between construction sites and waterbodies, installing erosion protection and sediment control, restricting construction activities to cleared areas, re-vegetating cleared and disturbed areas upon abandonment, scheduling construction during winter months and controlling herbicide use. The residual environmental effects of the proposed P7a All-Season Road Project on aquatic invertebrates after the application of mitigation measures were evaluated to be not significant. No follow-up is required. The environmental effects analysis for aquatic invertebrates is summarized in Table 6-18.

Sections of ESRA Environmental Protection Requirements that relate to aquatic invertebrate protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.15 Working Within or Near Water
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing

Table 6-18: Summary of Environmental Effects Analysis for Aquatic Invertebrates

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
<p>Impairment of aquatic invertebrate habitat in the local assessment area due to in-stream activities during construction</p>	<ul style="list-style-type: none"> • In-stream construction to be conducted in isolation of flowing water to mitigate downstream sediment transfer. • When necessary in-water work shall be staged to occur as a single event, if practical • Construction vehicles and machinery to remain above the high water mark during in-stream construction activities. <p><i>GR130.15.2 Timing of Work</i> <i>GR130.15.3 Disturbance to Stream Bed and Stream Banks</i></p>	<p>Temporary increase in total dissolved solids Minor mortality and injury to invertebrates Small loss of in-stream invertebrate habitat</p>	<p>Not significant</p>
<p>Impairment of aquatic invertebrate habitat due to increased suspended sediments from construction activities</p>	<ul style="list-style-type: none"> • Undertake construction under frozen conditions during winter months to the extent possible • Install erosion and sediment control measures prior to the commencement of construction. • Suspend construction activities near watercourses during storm events. • Locate and stabilize stockpiles well above the high water mark. • Re-vegetate disturbed areas or install erosion protection and sediment control measures upon abandonment • Erosion and sediment control measures to remain in place until disturbed areas are re-vegetated. <p><i>GR130.16 Erosion and Sediment Control</i></p>	<p>Minor impairment of invertebrate habitats</p>	<p>Not significant</p>
<p>Mortality and impaired aquatic invertebrate habitats from releases of fuels and hazardous substances during construction and operation and maintenance</p>	<ul style="list-style-type: none"> • Store fuel in approved containers provided with secondary containment • Drip trays, blankets or pads to be used when transferring fuel at construction sites • Spills to be reported to ESRA and to Manitoba Conservation as required, and are to be cleaned up immediately • Emergency spill response plan to be prepared and kept up to date at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Dangerous goods and hazardous waste storage areas shall have the top soil stripped and lined with ≥30cm of impermeable material to minimize the impact of any leak or spill 	<p>Minimal risk to impairment of invertebrate habitats</p>	<p>Not significant</p>

Table 6-18: Summary of Environmental Effects Analysis for Aquatic Invertebrates

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<i>GR130.9 Handling and Storage of Waste</i> <i>GR130.10 Spills and Remediation and Emergency Response</i>		
Mortality of invertebrates and impairment of habitats in the local assessment area from herbicide application during construction and operation and maintenance	<ul style="list-style-type: none"> • Apply herbicides in accordance with manufacturers guidelines • Prohibit application within 30 m of any watercourse/waterbody • Avoid application beyond road shoulder • Adhere to all applicable permit terms and conditions • Herbicide application will be done by a licensed commercial applicator <i>GR130.9. Materials Handling, Storage and Disposal</i>	Minimal risk of impaired invertebrate habitat	Not significant

6.7.9 Mammals and Mammal Habitat

Transport corridors, including roads, can potentially effect mammal populations due to alteration or loss of habitat, fragmentation or isolation of habitats, increased mortality, disturbance and increased human access.).

Sections of ESRA Environmental Protection Requirements that relate to wildlife and wildlife habitat protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.12 Noise and Noise Limitation
- GR130.15 Working Within or Near Water
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.19 Wildlife

6.7.9.1 Boreal Woodland Caribou

Boreal woodland caribou baseline data acquisition has been undertaken within the Local Assessment Area and Regional Assessment Area from 2011-2015 (Joro 2015), including: collaring, recruitment surveys, group counts, as well as calving site assessment and mortality investigations. These studies have provided a detailed understanding of: caribou distribution within the Local Assessment Area and Regional Assessment Area; Project intersection of caribou core use areas; calving habitat assessment;

range fragmentation; survival, pregnancy and rates of increase; and cumulative effects assessment (Joro 2015). The findings of previous studies on linear developments, the monitoring results for the P1 all-season road and the baseline data studies for this P7a all-season road Project were used to assess the significance of the predicted construction and operation effects to caribou and to identify effective mitigation measures.

Boreal woodland caribou have evolved within the boreal forest. Fire is both a disturbance and part of caribou habitat natural variability in the region, as well as required for regeneration of habitat over the long term (Joro 2015). A fire history analysis conducted within the Atikaki-Berens Management Unit suggests a major burn cycle occurs every 40 years with approximately 2,700-2,800 km² (12-13% of total area) being lost to fire each major burn cycle (Joro 2015). Habitat management toward old growth (fire suppression) forms part of the Current Recovery Strategy and Pending Action Plan for the Atikaki-Berens Management Unit (Manitoba Boreal Woodland Caribou Management Committee 2015).

Boreal woodland caribou have been shown to move across the existing sub-transmission line between Little Grand Rapids and Pauingassi as well as across existing winter roads (Joro 2015). This finding was supported by Traditional Knowledge. Findings from analysis for both P4 and P7a found that existing winter roads or transmission lines do not appear to be preventing access or movements, or separating individuals/populations (Joro 2015). One change observed was that rates of movement marginally increased when crossing linear features, but that the rates remain well below the maximum speeds travelled by caribou.

Calving complexes are located within and around the Local Assessment Area. The majority of known calving complexes and summer core habitat in the vicinity of the Project is located to the west of the proposed alignment. Demonstrated caribou calving site fidelity and available calving habitat suggests these sites are not limiting.

Details regarding the methods and results of the baseline data research and GPS collaring activities are found in Joro 2015. In addition to the above noted findings, no boreal woodland caribou-vehicle collisions have been reported in the Regional Assessment Area in relation to winter or all-season road operation or construction.

Effects and Mitigation

The potential effects on boreal woodland caribou in the Local Assessment Area due to Project construction prior to the implementation of mitigation measures were identified as: loss, alteration or fragmentation of existing habitat and temporary sensory disturbance, increased mortality due to vehicle collisions; increased mortality or changes in distribution due to changes in hunting access, increased mortality or changes in distribution due to changes in predation; and introduction of disease/parasitism (i.e., brainworm from white-tailed deer).

Based on the screening of potential effects (Joro 2015), the following potential adverse effects were identified as having a low level of effect:

- Increased mortality due to vehicle collisions;

- Increased mortality or changes in distribution due to changes in hunting access;
- Increased mortality or changes in distribution due to changes in predation; and
- Introduction of disease/parasitism (i.e. brainworm from white-tailed deer).

Increased Mortality Due to Vehicle Collisions

The P7a all-season road corridor will be restricted to construction personnel, and construction vehicles will be traveling at slow speeds. Information about wildlife awareness will be provided for road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions. Preventative design, dust abatement and traffic management mitigation measures will reduce the magnitude, frequency and likelihood of increased mortality due to vehicle collisions. No boreal woodland caribou-vehicle collisions have been reported in the Regional Assessment Area in relation to winter or all-season roads. As such, any increased risk to boreal woodland caribou in the Local Assessment Area due to vehicle collisions is expected to be low.

Increased Mortality or Changes in Distribution Due to Changes in Hunting Access

The predicted effect of increased hunting access has the potential risk of increased mortality of boreal woodland caribou as a result of hunting activities. Licenced boreal woodland caribou hunting is not currently permitted in Manitoba. The communities have advised that caribou are not harvested by members of Little Grand Rapids or Pauingassi First Nation. As construction proceeds, winter roads, temporary access roads and trails no longer required will be blocked off to limit access and further reduce risk.

As such, increased access as a result of the P7a all-season road is not anticipated to result in increased caribou mortality from local hunting.

The all-season road corridor will be restricted to construction personnel, with the possession of firearms by workers prohibited in camps and at work sites to reduce potential caribou mortality due to hunting during road construction. Road access control will be developed during construction to limit access and to reduce hunting opportunities. Barricades will be installed by camp entrances to restrict the use of the functioning portion of the all-season road, as it is constructed, and to discourage use of the road as a potential access trail. As such, no increased risk in boreal woodland caribou mortality or distribution is expected in the Local Assessment Area due to increased hunting access.

Increased Mortality or Changes in Distribution Due to Changes in Predation

Some literature has suggested that wolves may move along linear corridors (Kunkel and Pletscher 2000; Stein 2000), such as roads. The concern is that a road may allow predators such as wolves to access new areas, and may change existing predator-prey dynamics. However, due to construction disturbance and wolves' natural human avoidance tendencies, wolves are not expected to utilize the P7a all-season road right-of-way during construction. Preliminary results from ongoing monitoring of wolf movement and predation in the Regional Assessment Area indicate very low use of all-season roads (Joro 2015). As such, no increase in caribou mortality or distribution is expected in the Local Assessment Area due to changes in predation.

Introduction of Disease/Parasitism (Brainworm)

Commonly identified potential effect of new linear developments are that they will enable species not common to the area, such as white-tailed deer, to establish themselves. White-tailed deer are also the host for *P. tenuis*, also commonly known as brainworm. Northward encroachment of white-tailed deer in the Local Assessment Area has not been identified during baseline studies conducted from 2011-2015 (Joro 2015). While local communities have occasionally seen white-tailed deer south of the Local Assessment Area, and white-tailed deer may be occasionally present in the Local Assessment Area, their range is generally limited to south of the Bloodvein River (MCWS 2012) and are not anticipated to persist at densities capable of transmitting this parasite in the Project area; therefore, no effects on boreal woodland caribou are expected due to the introduction of parasitism (Joro 2015). Further, the P7a all-season road will not link to other road networks and therefore is not anticipated to enable the encroachment of white-tailed deer.

Based on the screening, the following potential adverse effects were identified as having a moderate level of effect:

- Habitat loss/alteration/fragmentation; and
- Temporary sensory disturbance.

Habitat Loss/Alteration/Fragmentation and Temporary Sensory Disturbance

A potential effect of the Project on boreal woodland caribou is habitat loss/alteration and potential fragmentation as a result of construction due to the clearing of vegetation along the right-of-way, the installation of bridges, culverts, borrow sites and quarries, and the development of temporary access roads and trails. Construction activities may also create temporary sensory disturbances such as noise and vibration.

Linear Features and Core Use Areas

The proposed Project has been located to the east of the existing sub-transmission line. Caribou point density analysis found that caribou were approximately 500m west of this existing sub-transmission line. Historic calving centroids are located over 1 km to the west of the existing sub-transmission line. The next closest calving area is located over 5 km away and isolated from the Project by a water body. The total area of summer core use in the Regional Assessment Area is 1,328 km². Using the Environment Canada guideline of 500m for disturbance associated with linear features, the total area of disturbed summer core areas is 5.7 km² or 0.43% of the total summer core area (Joro 2015). However, this disturbed area overlaps with the area already disturbed by the existing sub-transmission line.

Analysis of boreal woodland caribou core use areas was undertaken to determine the degree of high use habitat disturbance within the Local Assessment Area (Joro 2015). Core use areas can be defined as areas where wildlife (i.e., boreal woodland caribou) utilize habitat at significantly higher rates (for a longer length of time) within home ranges. They are developed using GPS data and surveys with Traditional Knowledge providing supporting evidence. Analysis of data collected from 2011 to 2015 indicates that the all-season road (total length 36.4 km) will intersect about 3 km linear of caribou

summer core use areas and no winter core use areas (Joro 2015). The total area of summer core use in the Regional Assessment Area is 1,328 km². Using the Environment Canada guideline of 500m for disturbance associated with linear features, the total area of disturbed summer core areas is 5.7 km² or 0.43% of the total summer core area (Joro 2015). As previously mentioned this disturbed area overlaps in its entirety with the area already disturbed by the existing sub-transmission line. The results indicate that critical caribou habitat, as represented by calving sites is not adversely affected from baseline nor limiting in the Regional Assessment Area.

Mitigation measures developed to reduce the potential effect of habitat loss/alteration and fragmentation and sensory disturbance include the application of design mitigation measures (Table 6-19). The all-season road routing has avoided areas of high quality habitat where feasible, with efforts to minimize construction related clearing (quarries, borrow, etc.) in potentially sensitive areas (known calving sites and high quality habitat areas). Quarry blasting and other construction activities will be suspended during spring months near known calving sites to avoid parturition times for Boreal Woodland Caribou. Staged construction, i.e., scheduling of construction activities in areas adjacent to sensitive sites until sensitive life cycles have passed (e.g., calving periods of May-June) will be implemented. Vegetation clearing will be limited to fall and winter to the greatest extent feasible, avoiding parturition times for boreal woodland caribou. Borrow areas and quarry sites will be avoided near sensitive habitat. Existing access roads, trails, or cut lines will be used where feasible and new access roads and trails will be kept as short and narrow as feasible. Existing water flow patterns, levels and wetland hydrologic regimes will be maintained and thereby avoid water-related changes to the surrounding habitat.

The existing winter road and temporary access roads and trails will be decommissioned to allow the regeneration of vegetation. A key mitigation measure proposed is to time construction activities in the vicinity of known calving areas outside of the calving window so as to eliminate construction related sensory effects. Quarry and borrow is available throughout the project area and quarries are planned to be located 1.5 km or greater from known calving sites. The proposed Project, located east of the existing sub-transmission line, is not anticipated to result in any substantive additional disturbance resulting in further set-backs during operation. Overall loss of functional habitat through sensory disturbance and road avoidance is considered to be minimal in relation to baseline conditions.

Sections of ESRA's Environmental Protection Procedures and ESRA's Environmental Protection Specifications (GR130s) that will be applied to further avoid or minimize potential adverse effects to ungulates (including moose, and boreal woodland caribou).

Overall loss of functional habitat through sensory disturbance and road avoidance is considered to be minimal in relation to baseline conditions. Further, habitat is not limiting in the Regional Assessment Area.

The residual environmental effects of the proposed P7a All-Season Road Project on boreal woodland caribou after the application of mitigation measures were evaluated to be not significant. Boreal woodland caribou, a valued environmental component, are not expected to be adversely affected with

the application of mitigation measures. Monitoring will provide for adaptive management should ensure environmental protection and mitigation measures not perform as intended. The environmental effects analysis for boreal woodland caribou is summarized in Table 6-19.

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Loss of caribou habitat due to clearing in the project assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way that avoid caribou core use areas as best possible and locate to the east of the existing sub-transmission line • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Identify high quality habitat during baseline study/pre-construction survey and plot on sensitive areas maps • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Minimizes extent of clearing at quarry and borrow areas, and staging areas and construction camps • Identify and flag construction exclusion areas around known or potential sensitive caribou habitat where possible • Restrict/minimize clearing activities near known or potentially sensitive areas as best possible • Positioning and staging of slash piles left from exploratory clearing so as not to create a barrier to movement • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds <p><i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minor loss of caribou habitat	Not significant
Disturbance of caribou due to construction activities in the local assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way that avoids caribou core use areas as best possible • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Identify construction exclusion areas around known or potential sensitive Restrict/minimize clearing activities near known or potentially sensitive areas as best possible • Select quarry and borrow locations with adequate setback from known sensitive caribou sites • Restrict disruptive construction activities during critical calving timing windows <p><i>GR 130.Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i></p>	Minor disturbance to caribou	Not significant

Table 6-19: Summary of Environmental Effects Analysis for Woodland Boreal Caribou

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Disturbance of caribou in the local assessment area due to vehicle traffic and maintenance equipment use during operation and maintenance	<ul style="list-style-type: none"> • Locate road east of the sub-transmission line, away from summer core use areas. • Seasonally restrict disruptive maintenance activities adjacent to known caribou calving sites <i>GR 130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minor disturbance to caribou	Not significant
Displacement of caribou in the local assessment area due to construction activities during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way that avoids caribou core use areas as best possible and locate to the east of the existing sub-transmission line • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Identify and flag construction exclusion areas around known high quality caribou habitat • Identify construction exclusion zones on right-of-way mapping for construction contractors • Restrict disruptive construction activities near known sensitive caribou sites as required • Restrict disruptive construction activities (i.e blasting) during critical calving timing windows <i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minor displacement of caribou	Not significant
Displacement of caribou in the local assessment area during operation and maintenance due to vehicle traffic and maintenance equipment use	<ul style="list-style-type: none"> • Post vehicle speed limits and signage where caribou are known to cross the road • Seasonally restrict disruptive maintenance activities in near known sensitive caribou sites <i>GR 130.Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minor displacement of caribou	Not significant
Mortality of caribou due to increased hunting access affecting caribou population in the regional assessment area during pre-construction , construction and operation and maintenance	<ul style="list-style-type: none"> • Restrict public access to construction sites • Prohibit firearms from being carried by construction workers while on the job site or in construction camps • Design road with no pull-off areas • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Contractor, employees and agents shall not hunt, trap or harass wildlife <i>GR130.19 Wildlife</i>	Negligible mortality of caribou	Not significant

Table 6-19: Summary of Environmental Effects Analysis for Woodland Boreal Caribou

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Mortality of caribou due to collisions with vehicles during construction and operation and maintenance	<ul style="list-style-type: none"> • Identify high quality habitat during baseline study/pre-construction survey and plot on sensitive areas maps • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Restrict vehicle speed limits and post wildlife warning signs in known caribou crossing areas or near known high quality habitat • Manage vegetation along road shoulders to ensure adequate site lines • Salt (an attractant) not planned for use to control ice on road 	Negligible mortality of caribou	Not significant
Mortality of caribou due to increased predation affecting caribou population in the regional assessment area during pre-construction, construction and operation and maintenance	<ul style="list-style-type: none"> • Select right-of-way that avoids caribou core use areas as best possible • Identify high quality habitat during baseline study/pre-construction survey and plot on sensitive areas maps • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Manage vegetation along road shoulders • Salt (an attractant) not planned for use to control ice on road <p><i>GR130.19 Wildlife</i></p>	Negligible mortality of caribou	Not significant
Modified movement and distribution patterns of caribou due to presence of all season road in the local assessment area during operation and maintenance	<ul style="list-style-type: none"> • Maintain vegetated buffers between road and disturbed areas such as quarries and borrow areas • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Manage vegetation along road shoulders • Salt (an attractant) not planned for use to control ice on road 	Minor movement modification	Not significant
Increased fragmentation of caribou habitat due to the presence of all season road in the local assessment area	<ul style="list-style-type: none"> • Co-locate adjacent to existing disturbed or cleared areas (i.e transmission line) for road right-of-way where practical • Maintain vegetated buffers between road and disturbed areas such as quarries and borrow pits • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds 	Negligible to minor increase in fragmentation effects	Not significant

Table 6-19: Summary of Environmental Effects Analysis for Woodland Boreal Caribou

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increased mortality of caribou from predation due to invasive prey species (white-tailed deer) affecting caribou in the regional assessment area due to presence of the all season road corridor	<ul style="list-style-type: none"> • Select right-of-way that avoids caribou core use areas as best possible • Use existing disturbed or cleared areas for road right-of-way where practical • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Manage vegetation along road shoulders • Salt (an attractant) not planned for use to control ice on road 	Negligible mortality of caribou	Not significant
Increased mortality of caribou from brainworm (<i>P. tenuis</i>) due to encroachment of invasive species (white-tailed deer) affecting caribou in the regional assessment area due to presence of the all season road	<ul style="list-style-type: none"> • Use existing disturbed or cleared areas for road right-of-way where practical • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Manage vegetation along road shoulders • Salt (an attractant) not planned for use to control ice on road 	Negligible mortality of caribou	Not significant

6.7.9.2 Moose

Joro Consultants summarized the current literature pertaining to the disturbance effects of linear feature development on moose. Moose select habitats of early successional vegetation such as shrub land areas and deciduous forests (Gillingham and Parker 2008). Such successional vegetation often exists after disturbance, both natural (i.e., wildfires) and anthropogenic (i.e. forest removal) (Stewart *et al.* 2010). Given moose habitat preferences, it is often assumed that linear feature development might benefit moose by offering additional forage species and extended range. They are often able to live within or near human developments as long as there is sufficient forage available.

Habitat selection is most often based on the presence of browse vegetation and they are often attracted to salt pools. Although linear features are thought to create fragmented landscape for wildlife, moose may be able to benefit from the use of newly disturbed areas as they primarily feed on early successional vegetation and select habitat for forage, rather than security from predators. These findings were supported by traditional knowledge interviews with resource harvesters from Little Grand Rapids First Nation and Pauingassi First Nation.

Previous environmental assessments on all season road projects on the east side of Lake Winnipeg identified environmental effects on moose and moose habitat (ESRA 2010, 2011, Canadian Environmental Assessment Agency 2011). Potential environmental effects prior to the implementation of mitigation measures include:

- Loss, alteration or fragmentation of existing habitat and temporary sensory disturbance;
- Increased mortality due to vehicle collisions;
- Increased mortality or changes in distribution due to changes in hunting access;
- Increased mortality or changes in distribution due to changes in predation; and
- Introduction of disease / parasitism (ie. Brainworm from white-tailed deer)

Joro Consultants reported on monitoring of moose carried in relation to construction of Project 1 from PR 304 to Berens River from 2011 to 2015. Monitoring information and conclusions were provided on habitat removal, construction disturbance, hunting, vehicular disturbance and predation. Joro Consultants reported that the overall disturbance to moose populations during construction from noise and equipment movement, and operation and maintenance is determined to be not significant. Moose habitat is not limiting in the local assessment area for the proposed P7a All-Season Road Project. Influx of Brainworm is not anticipated in the local project area as the local project area is beyond the northern extent of known white-tailed deer populations, and will not be directly linked to any outside road network.

The proposed development of the P7a All-Season Road Project may influence moose hunting patterns, by creating more access for local First Nations hunters into new areas. Vehicular collisions with moose may also increase mortality in localized areas. The adversity of the effects was determined to be low to moderate. Mitigation measures include aligning road to avoid high quality moose habitat where possible, selecting a right-of-way for constructability to minimize the extent of clearing for borrow and aggregate sources, identifying important habitat areas as non-disturbance areas restoring ditch areas, providing for natural regeneration of vegetation or re-vegetation of decommissioned areas, blocking access roads, restricting public access to construction sites, prohibiting firearms in construction sites, eliminating pull-offs along roadway, ensuring adequate driver sight lines, posting wildlife warning signs and controlling speed limits at known wildlife crossings. Salt use is not planned for de-icing the proposed all-season road.

ESRA will continue its research and monitoring during construction to ensure that environmental protection and mitigation measures perform as intended, and identify where adaptive management is required. These activities will be used to inform the nature of a post construction monitoring program.

The residual environmental effects of the proposed P7a All-Season Road Project on moose after the application of mitigation measures were evaluated to be not significant. The environmental effects analysis for moose is summarized in Table 6-20.

Table 6-20: Summary of Environmental Effects Analysis for Moose

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increase of moose habitat due to clearing in the project assessment area during pre-construction and construction – creation of early successional habitat	<ul style="list-style-type: none"> • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Identify high quality habitat during baseline study/pre-construction survey and map as an area of non-disturbance • Identify non-disturbance zones on right-of-way mapping for construction contractors • Positioning and staging of slash piles left from exploratory clearing so as not to create a barrier to movement • Minimizes extent of clearing at quarry and borrow areas, and staging areas and construction camps • Seed disturbed ditch areas <i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i>	Net increase in moose habitat	Beneficial
Disturbance of moose due to construction activities in the local assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid high quality habitat at the design stage during route and quarry and borrow site selection where possible • Flag construction exclusion areas around known sensitive high quality moose habitat • Identify construction exclusion zones on right-of-way mapping for construction contractors as required <i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minor disturbance of moose	Not significant
Disturbance of moose in the local assessment area due to vehicle traffic and maintenance equipment use during operation and maintenance	<ul style="list-style-type: none"> • Post speed limits • Seasonally restrict disruptive maintenance activities in known sensitive high quality <i>GR130.12 Noise and Noise Limitations</i>	Limited disturbance of moose	Not significant

Table 6-20: Summary of Environmental Effects Analysis for Moose

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Displacement of moose in the local assessment area due to construction activities during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Where possible, avoid high quality habitat at the design stage during route and quarry and borrow site selection • Flag construction exclusion areas around known sensitive high quality moose habitat • Identify construction exclusion zones on right-of-way mapping for construction contractors as required • Construction activities, including blasting, will be constricted within close proximity to sensitive wildlife or wildlife habitat during critical lifecycle (i.e. calving) <p><i>GR130.12 Noise and Noise Limitations</i></p>	Minor displacement of moose	Not significant
Displacement of moose in the local assessment area during operation and maintenance due to vehicle traffic and maintenance equipment use	<ul style="list-style-type: none"> • Post speed limits • Seasonally restrict disruptive maintenance activities near known sensitive high quality habitat <p><i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i></p>	Limited displacement of moose	Not significant
Increased mortality of moose due to increased hunting access in the regional assessment area during pre-construction, construction and operation and maintenance	<ul style="list-style-type: none"> • Restrict public access to construction sites • Prohibit firearms in construction camps • Design road with no pull-off areas • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds <p><i>GR130.19 Wildlife</i></p>	Minor mortality of moose	Not significant
Increased mortality of moose due to collisions with vehicles in the regional assessment area during construction, operation and maintenance	<ul style="list-style-type: none"> • Identify high quality habitat during baseline study/pre-construction survey and plot on sensitive areas maps • Avoid high quality habitat at the design stage during route and quarry and borrow site selection where possible • Post speed limits • Manage vegetation along road shoulders to ensure adequate site lines • Salt not planned for use to control ice on road; minimizing attraction to roadway <p><i>GR130.19 Wildlife</i></p>	Minor mortality of moose	Not significant

Table 6-20: Summary of Environmental Effects Analysis for Moose

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increased moose mortality due to increased predation in the regional assessment area during pre-construction, construction, operation and maintenance	<ul style="list-style-type: none"> • Avoid high quality habitat at the design stage during route and quarry and borrow site selection where possible • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Manage vegetation along road shoulders • Salt not planned for use to control ice on road; minimizing attraction to roadway <p><i>GR130.19 Wildlife</i></p>	Minor mortality of moose	Not significant
Modified movement and distribution patterns of moose due to presence of all season road in the local assessment area during operation and maintenance	<ul style="list-style-type: none"> • Maintain vegetated buffers between road and disturbed areas such as quarries and borrow areas • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Manage vegetation along road shoulders • Salt not planned for use to control ice on road; minimize attraction to the roadway 	Minor movement modification	Not significant
Increased fragmentation of moose habitat due to the presence of all season road in the local assessment area	<ul style="list-style-type: none"> • Use existing disturbed or cleared areas for road right-of-way where practical • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Maintain vegetated buffers between road and disturbed areas such as quarries and borrow pits • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds 	Minor increase in fragmentation effects	Not significant
Increased mortality of moose from predation due to invasive prey species (white-tailed deer) in the regional assessment area due to presence of the all season road corridor	<ul style="list-style-type: none"> • N/A • Mitigation measures applied for other potential environmental effects will further reduce potential effect. 	Not anticipated	Not significant
Increased mortality of moose from brainworm (<i>P. tenuis</i>) due to invasive prey species (white-tailed deer) affecting moose population in the regional assessment area due to presence of the all season road	<ul style="list-style-type: none"> • N/A • Mitigation measures applied for other potential environmental effects will further reduce potential effect. 	Not anticipated	Not significant

6.7.9.3 Furbearers and Other Mammals

Direct effects of roads on furbearers were reported to be increases in mortality from vehicle collisions or from increased trapping. While roads may have potential adverse effects for some furbearer species, others, such as beavers, can have adverse effects on the road by damming streams at culvert locations or causing washouts. Similarly, some construction activities may prove beneficial to furbearers.

Marten have been found to make seasonal use of regenerating cut areas and regularly use windrow piles for foraging, especially when close to forest edges (Steventon and Major 1982). Lynx have been found to investigate bush piles on recent clear-cuts where porcupines were denning and/or the piles were heavily used by snowshoes hare (Gyug 1994). Wolverine are most abundant where large ungulates are common and carrion is readily available in winter. Denning is an essential component of the wolverine life cycle and occurs beneath rocks, logs, or snow, where snow cover persists into spring (COSEWIC 2003). "Habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations" (Kelsall 1981).

Joro Consultants monitoring of furbearers has found that habitat for furbearers is not limiting in the local assessment area for the proposed P7a All-Season Road Project. Localized disturbance due to noise and vibration may take place during construction and is therefore thought to be temporary. Long-term overall effects of the proposed P7a All-Season Road Project on furbearers within the local assessment area were determined to be not significant. Sections of ESRA Environmental Protection Requirements that relate to furbearer protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.12 Noise and Noise Limitation
- GR130.15 Working Within or Near Water
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.19 Wildlife

The effects of the proposed P7a All-Season Road Project on terrestrial furbearers were determined to include loss of habitat from clearing and habitat alteration fragmentation or displacement from disturbance due to construction activities. The adversity of the effects was determined to be low. Mitigation measures identified include selecting right-of-way for constructability, identifying sensitive high quality habitat, avoiding denning habitats, restricting construction activities around known sensitive sites, restricting speed limits where required, managing waste at camps, prohibiting feeding or harassing of wildlife, encouraging trapping in other areas and reclaiming disturbed areas. The community of Pauingassi has decided to conduct trapping activities in other areas during the construction period for the proposed P7a All-Season Road Project, and trapping effort is expected to shift, rather than increase, with the opening of the all-season road. The residual environmental effects of the proposed P7a All-Season Road Project on terrestrial furbearers after the application of mitigation

measures were evaluated to be not significant. Terrestrial furbearer valued environmental components will not be adversely affected with the application of mitigation measures and monitoring. Monitoring will include inspections to ensure that mitigation measures are implemented, adequately maintained and effective. The environmental effects analysis for terrestrial furbearers is summarized in Table 6-21.

Table 6-21: Summary of Environmental Effects Analysis for Terrestrial Furbearers

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Loss of terrestrial furbearer habitat due to clearing in the project assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Dens identified during surveys and baseline studies to be addressed in construction planning (phasing) • Where dens are encountered during work, adaptive measures will be taken as required. • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds <p><i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minor loss of furbearer habitat	Not significant
Disturbance of terrestrial furbearers due to construction activities in the local assessment area during pre-construction, construction, operation and maintenance	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Clearing and grubbing shall not occur between April 1 and September 1 of any year to minimize disturbances to wildlife and habitat • Dens identified during surveys and baseline studies to be addressed in construction planning (phasing) • Where dens are encountered during work, adaptive measures will be taken as required. <p><i>GR130.12 Noise and Noise Limitations</i> <i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minor disturbance of furbearers	Not significant
Displacement of terrestrial furbearers in the local assessment area due to construction activities during pre-construction, construction, operation and maintenance	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Dens identified during surveys and baseline studies to be addressed in construction planning (phasing) • Where dens are encountered during work, adaptive measures will be taken as required. <p><i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i></p>	Minor disturbance of furbearers	Not significant

Table 6-21: Summary of Environmental Effects Analysis for Terrestrial Furbearers

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Mortality of terrestrial furbearers due to increased predation in the local assessment area during pre-construction, construction, operation and maintenance	<ul style="list-style-type: none"> Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds Leave a vegetation buffer between the ROW and any development including borrow areas, quarries, laydown areas, personal property, utility poles, camps, etc. <i>GR130.17 Clearing and Grubbing</i>	Minimal mortality of furbearers	Not significant
Increased fragmentation of terrestrial furbearer habitat due to the presence of all season road in the local assessment area	<ul style="list-style-type: none"> Use existing disturbed or cleared areas for road right-of-way where practical Maintain vegetated buffers between road and disturbed areas such as quarries and borrow pits Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds 	Minor increase in fragmentation effects	Not significant
Change in trapping success for terrestrial furbearers during operation and maintenance due to presence of road	<ul style="list-style-type: none"> Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds Potentially offer easier access to trapping areas Maintain trapping trails and provide snowmobile access ramps so as to not inhibit travel routes 	Improvement of trapping success not likely measurable	Not significant

The effects of the proposed P7a All-Season Road Project on aquatic furbearers were determined to include loss of habitat from clearing, disturbance and displacement due to construction activities, habitat fragmentation, shift in use or improved trapping success due to improved access. The adversity of the effects was determined to be low. Mitigation measures identified include selecting right-of-way for constructability, identifying critical habitat and avoid where possible, flagging sensitive sites as required, seasonally restricting construction activities around known sensitive sites, protecting riparian areas, installing sediment and erosion control measures along waterbodies, removing beaver dams by slow release, store and dispense fuel no closer than 100 m from watercourses, providing for regrowth of disturbed areas and limiting herbicide use. The community of Pauingassi has voluntarily decided to relocate trapping activities to other areas during the construction period for the proposed Road Project. The residual environmental effects of the proposed P7a All-Season Road Project on aquatic furbearers after the application of mitigation measures were evaluated to be not significant. Aquatic furbearer valued environmental components will not be adversely affected with the application of mitigation measures and implementation of follow-up. Follow-up actions include inspections to ensure that mitigation measures are implemented, adequately maintained and effective. The environmental effects analysis for aquatic furbearers is summarized in Table 6-22.

Table 6-22: Summary of Environmental Effects Analysis for Aquatic Furbearers

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Change in aquatic furbearer habitat due to clearing in the project assessment area during pre-construction and construction	<ul style="list-style-type: none"> Select right-of-way for constructability to minimize the need to extend beyond the project footprint <p><i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minor change in aquatic furbearer habitat	Not significant
Impairment of aquatic furbearer habitat in the local assessment area due to accidental releases of fuels and other hazardous substances during pre-construction, construction, operation and maintenance	<ul style="list-style-type: none"> Store and dispense fuels and other hazardous substances at least 100 m from waterbodies Store fuel in approved containers provided with secondary containment Use drip trays, blankets or pads when dispensing fuel at construction sites All petroleum storage containers and tank vehicles shall be inspected for leaks and spillages Emergency spill response plan to be maintained at construction sites Emergency spill clean-up equipment and materials to be maintained at construction sites <p><i>GR130.9 Handling and Storage of Waste</i> <i>GR130.10 Spills and Remediation and Emergency Response</i></p>	Minor impairment of furbearer habitat	Not significant
Impaired aquatic furbearer habitat due to due to increased suspended sediments in the local assessment area during construction and operation and maintenance	<ul style="list-style-type: none"> Avoid high quality habitat at the design stage during route and quarry and borrow site selection Conduct in-stream work during frozen or winter conditions to the extent possible Maintain 100 m vegetated buffers adjacent to waterbodies except at watercourse crossings Install erosion protection and sediment control along waterbodies prior to construction Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds Maintain vegetated buffers to waterbodies, except at crossing locations wherever possible Vegetation cover will be maintained to the extent possible adjacent to watercourses <p><i>GR130.15 Working Within or Near Water</i> <i>GR130.16 Erosion and Sediment Control</i></p>	Minor impairment of furbearer habitat	Not significant
Disturbance of aquatic furbearers due to construction activities in the local assessment area during pre-construction, construction and operation and maintenance	<ul style="list-style-type: none"> Select right-of-way for constructability to minimize the need to extend beyond the project footprint Maintain vegetated buffers to waterbodies, except at crossing locations wherever possible <p><i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i></p>	Minor disturbance of furbearers	Not significant

Table 6-22: Summary of Environmental Effects Analysis for Aquatic Furbearers

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Displacement of aquatic furbearers in the local assessment area due to construction activities during pre-construction, construction, operation and maintenance	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Maintain vegetated buffers to waterbodies, except at crossing locations wherever possible • Disturbed bed and banks of watercourses shall be restored to pre-existing conditions following disturbance <p><i>GR130.12 Noise and Noise Limitations</i> <i>GR130.15 Working Within or Near Water</i> <i>GR130.19 Wildlife</i></p>	Minor displacement of furbearers	Not significant
Increased fragmentation of aquatic furbearer habitat due to the presence of all season road in the local assessment area	<ul style="list-style-type: none"> • Use existing disturbed or cleared areas for road right-of-way where practical • Maintain vegetated buffers between road and disturbed areas such as quarries and borrow pits where possible • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Utilize appropriate stream crossing structures so as to not restrict water flow and allow for fish passage, and in turn allow for passage of aquatic furbearers where possible 	Minor increase in fragmentation effects	Not significant
Blockage of culverts, flooding and washouts due to beaver dams	<ul style="list-style-type: none"> • Slow release of beaver dams to alleviate water retention and minimize washout potential • Remove beaver dams during open water periods during summer and fall and only under permit issued by MB Conservation • Remove beaver dams slowly to minimize erosion and disturbance to stream bed • Implement beaver management program only if beaver dams become a reoccurring and structural problem • Install beaver cones on culverts as required to facilitate maintenance <p><i>GR130.15.3 Disturbance to Stream Bed and Stream Banks</i> <i>GR130.15.5 Stream Crossings</i></p>	Low risk of blockage with regular inspections	Not significant
Improved trapping success for aquatic furbearers during operation and maintenance due to presence of road	<ul style="list-style-type: none"> • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds • Design road with no pull-off areas 	Improvement of trapping success not like measurable	Not significant

6.7.10 Birds and Bird Habitat

Potential direct environmental effects of roads on birds include habitat loss, fragmentation, vehicle-caused mortality, pollution and poisoning, and indirect effects including noise, barriers to movement and road edges.

The environmental assessment report for the Rice River Road Upgrading and Extension (Manitoba Transportation and Government Services 2006) identified environmental effects of the road project on birds and bird habitat, including disturbance during construction and operation and maintenance, and potential loss or disturbance to raptor nests. Establishment of buffer zones around nests was identified as a mitigation measure for nesting raptors. The PR304 to Berens River All-Season Road and Bloodvein Community All-Season Access Road environmental assessment reports (ESRA 2010, 2011) identified environmental effects on birds and bird habitat to include disturbance from construction and operations noise and vibration, habitat loss, impairment and fragmentation, and mortality from collisions. Mitigation measures for bird and bird habitat included minimizing clearing, conducting clearing, drilling and blasting in fall and winter to avoid disturbance to nesting birds, avoiding destruction and disturbance of raptor nests, and decommissioning and re-vegetating cleared and disturbed areas. Joro Consultants identified migratory birds, raptors, owls, and listed songbirds to be potentially affected by road construction and operation and maintenance activities.

Potential environmental effects of the proposed P7a All-Season Road Project were identified to include loss or impairment of habitat, and destruction of bird nests during construction, disturbance and displacement of birds during construction and operation and maintenance, mortality of birds due to predation, hunting and vehicle collisions and habituation to humans. The adversity of the effects was determined to be low to high, with high adversity attributed to the presence of bird species of conservation concern. Mitigation measures identified include selecting right-of-way for constructability, identifying high quality habitat, avoiding nesting sites, flagging sensitive sites, restricting construction activities around sensitive sites, restricting disruptive construction activities during nesting periods protecting riparian areas, installing erosion protection and sediment along waterbodies, storing and dispensing fuel 100 m from watercourses, prohibiting feeding of wildlife, regular removal of food wastes, encouraging trapping in other areas, reclaiming disturbed areas and controlling herbicide use. The residual environmental effects of the proposed P7a All-Season Road Project on birds and bird habitat after the application of mitigation measures were evaluated to be not significant. Avian valued environmental components will not be adversely affected with the application of mitigation measures and implementation of follow-up. Follow-up actions include inspections to ensure that mitigation measures are implemented, adequately maintained and effective. The environmental effects analysis for birds and bird habitat is summarized in Table 6-23.

Sections of ESRA Environmental Protection Requirements that relate to bird and bird habitat protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response

- GR130.12 Noise and Noise Limitation
- GR130.15 Working Within or Near Water
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.19 Wildlife

Table 6-23: Summary of Environmental Effects Analysis for Birds and Bird Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Loss of bird habitat due to clearing in the project assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Identify high quality habitat including bird nesting sites during baseline study/pre-construction survey • Restrict clearing activities near active bird nests • Select right-of-way to avoid sensitive sites such as raptor nests, rookeries and cavity nesting sites • Flag construction exclusion areas around high quality habitat including nest sites • Identify construction exclusion zones on right-of-way mapping for construction contractors • Reclaim disturbed areas or encourage natural re-vegetation augmented by native plants and seeds <p><i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minimal loss of bird habitat	Not significant
Destruction of bird nests in the project assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Identify bird nest sites including raptor and cavity nest sites during baseline study/pre-construction survey and plot on sensitive areas maps • Restrict clearing activities near active bird nests • Select right-of-way to avoid sensitive sites such as raptor nests, rookeries and cavity nesting sites • Flag construction exclusion areas around high quality habitat including nesting sites • Identify construction exclusion zones on right-of-way mapping for construction contractors <p><i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minimal destruction of bird nests	Not significant

Table 6-23: Summary of Environmental Effects Analysis for Birds and Bird Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Impairment of aquatic bird habitat in the local assessment area due to accidental releases of fuels and other hazardous substances during pre-construction, construction and operation and maintenance	<ul style="list-style-type: none"> • Store and dispense fuels and other hazardous substances at least 100 m from waterbodies • Store fuel in approved containers provided with secondary containment • Use drip trays, blankets or pads when dispensing fuel at construction sites • Emergency spill response plan to be maintained at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Construction workers to receive training in emergency spill response and clean-up <p><i>GR130.9 Handling and Storage of Waste</i> <i>GR130.10 Spills and Remediation and Emergency Response</i></p>	Minimum risk of bird habitat impairment	Not significant
Impaired aquatic bird habitat due to due to increased suspended sediments in the local assessment area during construction and operation and maintenance	<ul style="list-style-type: none"> • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Conduct in-stream work during frozen or winter conditions to the extent possible • Maintain 100 m vegetated buffers adjacent to waterbodies except at watercourse crossings • Install erosion protection and sediment control along waterbodies prior to construction • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds <p><i>GR130.15 Working Within or Near Water</i> <i>GR130.16 Erosion and Sediment Control</i></p>	Minimal impairment of bird habitat	Not significant
Disturbance of birds due to construction activities in the local assessment area during pre-construction, construction and operation and maintenance	<ul style="list-style-type: none"> • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Identify high quality habitat including bird nesting sites during baseline study/pre-construction survey • Restrict disruptive construction activities near active bird nests • Flag construction exclusion areas around high quality habitat including nesting sites • Identify construction exclusion zones on right-of-way mapping for construction contractors • Reclaim disturbed areas and encourage natural re-vegetation augmented by native 	Minor disturbance of birds	Not significant

Table 6-23: Summary of Environmental Effects Analysis for Birds and Bird Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	plants and seeds • A vegetation buffer shall be maintained between ROW and sensitive features including stick nests <i>GR130.12 Noise and Noise Limitations</i> <i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i>		
Displacement of birds in the local assessment area due to construction activities during pre-construction and construction, and operation and maintenance	• Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Restrict disruptive construction activities near active bird nests • Flag construction exclusion areas around high quality habitat including nesting sites • Identify construction exclusion zones on right-of-way mapping for construction contractors <i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minor displacement of birds	Not significant
Mortality of birds due to interactions with vehicles affecting population in the local assessment area during construction and operation and maintenance	• Restrict vehicle speed limits in high quality habitat areas <i>GR130.19 Wildlife</i>	Minimal mortality of birds	Not significant
Mortality of birds due to increased predation affecting population in the local assessment area during pre-construction, construction and operation and maintenance	• Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds	Minimal mortality of birds	Not significant
Mortality of waterfowl and game birds due to increased hunting access affecting population in the regional assessment area during pre-construction, construction and operation and maintenance	• Restrict public access to construction sites • Prohibit firearms in construction camps • Design road with no pull-off areas • Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds <i>GR130.19 Wildlife</i>	Minimal mortality of waterfowl	Not significant
Increased fragmentation of bird habitat due to the presence of all season road in the local assessment area	• Use existing disturbed or cleared areas for road right-of-way where practical • Leave vegetated buffers between road and disturbed areas such as quarries and borrow pits	Minor increase in fragmentation	Not significant

Table 6-23: Summary of Environmental Effects Analysis for Birds and Bird Habitat

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<ul style="list-style-type: none"> Block abandoned access roads and encourage natural re-vegetation augmented by native plants and seeds 		
Mortality of birds due application of herbicides in the local assessment area during operation and maintenance	<ul style="list-style-type: none"> Apply herbicides in accordance with manufacturer's instructions Prohibit herbicide application within 30 m of any waterbody Avoid application of herbicides beyond road shoulder <i>GR130.9. Materials Handling, Storage and Disposal</i>	Low risk of bird mortality	Not significant
Habituation of scavenging birds to humans and foodstuff at construction camps in the local assessment area during construction	<ul style="list-style-type: none"> Prohibit feeding and harassing wildlife Storage of waste food in animal-proof containers Regular removal of wastes to approved waste disposal ground Construction camps and worksites will be kept clean and tidy and free of wildlife attractants <i>GR130.9 Materials Handling, Storage and Disposal</i> <i>GR130.19 Wildlife</i>	Low likelihood of bird habituation	Not significant

6.7.11 Amphibians and Reptiles

The effects of roads on amphibians and reptiles have been reported on and reviewed by various authors over the past decade (Kobylarz 2003, Ovaska *et al.* 2004, Jochimsen *et al.* 2004, Da Silva *et al.* 2007 and Malt 2012). Silva *et al.* (2007), Ovaska *et al.* (2004) and Malt (2012) also assessed effectiveness of mitigation measures and developed best management practices to minimize adverse environmental effects. The main effects of roads on amphibians and reptiles included habitat loss, degradation and fragmentation, harassment, introduction of non-native species and diseases, introduction of contaminants and endocrine disrupting substances, biomagnification, erosion and siltation and others. The PR304 to Berens River All-Season Road environmental assessment report (ESRA 2010) identified environmental effects on amphibians and reptiles to include the potential loss of frog, turtle and snake habitat resulting in a population decline. Mitigation measures identified included road alignment change, re-vegetating cleared and disturbed areas upon abandonment, maintaining surface drainage regimes, installing adequately sized culverts, and installing erosion protection and sediment control measures.

Potential environmental effects of the proposed P7a All-Season Road Project on amphibians and reptiles were identified to include loss and impairment of habitat during construction, disturbance and displacement during construction and operation and maintenance, and mortality due to vehicle interactions and herbicide use during operation and maintenance. The adversity of the effects was

determined to be low to moderate due to the presence of species of conservation concern. Mitigation measures identified included identifying and avoiding high quality habitat, selecting right-of-way for constructability, flagging sensitive sites, restricting clearing around sensitive sites, storing and dispensing fuel 100 m from watercourses, reclaiming disturbed areas, conducting in-stream work in winter and installing erosion protection and sediment control, and controlling herbicide use. The residual environmental effects of the proposed P7a All-Season Road Project on amphibians and reptiles after the application of mitigation measures were evaluated to be not significant. Herptile valued environmental components will not be adversely affected with the application of mitigation measures and implementation of follow-up. Follow-up actions include inspections to ensure that mitigation measures are implemented, adequately maintained and effective. The environmental effects analysis for amphibians and reptiles is summarized in Table 6-24

Sections of ESRA Environmental Protection Requirements that relate to amphibian and reptile protection are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.15 Working Within or Near Water
- GR130.16 Erosion and Sediment Control
- GR130.17 Clearing and Grubbing
- GR130.19 Wildlife

Table 6-24: Summary of Environmental Effects Analysis for Amphibians and Reptiles

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Loss of amphibian and reptile habitat due to clearing in the project assessment area during pre-construction and construction	<ul style="list-style-type: none"> • Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Identify high quality habitat during baseline study/pre-construction survey and plot on sensitive areas maps • Avoid critical habitat at the design stage where possible Identify construction exclusion zones on right-of-way mapping for construction contractors • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds <p><i>GR130.17 Clearing and Grubbing</i> <i>GR130.19 Wildlife</i></p>	Minimal loss of amphibian and reptile habitat	Not significant
Impairment of amphibian and reptile habitat in the local assessment area due to accidental releases of fuels and other hazardous	<ul style="list-style-type: none"> • Store and dispense fuels and other hazardous substances at least 100 m from waterbodies • Store fuel in approved containers provided with secondary containment • Use drip trays, blankets or pads when 	Minimal impairment of amphibian and reptile habitat	Not significant

Table 6-24: Summary of Environmental Effects Analysis for Amphibians and Reptiles

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
substances during pre-construction, construction and operation and maintenance	dispensing fuel at construction sites • Emergency spill response plan to be maintained at construction sites • Emergency spill clean-up equipment and materials to be maintained at construction sites • Construction workers to receive training in emergency spill response and clean-up <i>GR130.9 Handling and Storage of Waste</i> <i>GR130.10 Spills and Remediation and Emergency Response</i>		
Impaired aquatic amphibian and reptile habitat due to due to increased suspended sediments in the local assessment area during construction and operation and maintenance	• Avoid critical habitat at the design stage during route and quarry and borrow site selection • Conduct in-stream work during frozen or winter conditions to the extent possible • Maintain 100 m vegetated buffers adjacent to waterbodies except at watercourse crossings • Install erosion protection and sediment control along waterbodies prior to construction • Reclaim disturbed areas and encourage natural re-vegetation augmented by native plants and seeds <i>GR130.15 Working Within or Near Water</i> <i>GR130.16 Erosion and Sediment Control</i>	Minimal impairment of amphibian and reptile habitat	Not significant
Disturbance of amphibian and reptile habitat due to construction activities in the local assessment area during pre-construction, construction and operation and maintenance	• Select right-of-way for constructability to minimize the need to extend beyond the project footprint • Avoid critical habitat at the design stage where possible • Identify construction exclusion zones on right-of-way mapping for construction contractors <i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minimal disturbance of amphibian and reptile habitat	Not significant
Displacement of amphibians and reptiles due to construction activities in the local assessment area during pre-construction and construction, and operation and maintenance	• Avoid high quality habitat at the design stage during route and quarry and borrow site selection • Restrict disruptive clearing activities within 100 m of high quality habitat • Flag construction exclusion areas around high quality habitat • Identify construction exclusion zones on right-of-way mapping for construction contractors <i>GR130.12 Noise and Noise Limitations</i> <i>GR130.19 Wildlife</i>	Minimal displacement of amphibians and reptiles	Not significant
Mortality of amphibians and reptiles due to interactions with vehicles the local assessment area during construction and	• Restrict vehicle speed limits in high quality habitat areas <i>GR130.19 Wildlife</i>	Minimal mortality of amphibians and reptiles	Not significant

Table 6-24: Summary of Environmental Effects Analysis for Amphibians and Reptiles

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
operation and maintenance			
Mortality of amphibians and reptiles due application of herbicides in the local assessment area during operation and maintenance	<ul style="list-style-type: none"> • Apply herbicides in accordance with manufacturer's instructions • Prohibit herbicide application within 30 m of any waterbody • Avoid application of herbicides beyond road shoulder <i>GR130.9. Materials Handling, Storage and Disposal</i>	Minimal mortality of amphibians and reptiles	Not significant

6.7.12 Effects on Protected Species and Species of Special Interest

Several species of special interest were identified as valued environmental components in Section 6.5 and are listed in Table 6-7. The effects of the proposed P7a All-Season Road Project on these species were considered in the environmental effects assessment in the preceding sections of this Chapter. Mitigation measures specifically related to potential environmental effects on species of are summarized in Table 6-25.

Table 6-25: Summary of Mitigation Measures for Protected Species and Species of Special Interest

Species	Potential Environmental Effects	Mitigation Measures
Tesselated Rattlesnake Plantain	<ul style="list-style-type: none"> • Loss or damage during construction and operation 	<ul style="list-style-type: none"> • Pre-construction survey and flagging • Habitat identification • Habitat protection • Disturbance avoidance • Include on sensitive site mapping
Shortjaw cisco	<ul style="list-style-type: none"> • No effects likely 	<ul style="list-style-type: none"> • Water quality protection • Riparian vegetation protection • Aquatic habitat protection • Deleterious substance prevention • Blasting controls
Lake sturgeon	<ul style="list-style-type: none"> • No effects likely 	
Mapleleaf mussel	<ul style="list-style-type: none"> • Effects unlikely 	<ul style="list-style-type: none"> • Aquatic habitat protection • Deleterious substance prevention
Boreal woodland caribou	<ul style="list-style-type: none"> • Loss of habitat • Movement impairment • Disturbance during calving 	<ul style="list-style-type: none"> • Route adjustment • Habitat protection • Disturbance avoidance • Reclamation of disturbed areas

Table 6-25: Summary of Mitigation Measures for Protected Species and Species of Special Interest

Species	Potential Environmental Effects	Mitigation Measures
		<ul style="list-style-type: none"> • Include on sensitive site mapping
Little Brown Myotis	<ul style="list-style-type: none"> • Effects unlikely 	<ul style="list-style-type: none"> • Pre-construction survey
Northern Myotis	<ul style="list-style-type: none"> • Effects unlikely 	<ul style="list-style-type: none"> • Habitat identification • Habitat protection • Disturbance minimization
Olive-sided flycatcher	<ul style="list-style-type: none"> • No effects likely 	<ul style="list-style-type: none"> • Pre-construction survey • Habitat identification • Habitat protection • Disturbance avoidance • Include on sensitive site mapping
Common nighthawk	<ul style="list-style-type: none"> • No effects likely 	
Canada warbler	<ul style="list-style-type: none"> • No effects likely 	
Eastern whip-poor-will	<ul style="list-style-type: none"> • No effects likely 	
Rusty blackbird	<ul style="list-style-type: none"> • No effects likely 	
Yellow rail	<ul style="list-style-type: none"> • No effects likely 	
Waterfowl	<ul style="list-style-type: none"> • No effects likely 	
Birds of Prey	<ul style="list-style-type: none"> • No effects likely 	
Short-eared owl	<ul style="list-style-type: none"> • Loss of habitat • Destruction of nests • Disturbance during nesting 	
Snapping Turtle	<ul style="list-style-type: none"> • Effects unlikely 	
Green Frog	<ul style="list-style-type: none"> • Effects unlikely 	<ul style="list-style-type: none"> • Disturbance minimization • Deleterious substance prevention • Include on sensitive site mapping

6.8 Socio-Economic Environment and Aboriginal Communities and Land Use

6.8.1 Introduction

This section of the environmental assessment report focuses the potential indirect effects of the proposed P7a All-Season Road Project on the socio-economic environment in the regional assessment area that may occur as a result of biophysical changes in the natural environment and any potential indirect effects that may extend beyond that area. Included in this section are the potential effects of the proposed P7a All-Season Road Project on regional land and resource use (forestry, mining, commercial fishing, hunting and outfitting), parks and protected areas, aesthetics, tourism and recreation, infrastructure and services, health and safety and economic conditions. The potential indirect effects of the proposed P7a All-Season Road Project on Aboriginal communities and land use in the area encompassing Pauingassi and Little Grand Rapids First Nations, Little Grand Rapids Aboriginal Affairs Community and other Aboriginals are discussed in section 6.8.10 of this Chapter. The direct and indirect effects of the proposed P7a All-Season Road Project on heritage and cultural resources are discussed in section 6.8.11.

Environmental effects, mitigation measures, residual environmental effects, and significance evaluations are listed in tabular form for socio-economic environment components in the following sections.

6.8.2 Background Information

Most socio-economic effects are indirect resulting from direct environmental effects, and can be either secondary resulting from increased access or tertiary resulting from increased hunting mortality which, in turn, results from increased access.

6.8.3 Land and Resource Use

Land and resource use along the east side of Lake Winnipeg is described in Chapter 4, Sections 4.5.4 and 4.6.6. Major land and resource uses in the regional assessment area include forestry, mining, outfitting, and parks and protected areas will not be affected by the proposed project. Sport hunting and fishing, and traditional activities including hunting, fishing, trapping and berry picking are also found in the regional assessment area but may be potentially affected by the project at a local scale. This section provides information on the local scale effects on land and resource uses while the following sections provides information on the effects on parks and protected areas (6.8.4) and recreation and tourism (6.8.5). The effects of the proposed P7a All-Season Road Project on traditional land and resource use are provided in Section 6.8.10 under Aboriginal Communities and Land Use.

Construction of the proposed P7a All-Season Road linking Pauingassi and Little Grand Rapids First Nations to the Little Grand Rapids Airport is not expected to have noticeable effects on regional land and resource use. Potential effects on land and resource use from the proposed project stem from access gained to the Little Grand Rapids Airport and areas between the communities of Pauingassi and Little Grand Rapids as a result of the P7a All-Season Road and include the potential for increased competition among commercial fishery operations and licensed sport fishers; the potential interest in

mining exploration between the communities of Pauingassi and Little Grand Rapids First Nation; and a potential shift in the resources use patterns overtime which includes traditional activities and recreational hunting and fishing activities.

The local area is located within Paungassi and Little Grand Rapids Enhanced Management Area where commercial mining and forestry activities are not permitted. Quarries for road development are provided for. These management areas have been passed into legislation under the East Side Traditional Lands Planning and Projected Areas Act.

The proposed All Season Road will not be connected to another all season road network for several years and therefore an increase in poaching activities is not anticipated due to the continued isolation of the area.

Potential mitigation measures include the development of sector or area management plans to provide direction for land and resource use and allocation and economic development in the region and to establish a baseline for future all-season road projects. In the absence of demonstrable environmental effects and specific mitigation measures there are no residual environmental effects. Follow-up actions include monitoring land area resource use activities in the region and establishing a baseline for future all-season road projects. Mitigation measures specifically related to potential environmental effects on lands and resources of are summarized in Table 6-26.

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Potential, gradual interest in mining exploration and forest inventories in anticipation of an all season road to the communities of Pauingassi and Little Grand Rapids	<ul style="list-style-type: none"> • Development sector or area management plans in anticipation of future mining exploration and development • Monitoring mining exploration interests in the region to establish a baseline for future All Season Road Projects 	N/A	Not significant
Increased risk of hunters and poachers accessing parks and protected areas in the regional assessment area during construction	<ul style="list-style-type: none"> • Enforcing construction staff adherence to hunting regulations • Engage parks and wildlife enforcement staff in the planning and design of the All Season Road • Post signage at access points along the P7a All-Season Road 	Minor increase of hunting pressure parks and protected areas	Not significant

6.8.4 Parks and Protected Areas

The areas surrounding Pauingassi and Little Grand First Nations are protected by various means as described in Section 4.5.6 of Chapter 4 (Environment Description). Atikaki Provincial Park is located approximately 12.2 km south of the proposed All Season Road from Pauingassi First Nation to the Little Grand Airport. Atikaki Provincial Park is protected under *The Provincial Parks Act* and Atikaki Provincial Park Regulations, and Manitoba's Protected Areas Initiative, and is administered and

operated by Manitoba Conservation, Eastern Region using guidelines identified in the Atikaki Provincial Park and Bloodvein Canadian Heritage River Management Plan. Lands Management Plans for Pauingassi and Little Grand Rapids First Nations (section 4.1.4 in Chapter 4) describe Traditional Use Management Areas that contain land use zones with various degrees of protection (Pauingassi First Nation and Province of Manitoba 2012, Little Grand Rapids First Nation and Province of Manitoba 2012). These Management Areas are regulated under *The East Side Traditional Lands and Special Protected Areas Act*, the Little Grand Rapids First Nation Traditional Planning Area Regulation, and the Pauingassi First Nation Traditional Planning Area Regulation.

The proposed P7a All-Season Road Project is not likely to have direct adverse effects on the protected areas surrounding the First Nation communities. The proposed P7a All-Season Road Project will facilitate increased travel between Pauingassi First Nation, Little Grand Rapids First Nation and the Airport, but will not facilitate increased visitation by local residents or tourists to the surrounding area. As the road is approximately 12.2 km distance from the park boundary there will be no likely impairment of the wilderness quality of provincial parks and protected areas from the construction of the proposed P7a All-Season Road Project. Feedback received at community meetings held for the Large Area Transportation Network Study indicated a concern that the construction and operation of the proposed P7a All-Season Road may result in decreased abundance and modified movement patterns of wildlife. There is the potential for an increase in legal and illegal hunting by workers during construction of the proposed P7a All-Season Road Project. These concerns have been assessed under Biophysical effects in Section 6.7 of this Chapter. The adversity of the effects of the proposed P7a All-Season Road Project on parks and protected areas was determined to be low. Although no effects are anticipated, measures that can further mitigate this potential include engaging local communities and provincial park managers in the planning and design of the proposed P7a All-Season Road, explaining the proposed P7a All-Season Road Project and soliciting input into the project's design and operation. Other mitigation measures identified include not permitting firearms on construction sites, blocking and re-vegetating access roads when no longer required, and posting signage at access points as appropriate. The residual environmental effects of the proposed P7a All-Season Road Project on parks and protected areas were evaluated to be not significant. Follow-up actions include ensuring mitigation measures are implemented and effective. The environmental effects analysis for parks and protected areas is provided in Table 6-27.

Table 6-27: Summary of Environmental Effects Analysis for Parks and Protected Areas

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Changes in abundance and modified movement patterns of wildlife in the regional assessment area that move out of parks and protected areas and into the local assessment area during construction and operation and maintenance	<ul style="list-style-type: none"> • Engage local communities in the planning and design of the P7a All-Season Road • Engage provincial parks and wildlife managers in the planning and design of the P7a All-Season Road • Solicit feedback • Incorporate inputs from the communities and park and wildlife managers into the design of the P7a All Season Road 	Minor change of wildlife movements from parks and protected areas	Not significant

6.8.5 Tourism and Recreation

Tourism and recreation along the east side of Lake Winnipeg is described in Section 4.5.7 of Chapter 4 (Environment Description). This region is described as having wilderness backcountry tourism and outdoor recreation opportunities. During the construction phase of the proposed P7a All-Season Road Project there is not likely to be a noticeable increase in outdoor recreation activity in the local assessment area. Some road construction workers may engage in outdoor recreational activities during their off hours while at construction camps. When the P7a All-Season Road becomes operational there is limited potential for an increase in tourism and recreation activities in the area due to the improved ease of transportation between the two communities and the airport. The magnitude of the increase is not expected to be large and the potential may not be realized immediately.

The effects of the proposed P7a All-Season Road Project on tourism and recreation are indirect resulting from improved access within the local assessment area in the short term but are not anticipated to have an effect on the regional assessment area. The effects include increased recreational activities by workers during construction, increased tourism and recreational activities post construction, new accommodation facilities have the potential to be developed in community as a result of the P7a All-Season Road Project. Currently no proposed new accommodations have been identified at this time. Both communities have already developed land use plans for their traditional areas which address tourism and recreational opportunities. The overall effect of the proposed P7a All-Season Road Project on tourism and recreation was determined to be beneficial. Measures to mitigate adverse effects of increased tourism and recreation include discouraging construction workers from engaging in destructive recreational activities, provide for the re-vegetation of disturbed areas, and using signage as appropriate. The overall effects on recreation and tourism are expected to be minor, but positive with the potential for increased business and employment opportunities for communities and local residents. The residual environmental effects of the proposed P7a All-Season Road Project on tourism and recreation were evaluated to be not significant. Follow-up actions include ensuring mitigation measures are implemented and effective. The environmental effects analysis for regional tourism and recreation is provided in Table 6-28.

Table 6-28: Summary of Environmental Effects Analysis for Regional Tourism and Recreation

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increased outdoor recreational activities in the local assessment area during construction	<ul style="list-style-type: none"> • Discourage construction workers from engaging in destructive recreational activities • Discourage community members from entering construction sites for safety reasons • Close, sign and re-vegetate access roads immediately after construction 	Managed increase in outdoor recreational activities	Not significant

6.8.6 Aesthetics

Currently the landscape in the local assessment area consists of boreal forest and wetland complexes. Within this area are the following physical attributes: First Nation communities of Pauingassi and Little Grand Rapids, Northern Affairs Community of Little Grand Rapids, Little Grand Rapids Airport, existing winter road and the Manitoba Hydro powerlines, snowmobile trails, portages and traditional travel routes. Additions to the surrounding environment will include the proposed 36.4 km P7a All-Season Road and 1.7 kms of access road to the Little Grand Rapids Airport and Northern Affairs Community, two bridges, six culvert stream crossings and numerous equalization culverts. During construction there will also be quarry sites, borrow pits, staging areas, construction camps and access roads. Some aesthetic effects may be attributed directly to the new P7a All-Season Road while others may be indirectly related to the road through increased access and subsequent environmental damage. The adversity of the effects of the proposed P7a All-Season Road Project on regional aesthetics was determined to be low. Measures to mitigate the effects of the proposed P7a All-Season Road Project on regional aesthetics include engaging local communities, explaining the proposed P7a All-Season Road Project, incorporating results from the communities into project design, providing vegetated buffers between the roadway and adjacent developments, re-vegetating disturbed areas, eliminating pull-off areas, and blocking and re-vegetating abandoned access roads. The residual environmental effects of the proposed P7a All-Season Road Project on regional aesthetics were evaluated to be not significant. The environmental effects analysis for regional aesthetics is provided in Table 6-29.

Table 6-29: Environmental Effects Analysis for Aesthetics

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Impaired aesthetic values in the local assessment area due to construction of the P7a All-Season Road and associated project components, including construction equipment	<ul style="list-style-type: none"> • Engage local communities in the planning and design of the P7a All-Season Road • Solicit feedback. • Incorporate inputs from the communities into the design of the proposed P7a All-Season Road Project • Provide vegetated buffers between the roadway and quarry areas, borrow pits, staging areas and construction camps • Provide for re-vegetation of disturbed areas • Limit vegetative disturbance to the project area 	Minor impairment of aesthetic values	Not significant
Impaired aesthetic values in the local assessment area due to vehicle use of the P7a All-Season Road and human access during operation and maintenance	<ul style="list-style-type: none"> • Engage local communities in the planning of the P7a All-Season Road (i.e. locate bridge at the existing distribution line crossing site) • Solicit feedback. • Incorporate inputs from the communities into operation and maintenance activities • Provide for re-vegetation of disturbed 	Minor impairment of aesthetic values	Not significant

Table 6-29: Environmental Effects Analysis for Aesthetics

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	areas <ul style="list-style-type: none"> • Limit vegetative disturbance to the project area 		

6.8.7 Infrastructure and Services

The infrastructure along the east side of Lake Winnipeg presently consists of roads, ferry landings, airports and utilities including electricity and communications (Chapter 4, Section 4.5.5). Community infrastructure in the communities of Pauingassi and Little Grand Rapids includes roads, communications, septic and water systems, waste disposal and other typical municipal facilities. The Northern Affairs Community of Little Grand Rapids also contains similar infrastructure including the Little Grand Rapids Airport. An existing winter road connects the First Nation communities and the Northern Affairs Community to the Little Grand Rapids Airport and also to the PR 304 Berens River all Season Road which is currently under construction. The P7a All-Season Road between Pauingassi and Little Grand Rapids will constitute an important improvement to the road infrastructure in that area and will likely lead to improvements to the airport and other infrastructure.

The proposed P7a All-Season Road Project will provide a substantial improvement to the existing transportation infrastructure in the local assessment area which currently involves water and air travel in the summer and ice and air travel in the winter. For four to six weeks in the spring and fall the only safe form of transportation between Pauingassi and Little Grand Rapids is by helicopter. The anticipated increase in construction workers not from the local area may put a small increase on the local infrastructure and services (health care, policing and firefighting etc) during the construction period. The establishment of a road maintenance compound in Little Grand Rapids Northern Affairs Community is expected to offset some of the effects of the new road on local infrastructure and services.

There is an opportunity for services, including police, medical, emergency and fire, described in Chapter 4, Section 4.6.7, to improve with the construction of the P7a All-Season Road. The improvement in emergency medical services is expected to come from quicker and safer access to the Little Grand Rapids Airport, which will be accessible 24 hours (i.e. medi-vac). The needs for police, medical, emergency and fire services are not expected to change from current baseline conditions because these services are currently required for the existing transportation methods. While there is an increase in risk from motor vehicle accidents there is a decreased risk in boating and snowmobile accidents.

The overall effect of the proposed P7a All-Season Road Project on infrastructure and services was determined to be beneficial. Measures identified to mitigate the environmental effects include ensuring emergency service providers are aware of the project in advance so they can adjust programs and delivery mechanisms accordingly. The residual environmental effects of the proposed P7a All-Season

Road Project on regional infrastructure and services were evaluated to be not significant. Follow-up actions include ensuring mitigation measures are implemented and effective, and documenting beneficial effects. The environmental effects analysis for infrastructure and services is provided in Table 6-30.

Table 6-30: Summary of Environmental Effects Analysis for Infrastructure and Services

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increased demands on existing local infrastructure and services during construction	<ul style="list-style-type: none"> Ensuring emergency service providers are aware of the project in advance so they can adjust programs and delivery mechanisms accordingly 	Small increase in demand for local infrastructure and services	
Improved road infrastructure between Pauingassi and Little Grand Rapids	<ul style="list-style-type: none"> N/A 	Net improvement in road infrastructure	

6.8.8 Health and Safety

Currently, travel between Pauingassi, Little Grand Rapids and Little Grand Rapids Airport is by winter road, snowmobiles, all-terrain vehicles and air during the winter and by boat, all-terrain vehicle and air during the summer. During spring and fall the main means of travel between the two communities and airport is by helicopter due to unsafe ice conditions on Family and Fishing lakes. The new P7a All-Season Road will substantially improve the safety of travel between the two communities and the airport.

There are inherent health and safety concerns with construction in remote areas that are removed from medical facilities and services. There are risks of construction-related injuries and death specifically during road construction, heavy equipment and machinery use, bridge construction, quarry and borrow pit development, blasting, rock crushing, aggregate sorting and other related activities. Workers are subject to vehicle accidents, hearing damage, burns from fires, injuries from explosions, and health effects from hazard substance use including fuels, herbicides and other materials. During construction, there is a risk of injury and death to the public from construction equipment and machinery, vehicles, fires, explosions, blasting and other activities. They are also subject to hearing impairment from construction noise and blasting, exposure to herbicides and other hazardous substances. The adversity of the effects of road construction on health and safety was determined to be low. Mitigation measures relating to health and safety during road construction include educating workers on safe road construction practices, putting health and safety plans in place prior to commencing work, conducting regular construction site safety meetings, conducting regular safety inspection meetings, equipping vehicles with safety features, educating communities about construction activities, using trained and certified blasting crews, posting no entry warning signs around construction sites, limiting noisy construction activities adjacent to communities and muffling construction equipment and machinery.

During the operation and maintenance of the P7a All-Season Road there are a number of road or traffic related safety risks. These include single and multiple vehicle accidents, collisions with maintenance equipment and accidents involving wildlife. Accidents may be attributed to road or weather conditions, visibility impairment or various driver-related factors. Vehicle accidents or collisions at single-lane bridge crossings are also a concern. The adversity of the effects of road operation and maintenance on health and safety was determined to be low. Mitigation measures relating to health and safety during road operation and maintenance include establishing road speed limits based on design parameters, providing speed limit and warning signage, using a communications program to ensure community members are aware of construction areas, using approved dust suppressants, establishing safe driver sight lines at road bends, managing vegetation along road shoulders, warning drivers about wildlife crossings through the use of wildlife warning signs, displaying warning signs and lights for road maintenance activities and providing warning and speed reduction signs at bridge crossings. The residual environmental effects of the proposed P7a All-Season Road Project on health and safety were evaluated to be not significant. Follow-up actions include ensuring mitigation measures are implemented and effective. The environmental effects analysis for health and safety is provided in Table 6-31. The effects of accidents and malfunctions for the proposed P7a All-Season Road Project are described in greater detail in Section 6.9.

ESRA's Safety Requirements (GR140s) are dedicated to health and safety protection. Sections of ESRA Environmental Protection Requirements that relate to health and safety protection are as follows:

- GR130.3 Submittals
- GR130.6 General
- GR130.10 Spills and Remediation and Emergency Response
- GR130.11. Dust and Particulate Control
- GR130.12 Noise and Noise Limitations
- GR130.14 Staff Training and Awareness

Table 6-31: Summary of Environmental Effects Analysis for Health and Safety

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Reduced risk of injuries, fatalities, accidents and drownings of community members from unsafe travel	• NA	Decreased risk of injury or death	Beneficial
Improved access to airport emergency medical facilities, treatment and services for community members	• NA	Improved access to medical facilities, treatment and services	Beneficial
Road Construction			
Risk of worker injury or death during road and bridge construction and related activities	<ul style="list-style-type: none"> • Workers to be educated regarding safe road construction practices • Health and safety plan to be in place prior to commencing construction • Conduct regular construction site safety 	Minor risk of injury or death	Not significant

Table 6-31: Summary of Environmental Effects Analysis for Health and Safety

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<ul style="list-style-type: none"> meetings • Conduct regular safety inspections of construction sites 		
Risk of worker injury or death from construction equipment-vehicle accidents	<ul style="list-style-type: none"> • Workers to be educated regarding safe construction equipment and vehicle use practices • Vehicles to be equipped with safety mirrors and back-up warning devices 	Minor risk of injury or death	Not significant
Risk of worker injury or death from rock blasting	<ul style="list-style-type: none"> • Workers to be educated regarding safe blasting practices • Communities near blasting to be informed about blasting in the area • Blasting crews to be trained and certified • Blasting locations to be posed warning workers and public about blasting in the area • Warning sirens to be activated prior to detonation of explosives • Blasting sites to be covered to limit debris in the immediate area 	Minor risk of injury or death	Not significant
Risk of worker hearing impairment from exposure to construction activities, equipment and machinery, and blasting	<ul style="list-style-type: none"> • Workers to be educated regarding hearing protection requirements 	Minor risk of hearing impairment	Not significant
Risk of community member injury or death from construction-related activities and construction equipment	<ul style="list-style-type: none"> • Construction communication plan will be provided to the community members • Post no entry warning signs around construction sites 	Minor risk of injury or death	Not significant
Risk of community member hearing impairment from exposure to construction activities, equipment and machinery, and blasting	<ul style="list-style-type: none"> • Construction communication plan will be provided to the community members • Limit noisy construction activities to normal working hours • Designated construction areas where non-workers are not permitted unless proper Personal Protective Equipment is worn. • Comply with community requests for quiet times and locations adjacent to First Nations 	Minor risk of hearing impairment	Not significant
Road Operation and Maintenance			
Risk of injury or death to road users from single or multiple vehicle accidents	<ul style="list-style-type: none"> • Speed limits on road to be established based on road design 	Minor risk of injury or death	Not significant
Risk of injury or death to road users and snowmobile/ATV operators at snowmobile/ATV crossings	<ul style="list-style-type: none"> • Warning signage and markings to be provided at defined snowmobile crossing locations • Ramps for snowmobiles and ATVs to be 	Minor risk of injury or death	Not significant

Table 6-31: Summary of Environmental Effects Analysis for Health and Safety

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	placed at road crossings where existing snowmobile and ATV crossing occur		
Risk of injury or death of boat operators and potentially road users at watercourse crossing /portage sites	<ul style="list-style-type: none"> • Culverts to be designed for boat passage 	Minor risk of injury or death	Not significant
Risk of injury or death to road users due to poor visibility from dust, sight lines and vegetation encroachment	<ul style="list-style-type: none"> • Approved dust suppressants such as water to be used • Sight lines to be established at bends based on safety factors • Shoulder vegetation to be managed by mowing and herbicide use 	Minor risk of injury or death	Not significant
Risk of injury or death to road users from vehicle-wildlife interactions	<ul style="list-style-type: none"> • Posting of wildlife crossing warning signs where appropriate • Speed limits to be reduced and warning signs placed at known wildlife crossings 	Minor risk of injury or death	Not significant
Risk of injury or death to road users from vehicle accidents involving maintenance equipment	<ul style="list-style-type: none"> • Warning signs and lights to be displayed for road maintenance equipment • As required, flag persons will direct traffic around maintenance activities 	Minor risk of injury or death	Not significant
Risk of injury or death to road users from accidents at single-lane bridge crossings	<ul style="list-style-type: none"> • Warning signs with speed reductions will provided at bridge locations 	Minor risk of injury or death	Not significant

6.8.9 Regional Economic Conditions

The effects of all-season road projects on the east side of Lake Winnipeg on regional economic conditions have been reported on in previous environmental assessment reports by the ESRA (2010, 2011) and the Canadian Environmental Assessment Agency (2011). The effects have been reported to include increased economic development opportunities such as fishing, hunting, outfitting, recreation, tourism, forestry, mining, and other resource-based activities. Increased employment opportunities associated with these industries were also identified. “Promises to Keep ...” (East Side Planning Initiative 2004) identifies recommendations on how to ensure that Aboriginal treaty rights and traditional lands are not compromised by resource based developments. The recommendations include conduct of environmental assessments, incorporation of traditional environmental knowledge, preparation of plans, providing community involvement, training and employment, ensuring local enterprise and ownership, and pursuing joint ventures, partnerships and local ownership.

The proposed P7a All-Season Road Project connecting Pauingassi and Little Grand Rapids to the Little Grand Rapids Airport is expected to result in beneficial economic effects including increased employment and contract opportunities for East Side Lake Winnipeg communities in the local and regional assessment area during the construction phase. Commercial airline and air charter companies, regional hauling companies, local and regional suppliers of construction materials and

supplies, goods and services, and other provisions are expected to benefit from the construction stage of the proposed P7a All-Season Road Project. During the operation and maintenance phase the local economy will benefit from the establishment of a road maintenance compound which will provide steady cash flow and employment for the foreseeable future. Other local businesses that provide services directly or indirectly to road transportation including vehicle sales and services, overnight accommodations, restaurants, recreational equipment, fishing and hunting supplies and guiding services will also benefit from the P7a All-Season Road. The effects of road operation and maintenance on economic conditions were determined to be beneficial. Mitigation measures identified include favouring local and regional construction companies, encouraging local employment, requiring local purchasing of local materials, supplies, goods and services. The residual environmental effects of the proposed P7a All-Season Road Project on regional economic conditions after the application of mitigation measures were evaluated to be beneficial. Follow-up measures identified include ensuring that mitigation measures are implemented and effective, and documenting beneficial effects. The environmental effects analysis for regional economic conditions is provided in Table 6-32.

Table 6-32: Summary of Environmental Effects Analysis for Regional Economic Conditions

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increased contract opportunities for east side Lake Winnipeg communities in the regional assessment area during construction	<ul style="list-style-type: none"> Road construction contracts to favour companies from local communities 	Beneficial effect N/A	Beneficial
Increased employment opportunities for east side Lake Winnipeg communities in the regional assessment area during construction	<ul style="list-style-type: none"> Require percentage of employees to be local for road and bridge construction contracts 	Beneficial effect N/A	Beneficial
Increased revenues by local businesses for the purchase of goods and services during construction	<ul style="list-style-type: none"> Require local purchase of goods and services 	Beneficial effect N/A	Beneficial
Increased revenues by local and regional businesses during operation and maintenance	<ul style="list-style-type: none"> Encourage local businesses to provide goods and services 	Beneficial effect N/A	Beneficial

6.8.10 Traditional Land and Resource Use

The effects of roads on traditional land and resource used have been determined from traditional knowledge studies and community engagement that are completed as part of project-specific environmental assessment.

The effects of all-season roads on the east side of Lake Winnipeg have been reported in environmental assessment reports by ESRA (2009, 2010, 2011) and the Canadian Environmental Assessment Agency (2011). The environmental assessment for PR 304 to Berens River All Season Road (ESRA

2010) identified potential effects on traditional land and resource use to include a potential reduction in the supply of moose, caribou, small game and other wildlife, the supply of fish for the community, and the supply of medicinal plants and berries. It was reported that the all-season road would provide Aboriginal community members with easier access into areas for hunting, fishing and gathering that were previously accessible only by boat snowmobile or hiking. These areas will also be accessible by non-Aboriginal community members. The Canadian Environmental Assessment Agency (2011) also identified the effects on traditional land and resource use to include increased legal and illegal hunting, decrease of moose near communities, increased fishing pressure and the risk of fuel spills affecting fish populations. The environmental assessment for the Bloodvein Community All Season Road (ESRA 2011) identified potential effects on traditional land and resource use to result from improved access and include increased hunting pressure and moose mortality, loss of medicinal plants and berry harvesting areas, and potential reduction in trapping income.

Traditional land and resource use information was obtained from Pauingassi and Little Grand Rapids during leadership meetings, community meetings, trapper surveys, traditional knowledge studies and workshops and other sources. The information identified the locations of fishing, hunting, and trapping areas, travel routes, fishing, spawning, plant gathering and trapping sites, burial, cultural, sacred, gathering, educational and overnight sites, and other activities within their traditional territories.

Additional Traditional Land Use and Knowledge information was obtained through a review of the Manitoba Metis Traditional Use and Knowledge Study (MMF, 2011) and Pimachiowin Aki Cultural Landscape Atlas (2012). The Traditional Land Use and Knowledge Study (TLUKS) was conducted to gain information on Métis traditional land use in the regional study area for the PR304 to Berens River (Project 1). The P7a All-Season Road regional assessment area lies within Project 1's regional study area. A review of the TLUKS Study Report revealed that no specific use sites were identified within the project assessment area. Gathering of plant materials, harvesting of small mammals and birds, or trapping were not identified within the local or project assessment areas. Fishing by the Metis was only identified on Fishing Lake within the local assessment area and other waterbodies in the regional assessment area. Large animal harvesting was identified in one area within the local assessment areas, but outside of the project assessment area.

Maps provided in the Pimachiowin Aki Cultural Landscape Atlas, identified historical sites plant harvesting, rabbit snaring, caribou calving, caribou hunting, beaver trapping, mammal and furbearers sites, sturgeon fishing sites, and waterfowl hunting areas. Although a few of the sites (plant harvest and hunting area) were located in close proximity to the project assessment areas, the remaining sites (for all other historical uses) were identified within the local assessment area or the regional assessment area. Discussions with Little Grand Rapids and Pauingassi First Nations, confirmed that none of the historic sites listed in the Atlas are affected by the proposed P7a All-Season Road Project.

The traditional land and resource use information obtained was used in the selection of the P7a All-Season Road alignment, subsequent adjustments leading to the final alignment, and the design of the proposed P7a All-Season Road Project. The potential effects of the proposed P7a All-Season Road Project on traditional land and resource use include interference with trapper routes a decrease in traditional land and resource use due to effects of the road on wildlife and fish species and their habitats, and potential reduction of trapping success and incomes. The adversity of effects of the

proposed P7a All-Season Road Project on traditional land and resource use was determined to be low to moderate.

Mitigation measures identified for traditional land and resource use include conducting traditional knowledge studies, engaging communities in the planning and design, explaining the proposed road project, incorporating inputs from the communities into the design of the road, align road to avoid traditional land and resource use areas, conducting traditional knowledge studies, engaging communities in the documentation, reporting and use of traditional knowledge, constructing road during the winter months closing access roads after construction, and addressing interference within travel routes (e.g. snowmobile access camps, Root Creek portage) through design. In addition, information on the project was provided to community members and resource users to increase understanding of potential effects, and provide for community input into the identification and assessment of mitigation measures. This information also facilitated community initiated discussions on shifting resource areas during construction. The residual environmental effects of the proposed P7a All-Season Road Project on traditional land and resource use after the application of mitigation measures were evaluated to be not significant. Follow-up measures identified include ensuring that mitigation measures are implemented and effective. The environmental effects analysis for traditional land and resource use is provided in Table 6-33.

Table 6-33: Summary of Environmental Effects Analysis for Traditional Land and Resource Use			
Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Increased access to traditional lands for Aboriginal community members for traditional purposes	<ul style="list-style-type: none"> • Block and re-vegetate temporary access roads immediately after construction • Provide access ramps to traditional travel routes bisected by the P7a All-Season Road 	N/A Net improvement for Aboriginal community members	Not significant
Loss or impairment of areas for berry picking and cultural/medicinal plant gatherings due to construction of the P7a All-Season Road	<ul style="list-style-type: none"> • Engage local communities in the planning and design for the P7a All-Season Road • Identify traditional use areas for berry picking, cultural/medicinal plant gatherings and other purposes • Flag traditional use areas prior to construction • Avoid important traditional use areas to the extent possible in the alignment of the P7a All-Season Road 	Minor loss/impairment of traditional use areas	Not significant
Decrease in traditional land and resource use due to effects of the road on wildlife and fish species and their habitats	<ul style="list-style-type: none"> • Engage communities in the planning and design of the P7a All-Season Road • Explain proposed road project and solicit comments, concerns, questions • Incorporate inputs from the communities into the design of the P7a All-Season Road 	Minor decrease in traditional land and resource use	Not significant

Table 6-33: Summary of Environmental Effects Analysis for Traditional Land and Resource Use

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<ul style="list-style-type: none"> • Avoid important traditional land and resource use areas to the extent possible in the alignment of the P7a All-Season Road • Address interference with travel routes through design measures 		
Reduced hunting success due to the effects of the road on wildlife habitat, distribution and mortality	<ul style="list-style-type: none"> • Engage communities in the planning and design of the P7a All-Season Road • Explain proposed road project and solicit comments, concerns, questions • Incorporate inputs from the communities into the design of the P7a All-Season Road • Align P7a All-Season Road to avoid critical habitat • Restrict disruptive construction activities within 0.25 to 5km of high quality habitat during critical life stages • Close temporary access roads immediately after construction to allow for regeneration 	Minor decrease in hunting success	Not significant
Reduced trapping success and income due to effects of the road on furbearer habitat and sensory disturbance	<ul style="list-style-type: none"> • Conduct pre-construction surveys to identify areas of importance to trappers • Provide up-to-date information about the proposed project to trappers • Maintain trapper access to traplines during the construction phase • Maintain trapper trails 	Minimal reduction in trapping success	Not significant
Loss of or impairment of use of travel routes	<ul style="list-style-type: none"> • Watercourse crossings along key travel routes to be designed for boat passage or to include portages • Ramps for snowmobiles and ATVs to be placed at key road crossings where existing snowmobile and ATV crossing occur 	Minimal impairment use of travel routes	Not significant

6.8.11 Heritage and Cultural Resources

Heritage Resources Impact Assessments were conducted for the proposed P7a All-Season Road Project to locate heritage resources, identified potential areas of adverse effects and provide recommendations for mitigation (Northern Lights Heritage Services 2013, 2014). Mapping workshops held with Pauingassi and Little Grand Rapids First Nation Elders provided valuable information on areas of cultural and medicinal importance. This knowledge was transferred onto maps and later

digitized in GIS format. Tangible cultural heritage sites and archaeological sites were identified and located in the local assessment area, but outside of the project assessment area.

The potential effects of the proposed P7a All-Season Road Project on heritage and cultural resources include loss or damage to known and unknown sites and objects during construction, looting and damage to known and unknown sites and objects during construction and operation and maintenance, and destruction and damage of abandoned and unmarked graves, and desecration of human remains during construction and operation and maintenance. The adversity of effects of the P7a All-Season Road Project on heritage and cultural resources was determined to be high. Measures identified to mitigate the adverse effects include aligning the road to avoid known sites and objects, creating exclusion zones around known archaeological sites along road right-of-way during construction, monitoring during early construction, further heritage resource investigations once clearing has been completed, further discussion with elders on protection of heritage resources that could be affected by construction activities, conducting ceremonies for heritage sites that are influenced by construction activities, provide instructions to contractors on procedures to follow if archaeological sites or objects are exposed during construction, blocking access roads and other disturbed areas immediately after construction to provide for regeneration or revegetation, and managing access to limit off road use by visitors to the area. Detailed recommendations to mitigate potentially adverse effects of the proposed P7a All-Season Road Project on heritage and cultural resources are provided by Northern Lights Heritage Services (2013, 2014). The residual environmental effects of the proposed P7a All-Season Road Project on heritage and cultural resources after the application of mitigation measures were evaluated to be not significant. Follow-up measures identified include ensuring that mitigation measures are implemented and effective. The environmental effects analysis for heritage and cultural resources is provided in Table 6-34.

Table 6-34: Summary of Environmental Effects Analysis for Heritage and Cultural Resources.			
Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Loss and damage of known heritage sites and objects in the project assessment during construction	<ul style="list-style-type: none"> • Align P7a All-Season Road to avoid known historic sites and objects • Create construction exclusion areas around known archaeological sites along road right-of-way • Known heritage or cultural resources will be inspected prior to the start of construction where appropriate • Identify construction exclusion zones on right-of-way mapping for construction contractors • Plan work to avoid disturbances to heritage and cultural resource sites • Protect heritage resources that could be affected by construction activities • Conduct ceremonies for heritage sites that are in the vicinity of construction activities 	Minimal risk to heritage sites and objects	Not significant

Table 6-34: Summary of Environmental Effects Analysis for Heritage and Cultural Resources.

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	as requested by communities <ul style="list-style-type: none"> • Provide instructions to contractors on procedures to follow if archaeological sites or objects are exposed during construction • Monitor for heritage resources during early construction activities • Conduct further heritage resource inspections after clearing has been completed • Discuss results of heritage resource investigations with elders • Restrict contractor activities outside of the project area <i>GR130.18 Heritage Resources</i>		
Loss and damage to unknown heritage sites and objects due to increased access in the local assessment area during operation and maintenance	<ul style="list-style-type: none"> • Align P7a All-Season Road to avoid high potential heritage resource areas • Restrict contractor activities outside of project area • Provide instructions to contractors on procedures to follow if archaeological sites or objects are exposed during construction • Block and re-vegetate access roads and other disturbed areas immediately after construction • Manage access to limit off road use by visitors to the area <i>GR130.18 Heritage Resources</i>	Minimal risk to heritage sites and objects	Not significant
Looting and damage to heritage sites and objects in local assessment area during operation and maintenance	<ul style="list-style-type: none"> • Manage access to limit off road use by visitors to the area • Post notices at band offices to report damage to heritage sites and objects <i>GR130.18 Heritage Resources</i>	Minimal risk to heritage sites and objects	Not significant
Destruction and damage of abandoned and unmarked graves, and desecration of human remains in the project assessment area during construction	<ul style="list-style-type: none"> • Align P7a All-Season Road to avoid high potential areas • Provide instructions to contractors on procedures to follow if abandoned or unmarked graves are exposed during construction <i>GR130.18 Heritage Resources</i>	Minimal risk to sites	Not significant
Loss and damage to abandoned and unmarked graves, and desecration of human remains due to increased access in the local assessment area during operation and maintenance	<ul style="list-style-type: none"> • Manage access to limit off road use by visitors to the area • Maintain confidentiality of heritage and cultural use areas <i>GR130.18 Heritage Resources</i>	Minimal risk to heritage sites and objects	Not significant

6.9 Accidents and Malfunctions

During construction and operation and maintenance of the proposed P7a All-Season Road Project there are risks of accidental spills and releases of hazardous materials, accidents or collisions involving construction equipment, machinery, vehicles and wildlife, and fires and explosions.

6.9.1 Hazardous Substances

Hazardous substances used during construction include fuels (gasoline, diesel, propane), lubricating oils and greases, and hydraulic fluids. During construction there is a risk of accidental releases of these hazardous substances during transport to the project location via winter road, during transfer and storage at staging areas and work locations, and during operation of construction equipment, machinery and vehicles. During operation and maintenance, the hazardous substances will include the same fuels (gasoline, diesel, propane), lubricating oils and greases, and hydraulic fluids, but storage will be located in a maintenance compound to be established in Little Grand Rapids Northern Affairs Community. The risk of accidental release of hazardous substances will mainly involve maintenance equipment, transport trucks and passenger vehicles. Releases of hazardous materials during construction or operation and maintenance could result from improper storage, mechanical failures, collisions or careless use. Depending on the nature, size and location of the release, contamination of soils or surface and groundwaters may occur with indirect effects on vegetation, wildlife, and worker and public health and safety.

Hazardous substances will be transported, stored and handled in accordance with *The Dangerous Goods Handling and Transport Act*, *Storage and Handling of Petroleum Products and Allied Petroleum Products Regulation*, *Environmental Accident Reporting Regulation* and guidelines. Hazardous substances are also subject to *The Manitoba Workplace Safety and Health Act*, *Workplace Safety and Health Regulation*. Herbicide use will be in accordance with *The Pesticides and Fertilizers Control Act*, *Pesticides and Fertilizers Control Regulation* and guidelines. Any hazardous wastes will be collected, stored and disposed of locally or if no nearby facilities exist, backhauled out of the community.

ESRA's environmental protection requirements require the Contractor to prepare and implement an Emergency Response Plan for spill response and remediation, material data safety sheets, petroleum storage and equipment refuelling and servicing plan. Construction specifications require the contractor to prepare a waste management plan for approval. The plan must meet stringent procedures for the handling, and disposing of any hazardous waste generated during construction of the proposed P7a All-Season Road Project. Contractors will be required to meet stringent requirements and will conduct transport, store and dispense petroleum products in accordance with applicable legislation, guidelines and best management practices to minimize the risk of spills. Measures will include setback requirements from waterbodies, refueling requirements (i.e., drip pans) and on-site spill response kits. Worker training programs will be included in spill response plans to ensure the proper management of hazardous substances including wastes. Herbicides used will be those approved or recommended by Manitoba Conservation and Water Stewardship and application of herbicides will be in accordance with permit terms and conditions. Follow-up actions will include inspections of hazardous substance storage and dispensing facilities and hazardous waste storage locations, review of incidence and inventory reports and records, periodic testing and evaluation of emergency response procedures and conducting

environmental site assessments as part of decommissioning construction facilities such as fuel storage locations and construction sites.

6.9.2 Fires and Explosions

There are risks of fires and explosions during construction and operation and maintenance of the proposed P7a All-Season Road Project. During construction, fires are possible from construction activities involving equipment, machinery and vehicles, malfunction of construction equipment, and from welding, cutting, portable heaters and burning brush, as well as from careless smoking by workers. Fires are possible during operation and maintenance from maintenance equipment, machinery and vehicles. Forest fires could also result from careless smoking or campfires and natural events such as lightning. Accidental explosions may occur as a result from improper handling and storing petroleum products. Planned explosions will occur with the use of explosives during roadway preparation, rock quarries and bridge abutment construction.

The use of explosives is regulated in Canada under the Explosives Act and regulations and in Manitoba under *The Workplace Safety and Health Act, Workplace Safety and Health Regulation*. The Code of Practice for the Use of Explosives (Manitoba Safe Work 2006) gives employers and workers practical guidance on how they may fulfill their obligations to protect the safety and health of workers and implement and maintain safe systems of work where there is a requirement or permit for workers to use explosives in the workplace.

Fires and explosions can cause serious harm or death to workers, the public and can have adverse effects on the surrounding environment and wildlife depending on local weather and fuel conditions. The risk of forest fires is usually at its highest during the summer months under dry conditions. Fire prevention will be enforced through the application of the appropriate fire codes during construction and operation phase activities. The Contractor's Emergency Response Plan will outline ways to deal with fires and provide emergency measures to be followed, should there be such an occurrence. Provincial fire hazard and risk assessments will be used to guide construction or operations during the forest fire season. Restrictions on smoking at the construction sites and camp locations will be in place and will be enforced on a risk basis. Only trained, certified and licenced contractors will be permitted to use explosives as part the proposed P7a All-Season Road Project. ESRA's environmental protection and safety requirements outline requirements for the use, transportation and storage of explosives. In addition, the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Department of Fisheries and Oceans 1998) will be followed when using explosives near watercourses. Follow-up actions will include inspections of construction sites and work locations, review of incidence and inventory reports and records, and periodic testing and evaluation of emergency response procedures.

6.9.3 Collision Accidents

As with any road project, the potential exists for accidental collisions during construction and operation and maintenance. Accidental collisions involving injury and death to workers are possible during construction between various pieces of construction equipment and vehicles, and between construction equipment and vehicles and wildlife. Accidents during construction can also result in missed deadlines and cost overruns. ESRA's safety requirements outline requirements for the safe management of

construction work sites. The potential for collisions during road operation and maintenance are minimized with the proper design and construction of an all season road. The proposed P7a All-Season Road Project will be constructed based on accepted safety principles and in accordance with the most current safety standards. The most up-to-date Manitoba Government safety standards and road design criteria will be applied, and accepted construction practices will be followed. The design of the proposed P7a All-Season Road Project will incorporate safety measures such as appropriate design and posted speeds, traffic signals and signage. Since the proposed P7a All-Season Road is a new road, its construction will result in an increase in local travel capacity. The Province of Manitoba is responsible for road safety activities including monitoring accident rates, identifying potential collision hazards and establishing an on-going program of safety improvement. Posted speed limits and other road traffic rules will be monitored during operation by policing authorities.

Taking into consideration the implementation of the identified mitigation measures, no residual adverse environmental effects of accidents and malfunctions are anticipated. However, should a significant accident or malfunction occur, there is a risk of reduced soil, surface and groundwater quality and associated disruption to vegetation and vegetation communities, wetlands, wildlife and wildlife habitat. The overall risk has been minimized through design and mitigation measures, including environmental protection and safety requirements and emergency response and safe work plans, and therefore, environmental effects of significant accidents and malfunctions are considered to have a very low probability of occurrence. The environmental effects analysis for accidents and malfunctions is listed in Table 6-36 and are summarized with other environmental effects of the proposed P7a All-Season Road Project in Appendix F.

6.9.4 Summary

Sections of ESRA Environmental Protection Requirements that relate to accidents and malfunctions are as follows:

- GR130.8 Designated Areas and Access
- GR130.9 Materials Handling, Storage and Disposal
- GR130.10 Spills and Remediation and Emergency Response
- GR130.13 Planned and Unplanned Shutdowns
- GR130.20 Wildfires

Sections of ESRA Safety Requirements (2013) that relate to accidents and malfunctions are as follows:

- GR140.5 Safe Work Plan
- GR140.18 Emergency Procedures
- GR140.24 Material Safety Data Sheets (MSDS)
- GR140.29 Traffic Management
- GR140.36 Blasting
- GR140.37 Magazine Licence and Explosives Storage
- GR140.38 Explosives Transportation (By Ground)
- GR140.39 Explosives Transportation (By Air)

Table 6-35: Summary of Environmental Effects Analysis for Accidents and Malfunctions

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Risk of accidental release of hazardous substances during construction and operation and maintenance	<ul style="list-style-type: none"> • Adhere to provincial fuel storage and handling regulations and guidelines • Contractor to prepare emergency response plan and procedures that includes fuel releases • Contractor shall ensure a copy of the Material Safety Data Sheets (MSDS) is in a location accessible to all workers, including ESRA personnel, on the work site, for each hazardous product that is used and / or kept on site 	Minimal risk of fuel release	Not significant
Risk of fire or explosion due to fuels during construction and operation and maintenance	<ul style="list-style-type: none"> • Adhere to applicable explosive storage, use and transportation regulations and Acts • Contractor to prepare safe work plan • Contractor to prepare emergency response plan and procedures that includes fires and explosions • Conduct burning during the winter months and apply for permits between April and November to minimize the risk of a wildfire 	Minimal risk of fire or explosion	Not significant
Risk of forest fire during construction and operation	<ul style="list-style-type: none"> • Maintain on-site fire suppression equipment when working under high to extreme fire conditions • Establish procedures to close road due to proximity of wild fires 	Minimal risk of fire	Not significant
Risk of death or injury from used of explosives during construction	<ul style="list-style-type: none"> • Ensure blasting contractor is licenced, trained and experienced • Provide notification to local residents when working near communities • Provide blast warning signals prior to detonation • Comply with guidelines when blasting near waterbodies 	Minimal risk of accidents and damage from use of explosives	Not significant
Increased risk of construction vehicle/ equipment accidents during construction	<ul style="list-style-type: none"> • Contractor to prepare traffic management plan • Provide warning signage, speed control, flag persons • Adhere to provincial highway safety regulations and codes • Contractor to prepare safe work plan 	Minimal risk of accidents	Not significant
Increased risk of vehicle accident during operation and maintenance	<ul style="list-style-type: none"> • Adhere to provincial highway safety regulations and codes • Contractor to prepare safe working plan • Adhere to provincial highway safety regulations and codes 	Minimal risk of accidents	Not significant

Table 6-35: Summary of Environmental Effects Analysis for Accidents and Malfunctions

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
	<ul style="list-style-type: none"> • Providing warning signage along All Season Road • Provide warning signage at snowmobile crossings 		

6.10 Effects of the Environment

The determination of potential effects of the environment on the proposed P7a All-Season Road Project is based on potential magnification of project effects due to weather conditions, climate variations, flooding, forest fires and earthquakes.

6.10.1 Weather Conditions

The proposed P7a All-Season Road Project will be subject to severe or extreme weather events such as heavy snow falls, blizzards, extreme winds, wind shear, intense rain storms, and possibly tornadoes. These weather events could adversely affect the proposed P7a All-Season Road Project during construction resulting in damage to the environment, cost overruns and missed deadlines. During operation and maintenance the severe weather events could force closure of the road for extended periods of time due to heavy snow accumulations in the winter and stream washouts during the summer. In addition, severe weather events could lead to accidents which, in turn, may result in road closures. However, with proper road design, good construction practices and implementation of mitigation measures, the extent of these effects would be limited in area and short-term in duration.

This environmental assessment has also considered the sensitivity of the proposed P7a All-Season Road Project to variations in or changes to specific climate parameters (e.g., precipitation, wind, temperature, humidity, break-up/freeze up dates, etc.) over time and has generally considered the potential effects that changes in such parameters may have on the project. This assessment has also focused on the environmental effects that could result from longer-term climate change that would alter the frequency and/or severity of extreme weather events that may affect the continued use and maintenance of the P7a All-Season Road.

6.10.2 Flooding

The proposed P7a All-Season Road Project is at risk of flooding due to seasonal flood events. However, the project design standard of 1:100 year flood event for stream crossings is intended to limit the potential for flood damage and washouts at crossings and along the road right-of-way. In addition, the road design includes regular road side equalization culverts and stream crossing culverts to accommodate seasonal drainage flows. Local beaver populations in the vicinity of the P7a All-Season Road may cause damage due to the construction of beaver dams and the plugging of culverts. This may result in erosion at culvert locations and localized flooding. Constructing culverts with beaver

damming prevention devices, and regular inspections and maintenance such as culvert clean-outs will serve to minimise the potential for damage to the road and culvert crossings.

6.10.3 Forest Fires

It is very likely that the portions of the proposed P7a All-Season Road will be subject to forest fires several times over the operational lifetime of the road given the fire frequency of the east side of Lake Winnipeg. In general, the project components are made from materials that are not easily affected by fire (i.e., rock and concrete). Forest fires will result in periodic road closures and possible damage to infrastructure such as bridges and signage. In addition, smoke could lead to accidents which, in turn, may result in road closures. The proposed P7a All-Season Road Project could benefit regional fire efforts by the increased access provided between the Little Grand Rapids Airport and the communities of Pauingassi and Little Grand Rapids.

6.10.4 Earthquakes

The Local Assessment Area is in a low seismic hazard area in Canada. The design standard for the proposed P7a All-Season Road includes the risk for earthquakes.

Taking into consideration the likelihood of extreme weather events, predicted climate changes, risk of flooding, fire and earthquakes and the implementation of the mitigation measures and follow-up actions no residual adverse effects of the environment on the Project would be anticipated. The environmental effects analysis for the effects of the environment on the project is summarized in Table 6-36 and is summarized with other environmental effects of the proposed P7a All-Season Road Project in Appendix E. Section GR130.13 of ESRA's Environmental Protection Requirements deals with planned and unplanned shutdowns.

Table 6-36: Summary of Environmental Effects Analysis for Effects of the Environment on the Project			
Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
Risk of road damage and construction delays due to extreme weather events during construction	<ul style="list-style-type: none"> • Design road to withstand 1:100 year weather events • Suspend construction activities during extreme weather events • Provide additional erosion protection and sediment control as required • Prepare emergency response plan for road construction that includes extreme weather events 	Low risk to project construction	Not significant
Risk of damage and road closures due to extreme weather events during operation and maintenance	<ul style="list-style-type: none"> • Design road to withstand 1:100 year weather events • Coordinate contingency procedures with First Nations and Northern Affairs communities 	Low risk to project damage and operation	Not significant
Risk of road damage and construction delays due to	<ul style="list-style-type: none"> • Suspend construction activities during extreme weather events 	Low risk to project construction	Not significant

Table 6-36: Summary of Environmental Effects Analysis for Effects of the Environment on the Project

Potential Environmental Effects	Mitigation Measures	Residual Environmental Effects	Evaluation
flooding during construction	<ul style="list-style-type: none"> • Provide additional erosion protection and sediment control as required • Prepare emergency response plan for road operation that includes extreme weather events • Prepare emergency response plan for road construction that includes flooding 		
Risk of damage to road infrastructure and road closures due to flooding during operation and maintenance	<ul style="list-style-type: none"> • Design road to withstand 1:100 year flood events • Prepare emergency response plan for road operation that includes flooding • Coordinate contingency procedures with First Nations and Northern Affairs communities 	Low risk to project damage and operation	Not significant
Risk of road damage and construction delays due to forest fires during construction	<ul style="list-style-type: none"> • Enforce no smoking by workers during high and extreme fire conditions • Burn windrows during winter • Prepare emergency response plan for road construction that includes forest fires • Conduct burning during approved periods or under permit 	Low risk to project construction	Not significant
Risk of damage to road infrastructure and road closures due to forest fires during operation and maintenance	<ul style="list-style-type: none"> • Manage vegetation along road shoulders • Prepare emergency response plan for road operation that includes extreme weather events • Coordinate contingency procedures with First Nations and Northern Affairs communities 	Low risk to project damage and operation	Not significant

6.11 Sustainability Assessment

6.11.1 The Sustainable Development Act

In 1998, *The Sustainable Development Act* came into force in Manitoba with the purpose of creating a framework through which sustainable development will be implemented in the provincial public sector and promoted in private industry and in society generally. Among other things, the Act established the principles and guidelines for sustainable development, required the preparation of sustainable development strategies, and provided for the establishment of sustainability indicators and preparation of a provincial sustainable development report. Sustainable development was defined as: “meeting the needs of the present without compromising the ability of future generations to meet their own needs”.

6.11.2 Consultation on Sustainable Development Implementation

The Consultation on Sustainable Development Implementation (COSDI) was a multi-stakeholder, consensus-based process commissioned in 1997 by the government of Manitoba to “consider and make recommendations... on how Manitoba can best implement sustainable development principles and guidelines into decision-making, including environmental management, licensing, land-use planning and regulatory processes.” The COSDI report was adopted as a central component of

Manitoba's sustainable development strategy in 2000. The East Side Planning Initiative was born out of the COSDI report which recommended that the implementation of sustainable development include the creation of broad area plans across the province. Broad area planning was defined as *integrated and coordinated planning that is based on the sustainability of the ecosystem*. Such a planning process ensures that future land, resource and development decisions address the environmental, social, health, cultural and economic needs of the public, local communities, First Nations and various stakeholders and interest groups.

6.11.3 Promises to Keep ...

"Promises to Keep..." Towards a Broad Area Plan for the East Side of Lake Winnipeg (East Side Planning Initiative 2004) reported on its progress towards preparation of a broad area plan for the east side of Lake Winnipeg. The area of eastern Manitoba contained within the boundaries of the East Side of Lake Winnipeg Broad Area Plan is approximately 82,000 km² in area. Thirty-six thousand residents living in 34 communities inhabit the east side, and over 96% of that population is First Nations peoples. The geography is part of the largest ecozone in Canada (Boreal Shield) and contains the fourth largest, contiguous boreal forest in the world. The East Side Planning Initiative sought to put into practice the vision articulated in the COSDI report. This was "To develop an integrated framework for large area and municipal planning, significant resource allocations and environmental management decisions to ensure sustainable development in Manitoba." The vision for East Side Planning Initiative was based on the fundamental principle that the land is and must continue to be protected. Further, it is a vision which:

- equates the importance of human development with the requirement for a wise and sustainable stewardship of the land, thereby recognizing the rights of the inhabitants who live there to have access to services and necessities that will improve the quality of their lives;
- regards the east side as a protected landscape within which economic development activities are permitted if it is agreed that they are sustainable and benefit local communities;
- believes human development must be grounded on integrated and coordinated planning that honours the social integrity of communities and the natural integrity of the environment;
- commits to planning for the sustainability of the ecosystem, where our human interactions with it must maintain or restore ecological integrity and not cause it to deteriorate;
- invites Manitobans to steward and value all the resources that may be found there. These resources include the cultural uniqueness of those who live there and the natural resources that have defined and contributed so significantly to our economy; and
- embraces the immeasurable value to our spiritual and psychological well-being that is provided by a landscape of animals, forests, water, air, soil and rock all of which comprise the natural capital of the area. This landscape has contributed to the definition of our character and identity as Aboriginal peoples, Manitobans and Canadians.

Unsustainable levels of economic activity, or allowing major development to occur in sensitive locations were identified as potential threats to ecological integrity on the east side. The challenge is to achieve a consensus on how to use and protect this landscape in a sustainable manner and to do so using

current scientific data and traditional ecological knowledge. A related activity stemmed from the Canadian Boreal Initiative. The initiative has advanced a framework for boreal forest conservation that seeks to give the highest level of protection to at least 50% of the forest, and support sustainable communities in the remainder, through development based on state-of-the-art stewardship and management practices. The vision of the initiative is to safeguard ecological integrity in the forest, apply sustainable development practices, and ensure local and First Nations engagement in land management decisions.

6.11.4 All Season Road Sustainability

Schedules A and B to Manitoba's *The Sustainable Development Act* define the principles and guidelines of sustainable development. These principles and guidelines form the basis of a sustainability evaluation framework that can be used to describe and assess the sustainability of the proposed P7a All-Season Road Project. Actions taken by ESRA in relation to the principles and guidelines of sustainable development are discussed in Table 6-37.

Principles of Sustainable Development	Actions Undertaken or Professed by ESRA
<p>Integration of Environmental and Economic Decisions</p> <p>Economic decisions should adequately reflect environmental, human health and social effects.</p> <p>Environmental and health initiatives should adequately take into account economic, human health and social consequences.</p>	<ul style="list-style-type: none"> • The proposed P7a All-Season Road Project connecting Pauingassi and Little Grand Rapids First Nations to the Little Grand Rapids Airport is part of the provincial commitment to provide all season road access to and between remote, isolated communities on the east side of Lake Winnipeg. • The purpose of the proposed P7a All-Season Road Project is to provide safe and more reliable road transportation between the communities of Pauingassi and Little Grand Rapids, and to the Little Grand Rapids Airport. • The scope of the environmental assessment on the proposed P7a All-Season Road Project considered biophysical, socio-economic and Aboriginal communities and land use components. • The environmental assessment determined that the P7a All-Season Road Project will not cause significant residual adverse environmental effects, however the project will provide substantial social, economic and health benefits.
<p>Stewardship</p> <p>The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations.</p> <p>Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations.</p> <p>Today's decisions are to be balanced with tomorrow's effects.</p>	<ul style="list-style-type: none"> • ESRA is committed to being a positive and creative force for the protection and enhancement of the environment; having respect for the public that could be affected by our decisions and actions; and being responsible stewards of the environmental resources in our care (ESRA Environmental Protection Policy). • The proposed P7a All-Season Road Project is consistent with the recommendations of Promises to Keep ... in that it is an action today to provide benefit for many generations into the future. • The proposed P7a All-Season Road Project is part of a regional transportation network that will eventually connect the remote communities on the east side of Lake Winnipeg

Table 6-37: Sustainability Assessment for the Proposed P7a All-Season Road Project

Principles of Sustainable Development	Actions Undertaken or Professed by ESRA
	<p>with the provincial road network. This will benefit the health, social well-being and economy of those communities for future generations.</p> <ul style="list-style-type: none"> • The proposed P7a All-Season Road Project, and future road projects, will provide direct contract and direct and indirect employment opportunities for Aboriginal communities in the region.
<p>Shared Responsibility and Understanding</p> <p>Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation.</p> <p>Manitobans share a common economic, physical and social environment.</p> <p>Manitobans should understand and respect differing economic and social views, values, traditions and aspirations.</p> <p>Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including aboriginal peoples, to facilitate equitable management of Manitoba's common resources.</p>	<ul style="list-style-type: none"> • ESRA has undertaken an extensive Aboriginal and public engagement program consisting of community and other leadership meetings, traditional knowledge workshops and studies, and open houses aimed at providing information about the proposed P7a All-Season Road Project and obtaining information for use in the project design and environmental assessment. • Information obtained from the Aboriginal and public engagement program is being incorporated into the final design of the proposed P7a All-Season Road Project and has been used in the development of specific mitigation measures in the environmental assessment report. • The project design has considered the various issues and concerns of Manitobans living on the east side of Lake Winnipeg including regional transportation, economic development and employment opportunities, cost of goods and services and aboriginal and community development.
<p>Prevention</p> <p>Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose effects are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.</p>	<ul style="list-style-type: none"> • ESRA is committed to obtaining a proper understanding of these potential environmental effects and has adopted measures aimed at protecting and preserving our environment and promoting sustainable development (ESRA Environmental Protection Policy). • The proposed P7a All-Season Road Project was subject to a broad-scoped environmental assessment that identified, assessed and mitigated potentially adverse environmental effects and identified environmental protection measures to ensure that mitigation measures are implemented and effective. • Environmental protection plans, specific component plans and monitoring plans will be implemented to prevent potentially adverse environmental effects and to implement actions to correct mitigation measures that are not fully effective.
<p>Conservation and Enhancement</p> <p>Manitobans should:</p> <p>(a) maintain the ecological processes, biological diversity and life-support systems of the environment;</p> <p>(b) harvest renewable resources on a sustainable yield basis;</p> <p>(c) make wise and efficient use of renewable and non-</p>	<ul style="list-style-type: none"> • The proposed P7a All-Season Road Project was subject to a broad-scoped environmental assessment that identified, assessed and mitigated potentially adverse effects on ecological processes, biological diversity and life-support systems. • Specific baseline studies were carried out on vegetation, aquatic and wildlife resources to ensure that the

Table 6-37: Sustainability Assessment for the Proposed P7a All-Season Road Project

Principles of Sustainable Development	Actions Undertaken or Professed by ESRA
<p>renewable resources; and</p> <p>(d) enhance the long-term productive capability, quality and capacity of natural ecosystems.</p>	<p>environmental assessment considered relevant, recent and representative ecological information.</p> <ul style="list-style-type: none"> • Inclusion of traditional and local knowledge in the design of the proposed P7a All-Season Road Project and the environmental assessment helped to ensure that Aboriginal values were considered in decision-making process. • Mitigation measures for the proposed P7a All-Season Road Project include provisions to limit access by hunters and fishers to the region by blocking and re-vegetating temporary access roads.
<p>Rehabilitation and Reclamation</p> <p>Manitobans should:</p> <p>(a) endeavour to repair damage to or degradation of the environment; and</p> <p>(b) consider the need for rehabilitation and reclamation in future decisions and actions.</p>	<ul style="list-style-type: none"> • The proposed P7a All-Season Road Project was designed to use previously disturbed areas wherever possible. • Any contaminated sites encountered along the road right-of-way or caused by construction activities will be assessed and remediated in accordance with provincial standards. • Construction sites for the proposed P7a All-Season Road Project, including quarry sites, borrow areas, staging areas, construction camps, temporary access roads, will be re-vegetated using natural processes augmented with native plants and seeds once they are no longer required.
<p>Global Responsibility</p> <p>Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision-making while developing comprehensive and equitable solutions to problems.</p>	<ul style="list-style-type: none"> • While the focus of the proposed P7a All-Season Road Project is a relatively small area on the east side of Lake Winnipeg, ESRA's scope extends from the east side of Lake Winnipeg region to Manitoba, Canada and beyond. Environmental issues include transportation, boreal woodland caribou protection, protected areas, tourism and recreation which have global implications. • The proposed P7a All-Season Road Project has a small project footprint and a correspondingly small ecological footprint, while the socio-economic footprint is comparatively larger due to employment and economic development opportunities.
<p>Guidelines for Sustainable Development</p>	
<p>Efficient Use of Resources - which means:</p> <p>(a) encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources; and</p> <p>(b) employing full-cost accounting to provide better information for decision makers.</p>	<ul style="list-style-type: none"> • While the proposed P7a All-Season Road Project does not involve the commercial use of natural resources, the environmental assessment considered the protection of existing resources (e.g., forests) and the potential for future resource harvesting and extraction in the future due to improved road access over time. • The potential for future resource harvesting and extraction was considered in the cumulative environmental assessment for the proposed P7a All-Season Road Project.
<p>Public Participation - which means:</p> <p>(a) establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans;</p>	<ul style="list-style-type: none"> • ESRA has built upon the history of public participation carried out for east side of Lake Winnipeg initiatives including the East Side Planning Initiative and the Large Area Transportation Network. • The Aboriginal and public engagement program for the

Table 6-37: Sustainability Assessment for the Proposed P7a All-Season Road Project

Principles of Sustainable Development	Actions Undertaken or Professed by ESRA
<p>(b) endeavouring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions; and</p> <p>(c) striving to achieve consensus amongst citizens with regard to decisions affecting them.</p>	<p>proposed P7a All-Season Road Project consisted of leadership and community meetings, traditional knowledge workshops, and open houses aimed at providing information about the proposed P7a All-Season Road Project and obtaining information for use in the project design and environmental assessment.</p> <ul style="list-style-type: none"> • Notification for the engagement program included newspaper and radio announcements, posters placed in public locations, letters to individuals and organizations, and phone calls to community leadership and coordinators. The ESRA website was also used to inform the public about upcoming events, open houses and meetings. • The engagement program will continue through construction and the operation and maintenance phases of the proposed P7a All-Season Road Project.
<p>Access to Information - which means:</p> <p>(a) encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information; and</p> <p>(b) promoting the opportunity for equal and timely access to information by all Manitobans.</p>	<ul style="list-style-type: none"> • The Aboriginal and public engagement program provided information on the proposed P7a All-Season Road Project to First Nation and other communities and leaderships, and facilitated input to the project design and environmental assessment. • Information obtained from Aboriginal communities during baseline studies and the Aboriginal and public engagement program for the environmental assessment was returned to the communities. This included traditional knowledge shared with ESRA, meeting notes, minutes, maps, photographs and other forms of information. • The environmental assessment report and supporting documentation will be placed on Manitoba's Environmental Assessment and Licensing Branch's public registry.
<p>Integrated Decision Making and Planning - which means: encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sectoral which incorporate an inter-generational perspective of future needs and consequences.</p>	<ul style="list-style-type: none"> • Broad Area Planning for the east side of Lake Winnipeg was born out of the Consultation on Sustainable Development Implementation report (East Side Planning Initiative 2004) and continued through the Large Area Network Study (2010). • These initiatives have served as models for implementing the principles and guidelines of sustainable development, particularly integrated decision making and planning.
<p>Waste Minimization and Substitution - which means:</p> <p>(a) encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and</p> <p>(b) reducing, reusing, recycling and recovering the products of society.</p>	<ul style="list-style-type: none"> • The proposed P7a All-Season Road Project is located in a remote area of Manitoba that is only accessible by air and winter road. This provides both a challenge and an opportunity to ESRA to employ locally available materials, supplies and labour to the extent possible. • The right-of-way for the proposed P7a All-Season Road Project will be selected for constructability to minimize the extent of disturbance beyond the project footprint. • Locally available materials will be used in the construction and operation of the proposed P7a All-Season Road Project to the extent possible, including rock and aggregate materials for road building, and organic soils for reclamation.

Table 6-37: Sustainability Assessment for the Proposed P7a All-Season Road Project

Principles of Sustainable Development	Actions Undertaken or Professed by ESRA
	<ul style="list-style-type: none"> The extent of cleared areas will be minimized as will be number of trees cut; salvageable trees will be made available to local communities for use as firewood.
<p>Research and Innovation - which means: encouraging and assisting the research, development, application and sharing of knowledge and technologies which further our economic, environmental, human health and social well-being.</p>	<ul style="list-style-type: none"> Baseline studies, wildlife research and mapping support to conduct and report on the environmental assessment of the proposed P7a All-Season Road project have employed recent research findings and technologies. Traditional and local knowledge has been used to augment and support scientific knowledge and technologies whenever possible.

6.12 Greenhouse Gas Assessment

Road transportation on the east side of Lake Winnipeg is severely limited with communities depending on air, marine or winter road service. All of these forms of transportation tend to have higher operational costs or are severely limited, thereby resulting in increased costs for goods and services. The most widespread form of transportation throughout the region is air transportation. Most communities have an airport or have access to an airport in a nearby community. For some communities, such as the communities of Pauingassi and Wasagamack, this means taking a boat ride to the airport. For most local residents, air transportation is very costly and is often not an option.

During summer months, some communities are also able to utilize marine transportation such as ferries and barges. For example, communities that are located on the shores of Lake Winnipeg, such as Berens River, Bloodvein and Poplar River First Nation, are able to bring goods into their communities across the lake. However, marine transport is restricted to summer months and is only an option for communities that have marine access. During winter months, most communities are able to use winter roads to travel from one community to another or to travel to a larger centre such as Thompson or Winnipeg. It is during this time that many remote communities bring much of their supplies into their communities since road transportation is generally cheaper than air transportation. It is estimated that approximately 2,500 shipments of staple items such as fuel, groceries, construction materials and general freight are transported each year by commercial trucks on the provincial winter road system.

However, the period of time in which a winter road can be used varies and, with the challenges of climate change, the reliability of the winter road network is increasingly suspect, especially considering the latitude of the network on the east side of Lake Winnipeg. Generally, the window of opportunity for using the winter road network is about eight weeks starting in late January and continuing into mid to late March. However, in recent years, the winter roads have begun to thaw earlier in the year, thereby reducing the already short window for safely using the winter road network.

Runnalls (2004) commented that climate induced changes could have profound effects on the many communities dependent on the boreal forest for their economic livelihoods and social, cultural and spiritual well-being. Shorter, warmer winters could limit the reliability of the winter roads system.

Changes in the location and numbers of wildlife could affect ecotourism operations that rely on hunting and fishing. The timber industry could be affected by reduced yields as trees become more stressed and by increased incidence of forest fires and pest and disease outbreaks. As well, less predictable weather conditions could reduce the reliability of traditional knowledge systems. Some of these predicted effects are already being felt.

Manitoba Conservation and Water Stewardship's Environment Act Proposal Report Guidelines (2014) requires that an environmental assessment report consider the potential effects of a proposed development on the environment including climate change implications using a greenhouse gas inventory calculated according to guidelines developed by Environment Canada and the United Nations. Environment Canada's Technical Guidance on Reporting Greenhouse Gas Emissions (2013) provides guidance on determining whether submission of a greenhouse gas emissions report, and on how to use Canada's greenhouse gas reporting system, how to complete and submit a greenhouse gas report and other relevant documentation.

ESRA contracted a greenhouse gas assessment for the proposed 155 km PR 304 to Berens River All Season Road (Dillon Consulting Ltd. 2011). The assessment employed the CAN/CSA-ISO 14064 protocols to estimate the total direct and indirect greenhouse gas emissions due to the proposed all season road and compared this estimate to the direct and indirect emissions under the baseline scenario (i.e., without the project). The assessment was for the years 2010 to 2013 inclusive which included up to four years of construction and ten years of operation and maintenance. The baseline scenario resulted in a total of approximately 136 kt CO₂e being emitted. Carbon dioxide equivalent (CO₂e) is a unit of measure used to allow the addition of, or the comparison between, gases that have different global warming potentials. Since many greenhouse gases exist and their global warming potentials vary, the emissions are added in a common unit, CO₂e. The project scenario was estimated to emit a total of approximately 163 kt CO₂e over the same time period which is roughly 19% more than the baseline amount. The net change in greenhouse emissions due to the project was estimated to be approximately +27 kt CO₂e over the 10-year period. Substantial portions of the emission are due to the construction of the all season road (~33% of the total). The construction of the road was estimated to increase the province's construction based greenhouse gas emissions by approximately 13% based on the 2008 estimates of 0.098 Mt CO₂e. This increase is temporary so that once construction of the road has been completed it would result in the reduction of the province's construction-based emissions. Another increase in greenhouse gas emissions is from the estimated vehicular traffic between Winnipeg and Berens River. The anticipated improvements in future vehicular technology that result in emissions reductions have not been included in this assessment. The emissions due to the road transportation with the PR 304 to Berens River All Season Road in place was estimated to be less than 0.2% of Manitoba's total greenhouse gas emissions of 5,130 kt CO₂e due to road transportation in 2008. Greenhouse gas emissions for road transportation were reported to be 5,250 kt CO₂e in 2011 (Manitoba Climate Change Connection 2013).

The proposed 39.8 km all-season road between Pauingassi and Little Grand Rapids First Nations, including 36.4 on Crown land and 3.4 km of Reserve land is expected to produce proportionately less greenhouse gas emissions than the 155 km PR 304 – Berens All-Season Road. Both roads are located in the same Boreal forest region on the east side of Lake Winnipeg and the design and construction methods are essentially the same, but the circumstances are substantially different. Access to

Pauingassi and Little Grand Rapids First Nations will continue to be by air and winter road for the foreseeable future. Access between the two First Nation Communities and to the airport is currently by air, water and all-terrain vehicle during the summer, air, snowmobile and all-terrain vehicle during the winter, and air during the spring and fall. It is to be expected that the proposed P7a All-Season Road will result in a modest increase in greenhouse gas emissions due to road travel between the two communities.

On the basis of road length alone, it is estimated that the greenhouse gas emissions for the proposed P7a All-Season Road will be 25% of +27 kt CO₂e for the PR 304 – Berens River All Season Road. The net change greenhouse gas emissions for the proposed P7a All Season Road would be approximately +7 kt CO₂e over a 10-year period. This would amount to less than 0.005% of Manitoba’s total greenhouse gas emissions of 5,250 kt CO₂e due to road transportation in 2011.

During the spring and fall, travel by helicopter (Jet Long Ranger and Bell 205) is the main means of transportation between the communities and the airport. AMEC prepared an estimate of the greenhouse gas emissions produced from the helicopter used to fly community members between Little Grand Rapids and Pauingassi First Nations during the spring and fall of a given year and annual GHG emissions from the required maintenance trips between Little Grand Rapids and Lac du Bonnet, Manitoba. (Appendix A) The CO₂ emission rate for helicopter operations between Little Grand Rapids and Pauingassi First Nations was estimated to be 384,323.33 g/hr or 481.44 tonnes/yr. The annual greenhouse gas emissions (i.e., CO₂, CH₄, N₂O) was estimated to be 485.64 tonnes CO₂e/yr. The greenhouse gas emissions (i.e., CO₂, CH₄, N₂O) for helicopter maintenance trips would be 6.42 tonnes CO₂e/yr. Total annual greenhouse gas emissions would be 492.06 tonnes CO₂e/yr (AMEC, 2014). With helicopter travel occurring primarily in the spring and fall, it is predicted that the new road will result in a considerable decrease in greenhouse emissions (492.20 tonnes CO₂e) due to a reduction in air travel between the communities of Pauingassi and Little Grand Rapids, and the airport.

6.13 Effects on Valued Environmental Components

The effects of the proposed P7a All-Season Road Project on valued environmental components and associated mitigation measures are summarized in Table 6-38. Specific environmental effects and mitigation measures for biophysical, socio-economic and Aboriginal components are provided in the corresponding sections of this Chapter.

Valued Environmental Components	Potential Environmental Effects	Mitigation Measures
Biophysical Environment		
Vegetation species of special interest: tessellated rattlesnake plantain	• Loss or damage	• Pre-construction survey and flagging • Habitat identification • Habitat protection
Medicinal and culturally important plants: blueberries, cranberries, raspberries, saskatoons, strawberries,	• Loss or damage	• Disturbance avoidance • Include on sensitive site mapping
Water quality (pristine)	• Impairment	• Water quality protection

Table 6-38: Summary of Mitigation Measures for Valued Environmental Components

Valued Environmental Components	Potential Environmental Effects	Mitigation Measures
		<ul style="list-style-type: none"> • Construction exclusion areas • Disturbance avoidance • Erosion protection and sediment control • Reclamation of disturbed areas
Aquatic Species of conservation concern: shortjaw cisco, mapleleaf mussel, lake sturgeon	<ul style="list-style-type: none"> • No effects likely 	<ul style="list-style-type: none"> • Water quality protection • Fish habitat protection • Riparian habitat protection • Erosion protection and sediment control • Deleterious substance protection • Blasting controls
Fish & Fish Habitat	<ul style="list-style-type: none"> • Loss or impairment during construction and operation and maintenance 	<ul style="list-style-type: none"> • Fish habitat protection • Riparian habitat protection
Boreal woodland caribou	<ul style="list-style-type: none"> • Loss of habitat 	<ul style="list-style-type: none"> • Route adjustment
Moose	<ul style="list-style-type: none"> • Movement impairment • Disturbance during calving 	<ul style="list-style-type: none"> • Habitat protection • Disturbance avoidance
Furbearers: harvested species; martin, fisher, lynx, wolverine	<ul style="list-style-type: none"> • Loss of habitat • Disturbance of dens 	<ul style="list-style-type: none"> • Reclamation of disturbed areas • Include on sensitive site mapping
Forest songbirds of conservation concern: eastern whip-poor-will, Canada warbler, common nighthawk, olive-sided flycatcher, rusty blackbird	<ul style="list-style-type: none"> • Loss of habitat • Habitat impairment • Destruction of nests • Disturbance during nesting 	<ul style="list-style-type: none"> • Pre-construction survey • Habitat identification • Habitat protection • Disturbance avoidance • Include on sensitive site mapping
Raptors: eagles, osprey, hawks		
Migratory birds: harvested species;		
Owls: short-eared		
Amphibians: northern green frog, Reptiles: eastern snapping turtle	<ul style="list-style-type: none"> • Loss of habitat • Habitat impairment • Disturbance during breeding 	<ul style="list-style-type: none"> • Pre-construction survey • Habitat identification • Habitat protection • Disturbance avoidance
Socio-Economic Environment		
Tourism	<ul style="list-style-type: none"> • Increased opportunities 	<ul style="list-style-type: none"> • Engage communities
Trapping	<ul style="list-style-type: none"> • Loss of trapper income 	<ul style="list-style-type: none"> • Conduct traditional knowledge studies
Commercial hunting	<ul style="list-style-type: none"> • Increased competition 	<ul style="list-style-type: none"> • Route adjustment • Monitor regional developments • Disturbance avoidance • Include areas on sensitive site mapping
Aboriginal Communities and Land Use		
Wildlife habitat	<ul style="list-style-type: none"> • See above 	<ul style="list-style-type: none"> • See above
Fish habitat	<ul style="list-style-type: none"> • See above 	<ul style="list-style-type: none"> • See above
Heritage resources	<ul style="list-style-type: none"> • Loss or damage of heritage and cultural resources 	<ul style="list-style-type: none"> • Heritage Resource Impact Assessment
Cultural heritage	<ul style="list-style-type: none"> • Loss of damage of spiritual and cultural sites • Desecration of human remains 	<ul style="list-style-type: none"> • Pre-construction survey • Site identification • Site protection • Include on sensitive site mapping

6.14 Cumulative Environmental Effects

6.14.1 Introduction

Cumulative environmental effects are environmental effects that are likely to result from a project in combination with the environmental effects of other past, existing and future actions projects or activities. The Operational Statement: Assessing Cumulative Environmental Effects Under the *Canadian Environmental Assessment Act, 2012* (Canadian Environmental Assessment Agency 2013) provides guidance on how cumulative effects should be considered under the Act for federal designated projects. The Cumulative Effects Assessment Practitioner's Guide (Canadian Environmental Assessment Agency 1999) outlines a five-step process for cumulative effects assessment that includes: 1) scoping; 2) analysis of effects; 3) identification of mitigation; 4) evaluation of significance; and 4) follow-up. In the absence of guidelines on cumulative effects assessment by the province of Manitoba, federal guidance materials will be used as best practice for the assessment of cumulative environmental effects for the proposed P7a All-Season Road Project.

As noted by the CEAA (1999) cumulative environmental effects may exist in several forms and can occur in various ways:

- Physical-chemical transport: a physical or chemical constituent is transported away from the action under review where it then interacts with another action (e.g., air emissions, waste water effluent, sediment).
- Nibbling loss: the gradual disturbance and loss of land and habitat (e.g., clearing of land for a new sub-division and roads into a forested area). This can include alienation of wildlife habitat due to sensory disturbances.
- Spatial and temporal crowding: Cumulative effects can occur when too much is happening within too small an area and in too brief a period of time. A threshold may be exceeded and the environment may not be able to recover to pre-disturbance conditions. This can occur quickly or gradually over a long period of time before the effects become apparent. Spatial crowding results in an overlap of effects among actions (e.g., noise from a highway adjacent to an industrial site, confluence of stack emission plumes, close proximity of timber harvesting, wildlife habitat and recreational use in a park). Temporal crowding may occur if effects from different actions overlap or occur before the valued environmental component has had time to recover.
- Growth-inducing potential: Each new action can induce further actions to occur. The effects of these spin-off actions (e.g., increased vehicle access into a previously inaccessible hinterland area) may add to the cumulative effects already occurring in the vicinity of the proposed action, creating a feedback effect. Such actions may be considered as reasonably-foreseeable actions.

The National Environmental Policy Act in the United States of America defines cumulative effects as the effect on the environment which results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what proponent undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time". This broad definition can be further defined in terms of six general types of cumulative effects: 1) direct; 2) additive; 3) cross- or multi-media; 4) cross

boundary; 5) synergistic or interactive; and 6) catalytic, indirect or secondary. The Council of Environmental Quality (1997) guidance “Considering Cumulative Effects Under the National Environmental Policy Act” identifies four basic types of effects that can lead to cumulative effects:

- Type 1: Repeated additive effects on a resource from a single project.
- Type 2: Stressors from a single project that have interactive (countervailing or synergistic) net effect on a resource.
- Type 3: Additive effects on a resource arising from multiple sources (projects, point sources, or general effects associated with development).
- Type 4: Effects arising from multiple sources that affect resources in an interactive fashion.

Borrow (1997) summarized cumulative effects into the following // categories:

- Incremental (additive) (repeated additions of a similar nature (a+a+a...));
- Interactive processes (a+b+c+...+n) results in a cumulative effect);
- Sequential effects;
- Complex causation;
- Synergistic effects;
- Effects occur when a threshold is exceeded; and
- Effects triggered by a feed-back process (antagonistic – feedback which reinforces a trend or ameliorative – feedback which counters a trend).

6.14.2 Scoping

Scoping in a cumulative effects assessment involves the identification of key issues of concern and valued environmental components, thereby ensuring that the assessment remains focussed and the analysis remains manageable and practical. Scoping also involves identifying spatial and temporal boundaries, other actions that may affect valued environmental components and potential environmental effects. Regional planning initiatives are also examined as part of scoping for cumulative effects assessment if they are available. These tasks assist in determining if the projects and activities under review have the potential to contribute to any cumulative effects. The present cumulative effects assessment was scoped to focus on the identified regional issues, valued ecosystem components and residual environmental effects of the proposed Road Project when considered in relation to the environmental effects of past, present and future actions or projects and activities can be expected to be carried out in the reasonably foreseeable future.

6.14.2.1 Regional Environmental Issues

Regional environmental issues, in relative order of importance, for the assessment of cumulative environmental effects for the proposed All Season Road Project were determined to include:

- Regional transportation
- Economic development and employment opportunities

- Cost of goods and services
- Aboriginal and community development
- Country foods
- Caribou population
- Protected areas
- Mining exploration and development
- Forestry resources
- Aesthetic values
- Tourism and recreation

Regional environmental issues including the rationale for their selection and relevance to the east side of Lake Winnipeg are discussed in Section 6.4 of this Chapter of the environmental assessment report.

Previous environmental assessment reports for all season road projects on the east side of Lake Winnipeg (ESRA 2010, 2011; Canadian Environmental Assessment Agency 2011) identified the following regional environmental issues. While these issues were not all identified or relevant to the present environmental assessment of the proposed All Season Road Project (Project P7A) they were considered in this cumulative effects assessment

- boreal woodland caribou and moose habitat
- hunting pressure on wildlife populations
- fishing pressure on fish populations
- disturbance to wildlife of interest to the communities
- access to traditional resources
- access to communities and Lake Winnipeg
- flooding from beaver dam activity
- suspended sediment levels in watercourses from erosion
- potential for fuel spills from tanker trucks
- risk of forest fires from human activities
- transportation reliability, construction safety and provincial road network

While these issues were not all identified for the present environmental assessment of the proposed All Season Road Project they were considered in this cumulative effects assessment as they fall under other issues. Many of the previously identified “issues” are actually environmental effects (i.e., changes in the environment) and are treated as such in this cumulative effects assessment.

Regional environmental issues used for this cumulative effects assessment are listed in Table 6-40.

6.14.2.2 Regional Valued Environmental Components

Regional valued environmental components relevant to the cumulative environmental effects assessment for the All Season Road Project were determined to be:

Biophysical Environment

- Medicinal and culturally important plants
- Water quality (pristine)
- Aquatic species at risk
- Fish and fish habitat
- Boreal woodland caribou
- Moose
- Furbearers
- Forest songbirds
- Eagles/osprey/hawks
- Migratory birds
- Frogs
- Turtles
- Heritage resources

Socio-Economic Environment

- Aesthetic values
- Tourism
- Trapping
- Commercial hunting
- Wild rice harvesting

Aboriginal Communities and Land Use

- Moose
- Wildlife habitat
- Furbearers
- Fish Habitat
- Birds of Prey and waterfowl
- Forest Songbirds
- Medicinal and Culturally Important Plants
- Heritage resources

- Water
- Cultural heritage
- Travel routes

Valued environmental components are discussed in Section 6.5 of this Chapter the environmental assessment report.

Previous environmental assessment reports for all season road projects on the east side of Lake Winnipeg (ESRA 2010, 2011; Canadian Environmental Assessment Agency 2011) identified the following valued environmental components. While these components were not all identified or relevant to the present environmental assessment of the proposed All Season Road Project (Project P7A) they were considered in this cumulative effects assessment

- Air quality (ambient air quality, GHG and noise)
- Terrain and soils
- Groundwater (quality and quantity)
- Surface water (quality and quantity)
- Forest vegetation and plant communities
- Medicinal and berry plants
- Wetlands
- Fish and fish habitat
- Wildlife and wildlife habitat
- Species at risk
- Cultural environment

6.14.2.3 Regional Planning Initiatives

Numerous regional planning initiatives have been carried out on the east side of Lake Winnipeg over the past two decades. Following is a list these initiatives and/or the resulting reports if applicable:

- Ecoregion 90: Traditional Land Use and Occupancy Study (2000)
- Wabanong Nakaygum Okimawin (WNO) Planning Initiative (2000)
- East Side of Lake Winnipeg All-Weather Road Justification and Scoping Study (2000)
- Work Plan to Develop an All-Weather Road Network for the East Side of Lake Winnipeg (2001)
- Promises to Keep ... Towards a Broad Area Plan for the East Side of Lake *Winnipeg* (2004)
- Atikaki Provincial Park and Bloodvein Canadian Heritage River Management Plan (2008)
- East Side Lake Winnipeg Large Area Transportation Network Study (2011)
- Little Grand Rapids First Nation “*Ni-Kes*” Lands Management Plan (2012)
- Pauingassi First Nation Naamiwan “The Land of Fair Wind” Lands Management Plan (2012)
- Pimachiowin Aki: World Heritage Project (currently proposed)

This environmental assessment of the proposed All Season Road Project has drawn upon the vision, direction and recommendations and of Promised to Keep ... (East Side Planning Initiative 2004) wherever possible and the subsequent studies.

6.14.2.4 Spatial and Temporal Boundaries

Spatial boundaries are greater and temporal boundaries are longer for a cumulative effects assessment since the environmental effects of other projects and activities generally occur over a wider area and may extend before and after than those of the proposed or subject project.

Spatial Boundary

The spatial boundary identified for the cumulative effects assessment is the regional assessment area which is the Atikaki-Berens Caribou Management Unit as defined in Manitoba's Boreal Woodland Caribou Strategy (2014 draft). The cumulative effects assessment area is approximately 21,059 km² or 2,105,916 ha (Figure 2-3 in Chapter 2.0). The area forms part of the southern half of the planning area for Promises to Keep ... (East Side Planning Initiative 2004). It also approximates, but is slightly smaller than, the "study area" for the environmental assessment of the proposed PR 304 to Berens River All Season Road Project (ESRA 2010).

Temporal Boundary

The temporal boundary for the cumulative effects assessment was determined to extend over an approximate 50-year period commencing in 2000, with initial planning initiatives for the east side of Lake Winnipeg following the COSDI report (Manitoba 1999), to 2050.

6.14.2.5 Projects and Activities

Proposed Project

The proposed All Season Road Project consists of several project components with scheduled start of 2016 and completion dates as of 2021.

Decommissioning of the winter road segment made redundant by the proposed Road Project is assumed to be carried out following completion of the all-season road.

Other Existing/Concurrent/Ongoing Actions

Other existing, concurrent or ongoing road-related projects and activities include community access roads on Pauingassi and Little Grand Rapids First Nation Reserve lands, an all season road from PR 304 to Berens River (P1) which is under construction and scheduled to be completed in 2020, and continued operation of the existing winter road network which is expected to continue until the all season road network is completed (~2027). All season road projects on the east side of Lake Winnipeg are shown in Figure 1-2 in Chapter 1.0. Other ongoing activities include construction work in Pauingassi and Little Grand Rapids First Nations, Little Grand Rapids airport, Manitoba Hydro transmission lines, traditional land and resource use, commercial hunting, fishing and outfitting, recreational hunting,

fishing, hiking and snowmobiling, and tourism developments. Parks and protected areas in the regional assessment area are shown in Figure 4-20 in Chapter 4.0, and resource use areas (game management areas, registered traplines and forest management units) in this area are shown in Figure 4-13, 4-19 in Chapter 4.0.

Future Planned/Enabled Actions

Future planned road-related projects include those proposed by ESRA as listed below.

ESRA All Season Road Projects and Schedule			
All Season Road Projects	Length (km)	Start	End
PR 304 to Berens River First Nation (P1)	156	2012	~2020
Berens River to Poplar River (P4)	93	2016	~2022
P1 to LGRFN and PFN (P7)	131	2020	~2027
Pauingassi to Little Grand Rapids FN (P7A)	36.4	2014	2018

Start dates are dependent upon a number of factors including community concerns, environmental approvals and land transfers. Construction periods will be about 6-10 years after construction starts depending upon a number of factors including length of road, number of watercourse crossings and construction challenges (e.g., terrain, weather, etc). Winter road improvements will be ongoing throughout the construction of the all season road network.

Other road-related projects planned or enabled by the proposed Road Project include construction of a road maintenance compound at Little Grand Rapids Northern Affairs Community, all season road upgrading, winter road decommissioning, Acrow panel bridge decommissioning and steel girder bridge construction. The expected timeframe for possible bridge replacement is about 25-50 years which would be in 2043 to 2068, depending upon condition assessments and realized traffic levels.

Projects and activities identified for this cumulative effects assessment are listed in Tables 6-40 and 6-41.

6.14.2.6 Potential Environmental Effects

Interactions between projects and activities are illustrated in Table 6-40. The “matrix” table identify interactions and serves only to illustrate the potential overlap of activities and thus the potential for environmental effects that may occur for the proposed project, other existing, proposed or ongoing actions, and future planned or enabled actions. In other words, there is potential for the effects of the

project to act cumulatively with the effects of existing or future actions. It is the effects that act cumulatively with other effects and not the projects and activities themselves.

Potential environmental effects of the proposed All Season Road Project that relate to regional environmental issues and valued environmental components are listed below. Environmental effects of the proposed project must interact, overlap, cause or enable environmental effects on other project components and activities to act cumulatively. Further, there must be a pathway or linkage between or among the effects of the proposed Road Project and the effects of other projects and activities. Consequently, cumulative effects may be expected if they occur both for the proposed Road Project and other projects and activities that currently exist or may occur in the future in the regional assessment area.

Following are the potential environmental effects of the proposed All Season Road Project on valued environmental components:

Biophysical

- Impaired air quality from road construction activities
- Loss/impairment of soils from construction activities
- Loss/impairment of vegetation species of conservation concern
- Loss/impairment of harvest areas of medicinal/cultural plants
- Introduction of invasive species
- Increased risk of forest fire due to road construction activities
- Impairment of surface and ground water quality
- Loss/impairment of aquatic species at risk
- Loss/impairment of fish habitat/ mortality of fish/aquatic biota
- Loss/impairment of caribou habitat/ disturbance/mortality of caribou
- Loss/impairment of moose habitat/ disturbance/mortality of moose
- Modified mammal movements due to presence of road infrastructure
- Loss/impairment of furbearer habitat/ disturbance/mortality of furbearers
- Increased mortality of caribou and moose due to vehicle/hunting
- Loss/impairment of raptor habitat/ disturbance/mortality of raptors
- Loss/impairment of songbird habitat/ disturbance/mortality of songbirds
- Loss/impairment of herptile habitat/ disturbance/mortality of herptiles
- Increased fragmentation due to linear developments

Socio-economic

- Increased access to backcountry areas due to linear developments
- Impaired wilderness quality/improved access to protected areas

- Impaired aesthetic values of boreal forest wilderness setting
- Modified commercial trapping activities/incomes
- Increased tourism and recreational opportunities
- Increased commercial hunting/ fishing/outfitting competition

Aboriginal

- Modification of traditional land/resource use
- Loss/impairment of cultural/spiritual/ ceremonial sites
- Loss/impairment of travel routes
- Loss/impairment of cultural/heritage resources

6.14.2.7 Scoping Summary

Following scoping, several observations were made that serve to focus the cumulative effects assessment. These observations and the actions taken are as follows:

- Regional environmental issues are included in the assessment
- Valued environmental components are included in the assessment
- Northern all season road proposals are excluded from the assessment because of the distance between northern and southern road project and no spatial overlap between northern and southern projects can be demonstrated (Figure 6-7).
- Future mining exploration and development and forestry operations are excluded from the assessment because no such activities occur or are likely to occur for the foreseeable future. However, completion of the all season road from PR 304 to Berens River and all season road linking that road to Pauingassi and Little Grand Rapids First Nations may enable mining and forestry developments due to the lower transportation costs. However, those commercial scale developments are not permitted under the current land use planning guidelines.
- The potential decommissioning of the Acrow panel bridges and construction of steel girder bridges may be excluded from the assessment since they are proposed for consideration after 25-50 years and may simply be retrofitted.

All regional environmental issues, valued environmental components and existing and proposed projects and activities are included in the cumulative effects assessment for the proposed All Season Road Project.

6.14.3 Analysis of Cumulative Environmental Effects

6.14.3.1 Environmental Effects of the Proposed All Season Road (P7a)

The analysis of potential cumulative environmental effects of the proposed All Season Road Project is dependent upon: first, the identification of environmental effects of the project on selected valued environmental components; and, second, the identification of environmental effects of other projects

and activities on the same selected valued environmental component. Potential environmental effects of the proposed Road Project are listed in Section 6.8.2.6 above and provided in the horizontal axis of Table 6-49. These environmental effects are for a 39.8 km All Season Road including Community Access Roads on First Nation Reserve lands located in a remote area of Manitoba. This is less than 4% of the total length (1,028 km) of All Season Roads proposed for the east side of Lake Winnipeg. The environmental effects of the proposed Road Project are predictable and the mitigation measures to prevent or minimize adverse environmental effects are known and effective. The environmental effects and mitigation measures identified for the proposed Road Project are consistent with those of other road project environmental assessments and the literature reviewed on the assessment of linear developments including roads as reported in Section 6.2. Further, the proposed Road Project has been designed to minimize adverse environmental effects by selecting the right-of-way for constructability, adjusting the alignment to avoid high quality habitats and sensitive sites, incorporating feedback received from First Nation communities and scheduling construction to avoid critical times of year for fish, wildlife, birds, and amphibians and reptiles. The residual effect is an approximate 40 km all season road and associated infrastructure including bridges, culverts, guardrails, sign, etc. Despite effective design and project-specific mitigation measures there is always the risk of environmental effects due to unforeseen conditions. ESRA's environmental protection requirements, best management practices and ongoing monitoring programs are designed to identify unforeseen environmental effects and ineffective mitigation measures, and to take immediate actions to remedy the situations. Consequently, no significant adverse residual environmental effects were identified for the proposed All Season Road Project.

6.14.3.2 Environmental Effects of Other All Season Road Projects

The potential for environmental effects of other linear development projects (i.e., winter roads, all season roads, powerlines, etc.) was also examined. In the absence of environmental assessments on future all season road projects, it can be assumed that the environmental effects of other road and road-related project will produce environmental effects, require mitigation measures and result in residual environmental effects that are similar to those identified in this environmental assessment report and in others carried out on the east side of Lake Winnipeg (ESRA 2010, 2011; Canadian Environmental Assessment Agency 2011). It can also be assumed that the magnitude of those of residual environmental effects will be roughly proportionate to the length of the road and the environmental conditions through which the road is routed. The residual environmental effects of those roads will likely be minor, not detectable, expected to occur or justifiable under the circumstances, and therefore not significant. The potential environmental effects of the proposed All Season Road Project in combination of the environmental effects of other existing, concurrent and ongoing actions, and future planned and enabled actions will result in potential cumulative environmental effects provided there the projects and actions are sufficiently close to each other and there is some degree of spatial or temporal overlap. However, such potential cumulative effects are difficult to predict, measure and mitigate, and are best addressed through a robust environmental protection program such as that implemented by the ESRA on all season road and other projects under their mandate. Environmental effects monitoring of the road projects coupled with adaptive management is the best approach to ensuring that potential cumulative effects do not synergistically result in larger or potentially significant adverse cumulative effects.

6.14.3.3 Potential Cumulative Environmental Effects

Potential cumulative environmental effects of the proposed All Season Road Project (P7A) are predicted to occur in combination with the effects of the proposed all season road from P1 to the communities of Pauingassi and Little Grand Rapids (P7) in about 2020. The proposed ~131 km road will connect the two First Nation communities to the rest of Manitoba thereby triggering a variety of potential cumulative effects on the biophysical, socio-economic and Aboriginal environments.

Biophysical Environment

The proposed All Season Road Project (P7A) is not expected to have significant adverse environmental effects on the biophysical environment including air quality, surface and ground water quality and quantity, soils and terrain, vegetation, mammals, furbearers, birds, fish, and amphibians and reptiles with the implementation of mitigation measures and follow-up actions. There may be relatively minor residual effects on habitat, populations, communities and individuals due to construction of the proposed road and associated infrastructure, and the subsequent operation and maintenance activities. The effects are largely predictable, mitigatable and minor in nature. Air, water (surface and ground) and soil quality are not expected to be adversely affected by the proposed Road Project. The effects on species of conservation concern and cultural importance are expected to be minor and mitigated to the greatest extent possible. One species of conservation concern, boreal woodland caribou, is subject to habitat loss, disturbance, displacement and other environmental effects but with the mitigation measures incorporated into the design of the proposed Road Project and the mitigation measures to be implemented during construction and operation and maintenance the residual effects are expected to be minimal.

However, with the completion of the all season road (P7) from the PR 304 to Berens River All Season Road (P1) in ~2020, access to the Pauingassi and Little Grand Rapids area will be substantially improved resulting in a number of direct and indirect biophysical effects. These potential cumulative effects include introduction of invasive plant species and forest insects and diseases, increased risk of forest fires, impairment of surface and groundwater quality, loss/impairment of species at risk, loss/impairment of fish habitat and mortality of fish/aquatic habitat, loss of caribou and moose habitat, disturbance/ mortality of caribou and moose, impaired mammal movements, increased mortality due to predation, hunting, vehicles and brainworm infestation, and increased fragmentation with respect to the other all-season road projects, particularly P7. Application of similar mitigation measures as applied to P7a will avoid or minimize potential effects for each project, as well as cumulative effects that could otherwise arise.

Socio-Economic Environment

The proposed All Season Road Project (P7A) is not expected to have substantial effects on traditional land and resource use, commercial hunting, fishing and outfitting, recreational hunting, fishing, hiking and snowmobiling, and tourism developments in the vicinity of Pauingassi and Little Grand Rapids First Nations. There may be small shifts in traditional land and resource use due to the presence of the road and improved local access over time. Similarly, commercial hunting, fishing and outfitting, recreational hunting, fishing, hiking and snowmobiling, and tourism developments may increase gradually over the

long-term, but a dramatic increase is not expected. Reliance on country foods is expected to remain the same but decrease over time. Effects of the proposed Road Project on wilderness qualities and aesthetic values are not expected to be of concern over the short term. Increased contract, employment and revenues will have beneficial effects for the local communities and can be expected during the construction period but will decrease after construction. Mining exploration and forestry operations are also not expected to increase for the foreseeable future without all season road access from P1 to the two communities.

However, with the completion of the all season road (P7) from the PR 304 to Berens River All Season Road (P1) in ~2020, access to the Pauingassi and Little Grand Rapids area will be substantially improved resulting in a number of indirect socio-economic effects. These potential cumulative effects include increases in commercial hunting, fishing and outfitting, recreational hunting, fishing, hiking and snowmobiling, and tourism developments. These actions, in turn, affect protected and harvested wildlife and fish species in the region. Lower transportation costs due to improved access will enable outside goods and services to be purchased at lower costs and local goods to be produced (i.e., furs, wild rice) at greater profit margins. Dependence on country foods may decrease while consumption of “supermarket: foods may increase. Impaired wilderness qualities and aesthetic values can be expected over time due to the improved access provided by the new all season road (P7) and subsequent increases in visitation to the region. Increased contract, employment and revenues for the local communities can be expected during the construction of the new all season road, and can be more sustainable with the increased access provided by that new road. Potential also exists for mining exploration, forestry operations and other industries to become profitable over time with improved commodity pricing and market conditions, and reduced transportation costs.

Aboriginal Communities and Land Use

The proposed All Season Road Project (P7A) is predicted to have predictable and, for the most part, mitigatable effects on the Aboriginal environment including the communities of Pauingassi and Little Grand Rapids. Change to community life, traditional lifestyle and individual well-being are not expected to be dramatically by the proposed Road Project, and the loss of local and traditional knowledge has been largely mitigated by the conduct of traditional knowledge studies and workshops. Traditional land and resource use will likely change over the short term but not dramatically in relation to regional trends. Loss and impairment of heritage resources and cultural, spiritual and ceremonial sites are unlikely due to the conduct of a Heritage Resource Impact Assessment and the implementation of mitigation measures.

The proposed all season road (P7) from P1 to the communities of Pauingassi and Little Grand Rapids will result in improved access to the communities which, in turn, will likely result in cumulative environmental effects. The cumulative environmental effects may include impaired community life, traditional lifestyle, modification of traditional land and resource use. Further loss of traditional knowledge expected due to the mitigation of effects for the Proposed Road Project (P7A). Heritage and cultural resources are subject to cumulative effects with the increased access to the region resulting in possible looting and damage of heritage resources by outside interests.

Boreal Woodland Caribou

Joro Consultants (2014a) examined the cumulative effects of three all season road proposals P1, P4, P7 and P7A) within the Atikaki-Berens Management Unit using a disturbance analysis approach.

The disturbance analysis determined total habitat disturbance in the Management Unit relative to the sustainable threshold of 65% undisturbed habitat identified by Environment Canada (2012). Disturbance was broken into two major disturbance components consistent with those described by Environment Canada (2012) and included natural disturbance (mainly fire less than 40 years old) and anthropogenic disturbance including linear features such as WRs, transmission lines, as well as other footprint disturbance including forestry and mining.

Atikaki-Berens Management Unit Disturbance Regime

The 65% threshold of undisturbed habitat was used in this analysis. The Atikaki-Berens Management unit has a natural disturbance from fire of approximately of 29%, below the threshold identified by Environment Canada (2012). The disturbance when all anthropogenic factors are considered including Projects 1, 4, 7 and 7-7a, rises to between 33.43 to 34.07%, remaining under the 35% threshold. The addition of the all season road Projects is a very small percentage of the overall disturbance in this management unit. Fire is the largest contributor.

6.14.4 Identification of Mitigation Measures

No additional mitigation measures are required for any potential cumulative environmental effects directly associated with the proposed All Season Road Project. ESRA's ongoing monitoring programs are sufficiently robust to ensure that prompt attention is given to any problems identified regarding protected or harvested species, or other valued environmental components.

6.14.5 Evaluation of Significance

With the implementation of mitigation measures and follow-up actions, no significant cumulative environmental effects were identified for the proposed All Season Road Project (P7A).

6.14.6 Follow-up

No additional follow-up actions are required for any potential cumulative environmental effects of the proposed Road Project.

Table 6-39 Disturbance factors and extent of disturbance of the Atikaki-Berens Management Unit* (based on available data)

	1960		1980		2015		2020		2025	
	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance
Disturbance										
Roads**	239	1.20	397.30	1.99	167.71	0.84	167.71	0.84	167.71	0.84
Winter Roads	289	1.45	289.60	1.45	213.63	1.07	124.32	0.62	124.32	0.62
Transmission Lines	190	0.96	190.63	0.96	306.06	1.54	313.26	1.57	313.26	1.57
Drill Holes (less than 40 years)	2.91	0.01	6.06	0.03	13.75	0.07	13.75	0.07	13.75	0.07
Mines	3.96	0.02	1.94	0.01	2.96	0.01	2.96	0.01	2.96	0.01
Forestry Harvest Areas (less than 40 yrs)	0	0	0.00	0.00	363.19	1.82	363.19	1.82	363.19	1.82
Total Anthropogenic Disturbance	726.28	3.64	885.54	4.44	1,067.30	5.36	985.19	4.94	985.19	4.94
Natural Disturbance - Fire History (less than 40 yrs)	8,865.83	44.48	5,776.74	28.99	5,722.31	28.71	5,724.17	28.72	5,724.17	28.72
Total Disturbance	9,592.11	48.12	6,662.28	33.43	6,789.61	34.07	6,709.36	33.66	6,709.36	33.66

*Area of Management Unit 19,930.00 km²

**ASRs	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance	Area (km ²)	% of Disturbance
P1	0	0	0	0	32.22	0.16	32.22	0.16	32.22	0.16
P4	0	0	0	0	86.74	0.44	86.74	0.44	86.74	0.44
P7a (2020)	0	0	0	0	0	0	14.79	0.07	14.79	0.07
P7 (2025)	0	0	0	0	0	0	0	0	57.23	0.29

Table 6-40: Temporal Distribution of Projects and Activities

Actions (Projects and Activities)	Pre-Project	2014-2019	2020-2024	2025-2029	2030-2034	2035-2039	2040-2050
Traditional resource use activities							
Commercial hunting/fishing/outfitting							
Recreational hunting, fishing, etc.							
Recreational hiking, snowmobiling, ..., etc)							
Tourism developments (roads, trails, ..., etc)							
Future Planned/Enabled Actions							
P7A LGR NAC maintenance compound							
P7A All season road maintenance							
P7A Acrow panel bridge decommissioning							
P7A Steel girder bridge construction							
ASR: Berens River to Poplar River (P4)							
ASR: P1 to LGRFN and PFN (P7)							
Winter road improvements							

6.15 Summary

This chapter of the environmental assessment report identified, described and assessed the effects of the proposed road project on the biophysical, socio-economic and Aboriginal environment. The environmental assessment approach including methods, Aboriginal traditional knowledge, Aboriginal and public engagement, site visits, field study and research, and baseline studies is described. Regional environmental issues and valued environmental components for the environmental effects assessment of proposed Road Project are described. Measures to mitigate adverse effects, residual environmental effects and actions for follow-up are identified. Effects of accidents and malfunctions, effects of the environment on the Project and cumulative environmental effects are also addressed. Environmental protection measures are summarized in the following Chapter.