WSR
WEBEQUIE
SUPPLY ROAD

WEBEQUIE SUPPLY ROAD FINAL ENVIRONMENTAL ASSESSMENT REPORT / IMPACT STATEMENT

January 30, 2026

AtkinsRéalis Ref: 661910

SECTION 12:
Assessment of Effects on Wildlife and Wildlife Habitat

WEBEQUIE FIRST NATION

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12. Assessment of Effects on Wildlife and Wildlife Habitat

The Wildlife and Wildlife Habitat valued component (VC) was identified during the VC scoping and selection process as part of the Environmental Assessment / Impact Assessment (EA/IA) process and is described and assessed in this section. For the purpose of this section, wildlife includes mammals, birds, reptiles, and amphibians. The Project Team conducted studies to establish the existing conditions for Wildlife and Wildlife Habitat and determined the potential effects of the Project. The existing conditions studies were based on a review of literature, internet searches, engagement and consultation, field surveys, and expert opinion, and are documented in detail in Appendix F of this EAR/IS – Natural Environment Existing Conditions [NEEC] Report).

The assessment of the Project's potential effects on the Wildlife and Wildlife Habitat VC is presented in the following manner:

- Scope of the Assessment;
- Existing Conditions Summary;
- Potential Effects, Pathways and Indicators;
- Mitigation and Enhancement Measures;
- Characterization of Net Effects;
- Determination of Significance;
- Cumulative Effects;
- Prediction of Confidence in the Assessment;
- Predicted future Condition of the Environment if the Project Does Not Proceed;
- Follow-up and Monitoring Programs; and
- References.

12.1 Scope of the Assessment

12.1.1 Regulatory and Policy Setting

The Wildlife and Wildlife Habitat VC is assessed in accordance with the requirements of the *Impact Assessment Act* (IAA), the Ontario *Environmental Assessment Act* (EA), the Tailored Impact Statement Guidelines (TISG) for the Project (Appendix A-1), the provincial approved EA Terms of Reference (ToR) (Appendix A-2), and EA/IA guidance documents.

Table 12-1 outlines the key regulations, legislation, and policies relevant to the assessment of the Wildlife and Wildlife Habitat VC for construction and operations of the Project.

Table 12-1: Key Regulation, Legislation, Policy Relevant to Wildlife and Wildlife Habitat

Regulatory Agency	Regulation, Legislation, or Policy	Project Relevance
Federal		
Impact Assessment Agency of Canada (IAAC)	*Impact Assessment Act*	The Project is subject to the federal *Impact Assessment Act* (refer to Section 1.4.2). The Tailored Impact Statement Guidelines (TISG) issued by IAAC (2020) for the Project were used to identify requirements for the assessment of effects on Wildlife and Wildlife Habitat VC.
Environment and Climate Change Canada (ECCC)	*Migratory Birds Convention Act* and Migratory Bird Regulations	The Project has the potential to interact with migratory birds, their eggs, and nests during the construction phase. The purpose of this Act is the protection of migratory birds – as populations and individuals – and their eggs and nests. Under the *Migratory Birds Convention Act*, no person shall: a) be in possession of a migratory bird or nest; or b) buy, sell, exchange or give a migratory bird or nest or make it the subject of a commercial transaction. No person or vessel shall deposit a substance that is harmful to migratory birds, or permit that substance to be deposited, in waters or areas frequented by migratory birds, or in any place from which the substance may enter those waters or areas. The Act also prohibits any substance from being deposited in any place where it can combine with one or more other substances to become harmful to migratory birds in waters or areas where they may enter. The Regulations outline the authority of the Minister to issue permits under the *Migratory Birds Convention Act* and set conditions on such permits, as well as detail prohibitions and exceptions. Under the *Migratory Bird Regulations,* a person must not engage in any of the following activities: a) capture, kill, take, injure or harass a migratory bird or attempt to do so; b) destroy, take or disturb an egg; and c) damage, destroy, remove or disturb a nest, nest shelter, eider duck shelter or duck box. Generally, no person shall hunt a migratory bird except under authority of a permit. (Hunt is defined as: “chase, pursue, worry, follow after or on the trail of, lie in wait for, or attempt in any manner to capture, kill, injure or harass a migratory bird, whether or not the migratory bird is captured, killed, taken, injured or harassed.”)
Provincial		
Ministry of Natural Resources (MNR)	*Invasive Species Act*	This Act sets out rules to prevent and control the spread of invasive species in Ontario. A species may be listed under this Act if it is not native to Ontario, or to part of Ontario and is harming (or likely to harm) the natural environment. Each species is assessed depending on its biological characteristics, risk of harm to the natural environment, ability to disperse, and the social and economic impacts it may cause. It is illegal to import, own, deposit, release, transport, breed/grow, buy, sell, lease or trade species that are listed as prohibited or restricted under the Act without specific authorizations. Such activities are not illegal if done while carrying out a prevention and response plan, or otherwise authorized by the MNR (e.g., for education, prevention, control, or elimination).

Regulatory Agency	Regulation, Legislation, or Policy	Project Relevance
Minister of Municipal Affairs and Housing (MMAH)	*Planning Act*	One of the purposes of the *Planning Act* is to provide a land use planning system led by provincial policy. Further guidance is provided by provincially issued statements and plans. The *Planning Act* also describes how land uses may be controlled, and related administration for land use planning in Ontario. The Act provides the basis for protecting and managing natural resources within the province.
MMAH and MNR	Provincial Planning Statement, 2024 (under the *Planning Act*)	The *Provincial Planning Statement, 2024* (PPS) provides policy direction on matters of provincial interest related to land use planning and development in the province of Ontario. In terms of the management of natural resources, the PPS requires that "natural features and areas be protected for the long term," and that "the diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems should be maintained, restored, or, where possible, improved, while recognizing linkages between such natural features and areas, surface water features and ground water features. The Provincial Planning Statement prohibits development and site alteration in a variety of listed natural heritage features including Significant Wildlife Habitat (SWH), and Significant Areas of Natural and Scientific Interest (ANSI). In Ontario, the management of natural heritage systems is primarily overseen by the Ministry of Natural Resources (MNR). They provide policies and guidelines for the protection and management of natural heritage features and functions. Local municipalities also play a significant role in implementing these policies and managing natural heritage systems in their jurisdictions. Non-governmental organizations also contribute to the preservation and management of natural heritage through various programs and initiatives.
MNR	*Fish and Wildlife Conservation Act*	The *Fish and Wildlife Conservation Act* provides direction relating to the conservation and management of fish and wildlife in the province of Ontario. The Act, and its regulations, provide rules relating to the hunting and trapping of game wildlife (mammals, birds, reptiles, and amphibians) and fish. It also helps with the conservation and protection of wildlife and the environment(s) they inhabit (e.g., North American beaver dams, dens of furbearing animals). Under this Act, nests, and eggs of most wild birds (not already subject to the federal *Migratory Birds Convention Act, 1994)* are protected. Further, the Act prohibits anyone from hunting, trapping, or keeping live game wildlife or live specially protected wildlife in captivity unless under the authority of a licence and in accordance with its regulations. It also prohibits the sale or purchase of game wildlife or specially protected wildlife, including pelts, without a licence or other authorization. In addition to the authorizations previously mentioned, licences can be obtained for scientific collection purposes. Collection of wildlife for scientific purposes is overseen by the Wildlife Animal Care Committee in Ontario.
Ministry of the Environment, Conservation and Parks (MECP)	Ontario *Environmental Assessment Act*	The Project is subject to the Ontario *Environmental Assessment Act*. This Act generally requires an environmental assessment of any major public or designated private undertaking to determine the ecological, cultural, economic and social impact of the project. The Terms of Reference (ToR) (Webequie First Nation 2020), which was approved by MECP on October 8, 2021, was used to identify requirements for the assessment of Wildlife and Wildlife Habitat VC.

Regulatory Agency	Regulation, Legislation, or Policy	Project Relevance
MECP	Ontario *Environmental Protection Act*	The *Environmental Protection Act* is the primary pollution control legislation in Ontario and can be used interchangeably with the Water Resources Act. The legislation prohibits discharge of any contaminants into the environment that cause or are likely to cause adverse effects, including to aquatic habitat. Amounts of approved contaminants must not exceed limits prescribed by the regulations. The Act also requires that spills of pollutants are reported and cleaned up promptly. The *Environmental Protection Act* also has the authority to establish liability on the party at fault
Other		
MNR	Significant Wildlife Habitat Criteria Schedules for Ecoregion 3E, January 2015	Provides regionally relevant criteria for identifying Significant Wildlife SWH as recognized by the MNR, including descriptions of wildlife habitat, wildlife species, and defining criteria to confirm SWH.

12.1.2 Consideration of Input from Engagement and Consultation Activities

Table 12-2 summarizes feedback related to the Wildlife and Wildlife Habitat VC received during the engagement and consultation for the EA/IA and how the inputs and comments are addressed in the EAR/IS. This feedback includes concerns raised by Indigenous communities/groups, the public, government agencies, and stakeholders prior to the formal commencement of the federal IA and provincial EA, during the Planning Phase of the IA and ToR phase of the EA. This input helped to define the data collection objectives of the desktop and field programs and guide the effects assessment. The Project Team considered the comments received on the Draft EAR/IS in finalizing the EAR/IS. Details of responses and how the comments have been addressed are provided in the Record of Engagement and Consultation.

Table 12-2: Wildlife and Wildlife Habitat – Summary of Inputs Received During Engagement and Consultation

Comment Theme	How the Comments are Addressed in the draft EAR/IS	Indigenous Community or Stakeholder
Concerned that the survey method for evaluating waterfowl stopover and staging areas is unacceptable to Attawapiskat First Nation. A single fly-over late in the fall migration season (October) is not an appropriate way of establishing a baseline of waterfowl stopover and staging areas."	Waterfowl surveys were conducted in the spring of 2019, in addition to a fall survey conducted in October 2017. These surveys augment existing data (Noront Eagle's Nest Project) regarding waterfowl staging and migration for the area. Three helicopter flights took place in 2019 and 2020 for waterfowl migration surveys over 10 days to account for daily variations and were dependent on weather conditions. Spring surveys were conducted between mid-May and early June, while fall surveys were conducted between early September and mid-October. **Section 12.2** provides a summary of the survey methods and results. Details of the surveys and results are provided in Appendix F of this EAR/IS – Natural Environment Existing Conditions Report (NEEC Report).	Attawapiskat First Nation

Comment Theme	How the Comments are Addressed in the draft EAR/IS	Indigenous Community or Stakeholder
Concerned that the existing data from breeding bird surveys has little coverage of the study area and therefore a poor ability to detect trends for most species. The description of bird survey techniques in the draft ToR makes no mention of the number of stations that will be visited in the planned breeding bird survey. The draft ToR states that marsh birds will be surveyed opportunistically, as part of the breeding bird survey. This approach is unlikely to lead to an accurate assessment of the habitats (stopover and staging areas) where migratory waterfowl concentrate. Ducks and geese are important components of First Nations diets, and their habitats are also potential Significant Wildlife Habitats. Waterfowl migration staging/stopover areas should be assessed separately from the planned breeding bird surveys."	The scope and intensity of the field studies, and associated data collection methodologies have been established during the EA/IA process through consultation with Indigenous communities, federal/provincial agencies and stakeholders. This included the development of a Birds Study Plan at the outset of the EA/IA, including the opportunity for federal and provincial agencies to review the plan and provide guidance. **Section 12.2.1.3** outlined the baseline studies on Breeding Birds count and acoustic surveys as well as Waterfowl and Shorebird migration surveys. Potential effects to waterfowl are described in **Section 12.3.9**.	Attawapiskat First Nation
Concerned that the "Fragmentation should be included as an indicator related to Upland Ecosystems, Riparian Ecosystems & Wetlands, SAR, and Wildlife & Wildlife Habitat. Areas of waterfowl nesting, staging, and stopover areas should be included as indicators under Migratory Birds."	Fragmentation is identified as a potential effect resulted from vegetation clearing and grubbing activities and assessed in Section 11 of the EAR/IS section through analysis of the size, shape, number, and distribution of patches within the LSA and RSA including patch area, number of patches, edge length, perimeter and area ratio, density, and nearest neighbor.	Attawapiskat First Nation
Concerned with the current moose population, having observed local declines in population that may be exacerbated by increased human traffic and tourism in the North. Concerned that the planes already scare moose in the Project area(s) and that additional vehicle traffic could scare the moose even more.	Existing conditions of Moose in the project study areas are described in the NEEC Report (Appendix F of the EAR/IS) and summarized in this EAR/IS section (**Section 12.2**). Potential project effects on Moose are assessed in **Section 12.3.3** and Section 21 (Cumulative Effects Assessment). With the implementation of proposed mitigation measures outlined in **Section 12.4**, the net effects of the Project on Moose are predicted to be not significant (refer to **Sections 12.7.1** and **12.8.1**).	Constance Lake First Nation Marten Falls First Nation
Expressed that the ToR identifies mammals within the study area that may be affected by the Project. The ToR does not identify insect species that may be affected by the Project. Insect are an important food sources for animals, and perform important roles as pollinators and other roles in the muskeg. Insects are also pests, an important issue during the warmer months in the region. Please include information on how insects will be integrated in the ToR, for both the existing (baseline and trend) environment and in the effects assessment.	The Project Team acknowledge that insects and other invertebrates are an important link in biological food webs. However, the final ToR and federal TISG for the Project did not specify requirements for assessment of insects and therefore is excluded from the EA/IA at this time. We note that concerted entomology surveys for insects would require a high level of effort to complete based on the estimated 22,000 insect species known to occur in the boreal zone of Canada (Danks and Foottit, 1989).	Fort Albany First Nation

Comment Theme	How the Comments are Addressed in the draft EAR/IS	Indigenous Community or Stakeholder
Concerned about the common part-time trapping. The roads might make it cheaper to trap (not having to fly in which is very expensive) which could affect the quantity of resources.	Section 19 (Assessment of Effects on Indigenous Peoples and the Exercise of Aboriginal and/or Treaty Rights) of this EAR/IS assesses potential effects of the Project on Aboriginal and Treaty Rights and includes proposed mitigation measures to address potential adverse effects, including potential over-harvesting due to increase in access. Mitigation measures to address concerns around potential over-harvesting by non-indigenous resource users (e.g., hunters, trappers, fishers) may include, but not limited to, access restrictions for road users.	Marten Falls First Nation
Concerns about animals which will end up travelling and foraging along the Road(s).	**Section 12.4** outlines proposed mitigation measures to address potential effects of the Project on wildlife including the risk of injury and death of wildlife during the construction and operations phases of the Project.	Marten Falls First Nation
Concerned that the proposed study area considerations are inadequate for considering ecological (e.g., caribou, wolverine, lake sturgeon, migratory birds, freshwater fish biodiversity, eskers, peatlands) and social (e.g., eskers, transportation, cultural and sacred sites, traditional land use) impacts. We recommend a zone-of-influence analytical approach (e.g., Boulanger et al. 2012, Plante et al. 2018), including consideration of this road segment being part of the larger industrial access road to the Ring of Fire that will be eventually developed.	Based on the existing conditions information assembled to date, and the Project Team's experience on the assessment of roads in similar northern environments, the proposed study areas are currently deemed adequate for assessing potential effects to the ecological and social valued components under consideration. Adopting a zone-of-influence approach is inherent in the cumulative effects assessment (i.e., ZOI's must be established to determine whether and how the projects and physical activities under consideration interact with each other). In accordance with the federal Tailored Impact Statement Guidelines for the Webequie Supply Road project, the Northern Road Link, Martin Falls Community Access Road and Anaconda/Painter Lake Forestry Road Upgrades are on the list of projects and activities that are considered in combination with the Webequie Supply Road as part of the cumulative effects assessment. The Webequie Supply Road will not be considered to have an "industrial" function in the manner that the other aforementioned road links will, since it will not be used to haul mineral ores or mine products.	Neskantaga First Nation

Comment Theme	How the Comments are Addressed in the draft EAR/IS	Indigenous Community or Stakeholder
Concerned to know if the proponent possess the financial and technical capacity to protect the fish, wildlife and water resources that will be impacted by the project?	Webequie First Nation is the sole proponent of the Webequie Supply Road Project for the purpose of the EA/IA. At this point in time, it has not been determined who will construct, maintain and operate the Webequie Supply Road and is subject to further discussion between Webequie First Nation and Ontario. The ultimate proponent for the construction and operation phases of the Project is expected to have the financial and technical capacity to protect the environment, including meeting the obligations and commitments in the EAR/IS.	Neskantaga First Nation
Concerns about assessing the Wildlife Habitat, rare vegetation, wetlands, Ecoregion/District and Natural Heritage Features in the EA process (to reflect the requirements of the Natural Heritage Reference Manual, 2014)	Significant Wildlife Habitat, rare vegetation, wetlands, Ecoregion/District and Natural Heritage Features and other values are assessed in respective sections of this EAR/IS.	Ministry of Natural Resources (MNR)
Identifying species and mitigations for peak migration between wetlands that will be intersected by the ROW should be addressed in the document.	Mitigation measures designed to ameliorate potential effects on wildlife movement and migration patterns are described in **Section 12.4**.	MNR
Concerns regarding prediction of impacts on animals caused by collisions with vehicles as part of “project activities and potential effects on the natural environment.”	Potential effects on wildlife and wildlife habitat from the supply road, including the potential for direct mortality of wildlife from vehicle collisions, are assessed in this EAR/IS (**Section 12**).	Ministry of Transportation (MTO)
Concerns regarding consideration of all activities, including prep work, for impacts to SAR and their habitat and outlined in the EA.	Relevant project components and activities were examined in the EA, including in the context of potential effects to SAR that are assessed in Section 13 (Assessment of Effects on Species at Risk) of the EAR/IS.	Ministry of the Environment, Conservation and Parks (MECP)
Concerns about updating the ToR and providing more details on mammals (in a summary table of the 2011-2012 survey results)	Section 6.2.3 of the ToR is intended to provide a high-level overview of those species observed in the project area from the review of secondary source information and field work conducted in 2017. Specific details of previous studies with respect to mammals are provided in tabular form in **Section 12.2.2.1**.	MECP
Concerns regarding sampling tree’s age that are over 10 m of length to determine appropriateness for wildlife habitat or for visual assessment purposes.	Visual assessment of vegetation, along with supportive field surveys, are deemed adequate for determining potential effects to wildlife habitat, including species at risk, as usage is more dependent on size class and height/cover than actual age of trees. The scope and intensity of the field studies, and associated data collection methodologies have been established during the EA/IA process through consultation with Indigenous communities, federal/provincial agencies and	Ministry of Mines (now Ministry of Energy and Mines)

Comment Theme	How the Comments are Addressed in the draft EAR/IS	Indigenous Community or Stakeholder
	stakeholders. This included the development of Study Plans at the outset of the EA/IA related to the biological environment (e.g., species at risk, vegetation and wetlands, wildlife, etc.), including the opportunity for federal and provincial agencies to review the plans and provide guidance.	
Concerned about the need to adequately assess impacts to birds and bird habitat, including the utilization of best available resources and models, as well as Indigenous Knowledge. The following bird species have been identified as necessary to study: Eastern Whip-Poor-Will (*Antrostomus vociferus*), Common Nighthawk (*Chordeiles minor*), Canada Goose, Snow Goose (*Answer caerulescens*), Gyrfalcon *(Falco rusticolus*), Peregrine Falcon (*Falco peregrinus*), Swans (*Cygnus species*), and Loons *(Gavia species*). Ducks and geese were identified as important to Indigenous peoples' diets, especially in waterfowl habitats.	**Sections 12.3.7** through **12.3.11** outline the potential effects of the Project on birds, including shorebirds, waterfowl, raptors and migratory wetland songbirds. **Table 12-3** includes a summary of Indigenous Knowledge received from Indigenous communities.	Aroland First Nation Attawapiskat First Nation Fort Albany First Nation Kasabonika Lake First Nation Environment and Climate Change Canada Member of public Wildlife Conservation Society Canada
Provide further detail to demonstrate how the field surveys are expected to be sufficient to estimate baseline estimates of abundance and distributions of breeding birds. Include surveys that allow for estimates of annual variability of other phases of the annual cycle, including migration and overwintering, and to other groups, including waterfowl and shorebirds.	Annual data on variability was captured using Acoustic Recording Units deployed in representative habitats that provided around 12,000 recordings and over 600 hrs of audio data. The data was divided into three periods: breeding season (May 1 through July 10), fall migration (August 1 through September 30) and winter season (November 1 through March 31). These data underwent subsampling, and seasonal datasets were further subdivided into dawn (one hour before sunrise to five hours after), dusk (0.5 hours before sunset to two hours after sunset), and nighttime (midnight to one hour before sunrise). Days with heavy precipitation (>10mm) were removed from the sample by importing Environment Canada historical weather data using the R package WeatherCan. Please refer to **Section 12.2.1.3.2** (Bird Acoustic Surveys) for further information.	Impact Assessment Agency of Canada (IAAC)
Provide details for both compliance monitoring and effects monitoring for breeding birds. If the monitoring program is described in more detail elsewhere in the Breeding Birds Study Plan, refer to bird relevant sections to demonstrate the approach that is proposed.	Planned compliance monitoring and effects monitoring efforts are described in **Section 12.12** (Follow-up and Monitoring Programs) and summarized in Section 22 of this EAR/IS.	IAAC

12.1.3 Incorporation of Indigenous Knowledge and Land and Resource Use Information

To date, the following First Nations have provided Indigenous Knowledge and Land and Resource Use (IKLRU) information to the Project Team:

- Webequie First Nation;
- Marten Falls First Nation;
- Weenusk First Nation;
- Kashechewan First Nation; and
- Fort Albany First Nation.

Table 12-3 summarizes key information and concerns relating to Wildlife and Wildlife Habitat VC and indicates where this input is incorporated in the EAR/IS.

Table 12-3: Wildlife and Wildlife Habitat VC – Summary of Indigenous Knowledge and Land and Resource Use Information

Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
Wildlife Injury/Death	▪ Weenusk First Nation members are concerned that an increase in public access will impact wildlife survival and reproduction due to hunting or vehicle strikes. Increased mortality may impact the availability of harvestable species. Increased access by non-Weenusk harvesters may impact Weenusk harvesting preferences. Members of Weenusk First Nation identified caribou and geese as the most commonly harvested wildlife, with moose as well. ▪ First Nation respondents expressed concern that increased vehicle traffic could raise the risk of accidents or wildlife-vehicle collisions.	▪ Potential effects of hunting and vehicle strikes for each wildlife group are described in **Section 12.3**. ▪ Potential effects to moose and waterfowl, including geese, are described in **Sections 12.3.2** and **12.3.7**, respectively. ▪ Potential effects to caribou are described in Section 13.2.2.
Alteration in Movement	▪ Disturbances to migratory animals by construction activities have impacted migratory routes and changed the availability of harvested species in Weenusk's traditional areas. ▪ Concerns were raised by First Nation members regarding elevated noise levels in the LSA, RSA, and PDA, which may disrupt animal movements, impact resource availability, and hinder traditional harvesting practices. ▪ Members of Weenusk First Nation have noted a noticeable decline in waterfowl and migratory birds such as Canada Goose, Snow Goose, and ducks. ▪ Noise from aircraft presence at De Beers has been identified as a source of wildlife disturbance, alongside effects on air quality.	▪ Potential effects due to alteration in movement for each wildlife group are described in **Section 12.3**. ▪ Potential effects to the waterfowl are described in **Section 12.3.7**.

Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	▪ Previous experience with the Victor Mine suggests that noise from construction and road traffic during operations could drive animals away. ▪ Wildlife in the area may decline and that significant changes are anticipated for animal populations. One of the most notable impacts expected from the Project is the alteration of species' migration patterns which could lead to harvesters unable to find game in preferred harvesting areas. ▪ Electricity transmission to the Victor Mine, along with increased aircraft traffic, contributed to changes in moose movement patterns. ▪ There have been significant changes over the past 14 years with DeBeers' activities. For example, when the electricity grid was extended to the mine site, it was observed that moose left the area, relocating to other parts of the Kashechewan territory.	
Population trends	▪ Geese populations have been noted as declining, likely due to pollution, and harvested meat quality has also diminished. ▪ First Nation community members' observations included changes in the environment due to new species not usually present and altered availability of native species. Respondents were unsure of the reasons but associated these changes with climate change. ▪ Concerns from First Nation community members on the potential reduced ability to maintain traditional diets due to an overall decline in the availability and health of wildlife.	
Wildlife habitat	▪ The Kistachowan Sipi system flows through First Nation traditional territory, supporting terrestrial and aquatic ecosystems that sustain harvested resources such as fish, wildlife (including mammals and birds), and vegetation. ▪ Respondents noted that First Nation territory contains critical habitats for caribou, moose, and Canada geese, as well as calving and breeding areas, migration routes, and fish spawning sites for species such as sturgeon and trout. ▪ First Nation community members identified harvesting sites for species such as moose, geese, caribou, ducks, waterfowl, partridge, beaver, rabbit, snipes, wavies, godwits, marten, black bear, fox, lynx, muskrat, otter, pintails, wolf, deer, and ptarmigan.	

Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	▪ Community members caribou hunt along the Pagashi Lake and Kapiskau River ▪ The Albany River is a significant harvesting corridor during the Fall season. ▪ The Project may cause wildlife to move to different areas in search of suitable habitat and water sources. ▪ Contamination and pollution may impact wildlife including ducks, Canada geese and moose. ▪ Community members are concerned regarding the effects of removing muskeg habitat and mossy areas which provide habitat for small mammals ▪ Each wildlife species requires specific habitat conditions and exhibits seasonal behaviors that have influenced how First Nations use the land and practice their cultural traditions	

12.1.4 Valued Component and Indicators

Valued components including Wildlife and Wildlife Habitat were identified in the TISG and by the Project Team and are, in part, based on what Indigenous communities and groups, the public, government agencies, and stakeholders have identified as valuable to them in the EA/IA process to date. Subcomponents (or criteria) of the Wildlife and Wildlife Habitat VC are further identified to help inform the report structure and better assess and present the data and assessment results. The assessment of these subcomponents is conducted using the methodology outlined in Section 5 (Environmental Assessment / Impact Assessment Approach and Methods). The identified subcomponents for Wildlife and Wildlife Habitat VC are:

- Wildlife Habitat including Identified Significant Wildlife Habitat:
  - Wildlife Habitat Loss; and
  - Wildlife Habitat Alteration or Degradation.
- Wildlife Populations:
  - Alteration in Wildlife Movement; and
  - Wildlife Injury or Death.

12.1.4.1 Selection of Key Species and Species Groups

- Nine species and species groups were used for the assessment of the Wildlife and Wildlife Habitat VC:
  - Moose;
  - Furbearers;
  - Bats;
  - Migratory Songbirds (Forest and Wetland);
  - Waterfowl;
  - Shorebirds;

- Raptors; and
- Herpetofauna (Reptiles and Amphibians).

These key species and species groups were selected because they represent wildlife use in the range of habitats found in the “Project area”, represent use of the “Project area” at wide range of spatial scales, and use the “Project area” at a range of temporal scales including summer, winter, and spring/fall migration. As a result, it is expected that effects to one of these key species would likely affect other similar species in a similar fashion. Additional consideration was given to species that were deemed regionally important based on either regulatory or community feedback and to species that were known to be sensitive (responding positively or negatively) to linear development. The TISG also designated certain key species to be included in the effects assessment. Species at Risk (SAR) are considered separately in Section 13 of this document.

For species groups where effects would be similar for multiple species, a representative species was selected as the criterion to reduce redundancy. When a species group utilizes several ecosystem types (upland, riparian, aquatic) multiple representative species were selected. Based on background information, field work and input from Indigenous communities and stakeholders the following species were chosen.

Ungulate – Moose (*Alces americanus*)

The moose is North America’s largest ungulate. It eats mostly deciduous leaves and aquatic plants in the growing season, and twigs primarily of coniferous trees in the winter in the eastern boreal (Brassard et al. 1974). Moose are stressed more easily than other ungulates by high temperatures and modify their habitat use in both winter and summer. Use of aquatic habitats and taller forest stands increases with increasing temperatures (Street et al. 2015). Moose also use more densely forested areas in the winter that provide shelter from snow, particularly those near edges with abundant food (Dussault et al., 2005). On the landscape scale, moose avoid areas in the winter with low snowfall to reduce wolf predation (Dussault et al., 2005).

Furbearer – American Marten (*Martes americana*)

The American marten is a medium-sized terrestrial furbearer whose primary habitat is mature coniferous forest, although it also utilizes other treed vegetation communities, especially those with structure (coarse woody debris [CWD] and snags). Open habitats like open bogs, fens and recent burns are not used to any great extent. American martens are opportunistic predators feeding on small mammals including other furbearers such as Snowshoe Hare. American martens are also a prey source for other furbearers including fisher (*Martes pennanti*), Canada lynx (*Lynx canadensis*), and wolves. (Suffice et al. 2017).

Furbearer – North American beaver (*Castor canadensis*)

The North American beaver is a medium-sized aquatic furbearer. North American beavers inhabit aquatic habitats including rivers, ponds, streams and smaller lakes (Allen, 1983). North American beavers are adaptable to human environments and are not considered sensitive to anthropogenic disturbance like road construction, or linear features (Mumma et al. 2018). The North American beaver is an important prey source for other furbearers including fisher, wolves, Canada lynx, bears and wolverine with river otters occasionally predating on kits (Reid, 1984).

Bats – Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereus*), and Silver-haired Bat (*Lasionycteris noctivagans*)

For the purpose of the effects assessment, bats are treated as one species group since they share many similarities, between roosting and foraging habitats and other life history traits, and background data collection, scientific literature, and field data are not always sufficient to provide individual species accounts.

Big Brown Bats are the most encountered bat species in Ontario. Natural roosts for this species include tree cavities, such as woodpecker holes, rot holes, and knot holes, as well as caves, but Big Brown Bats also take advantage of anthropogenic structures like attics and outbuildings. This species typically migrates short distances from their summer range to overwinter (hibernate) (Thorne, 2017).

Hoary Bats exclusively roost in trees by hanging among the foliage and roosting on the surface of the bark. They migrate south to warmer climates for the winter, departing around October and returning in April (Thorne, 2017).

Silver-haired Bats roost in small colonies in cracks or hollows in tree bark. They move roosts frequently and typically require mature habitats with a high availability of roosts (Thorne, 2017). This species migrates south to warmer climates for the winter, departing by November and returning in April (Thorne, 2017).

On January 27, 2025, Hoary Bat and Silver-haired Bat were listed as Endangered under the *Endangered Species Act, 2007*. The present assessment considers the factors involved in the species' decline in Ontario and how the Project may affect the survival of the species and their populations in the RSA.

Forest Songbirds – Orange-crowned Warbler (*Vermivora celata*) and Tennessee Warbler (*Leiothlypis peregrina*)

In Canada, Orange-crowned Warblers breed in brushy and open deciduous woodlands, shrub thickets, mixedwoods, and coniferous forest edges where low growth is present (Gilbert et al., 2020). Foraging habitats can be variable, typically reflecting fluctuations in breeding habitat vegetation, but these birds usually forage in dense green foliage and along the bark and outer branches of trees (Gilbert et al., 2020).

Tennessee Warblers are associated with open areas that contain grasses, dense shrubs, and scattered clumps of young deciduous trees. In the boreal forests of Ontario, this species has been found in successional stages grading from three-year-old lowland and upland timber harvest areas to mature (60-220-year-old) lowland and upland boreal forests (Rimmer and McFarland, 2020). During the breeding season, this species primarily gleans invertebrates from the outer foliage of trees and shrubs. In Northern Ontario, it primarily forages in aspen (*Populus species*), followed by birch (*Betula species*), white spruce (*Picea alba*), alder (*Alnus species*), balsam fir (*Abies balsamea*), and black spruce (*Picea mariana)* (Rimmer and McFarland, 2020).

Wetland Songbirds – Palm Warbler (*Setophaga palmarum*)

The Palm Warbler is associated with black spruce bog environments but also uses other peatlands with scattered trees and regenerating burnt areas (Taylor, 2018). Due to its nesting habitat being in remote areas, knowledge of its breeding biology is lacking. Since it prefers peatlands for nesting, this warbler is less likely to suffer from habitat fragmentation than other species (BSI, 2024). Palm Warblers can also

use drier areas and habitat structure. Open areas with small trees appear to be more important than species composition (Welsh, 1987).

Wetland Songbirds – Alder Flycatcher (*Empidonax alnorum*)

A relatively new species, only being separated from Willow Flycatcher in 1974, Alder Flycatchers feed preferentially on insects caught in the air or gleaned from trees and shrubs (BSI, 2024). This species prefers shrubby early seral growth including wet thickets, riparian areas of swamps, bogs and North American beaver ponds. In the project area nesting habitat would include forest edges, willow (*Salix species*) and alder swales and creek margins, as well as early successional forest regenerating after fires (Lowther 1999). Alder flycatchers are moderately tolerant of human effects, as they can also be found nesting along road edges.

Waterfowl – Canada Goose (*Branta canadensis*)

The Canada Goose breeds in a broad range of habitats, including treeless and forested areas, a variety of managed refuge conditions, and among areas of human habitation. In remote areas, this species will nest both individually and semi-colonially, with a preference for sites that provide a clear view in all directions and nearby permanent waterbodies such as lakes, ponds, marshes, and muskeg (Mowbray et al., 2020).

Waterfowl – Mallard (*Anas platyrhynchos*)

Mallards in the Boreal region of Canada breed on vegetated and fertile wetlands that have some open water. This species will usually nest in uplands close to water, using a wide variety of habitats with dense cover such as marshes, bogs, riverine floodplains, forests, and roadside ditches (Drilling et al., 2020).

Shorebirds – Greater Yellowlegs (*Tringa melanoleuca*)

The Greater Yellowlegs is a Boreal obligate and breeds throughout the Boreal zone in muskegs, wet bogs with small, wooded islands, and coniferous forests with abundant clearings. These areas generally have many small ponds or lakes, scattered tall trees that are used as perches, and are characterised by wet, hummocky ground covered with mosses, lichens, and sedges interspersed with slightly higher and drier areas of low shrubs and grasses (Elphick and Tibbitts, 2020).

Raptor – Red-tailed Hawk (Buteo jamaicensis)

Red-tailed Hawks are found in a broad range of habitats that offer sufficient open space. In the Boreal Forest, dense forest habitats are restricted, but Red-tailed Hawks may still use the edges next to open environments. Scattered large trees are still required in open areas as Red-tailed Hawks are sit and wait predators. Red-tailed Hawks nest close to habitat edges and openings in the canopy, with nest sites often being in taller trees than surrounding areas (Moorman and Chapman, 1996). In general, Red-tailed Hawks use areas during foraging which provide less cover and more prey vulnerability (Leyhe and Ritchison, 2004). Red-tailed Hawks have a high tolerance of humans, nesting and foraging in human environments (Demarchi and Bentley, 2005).

Raptor – Great Grey Owl (Strix nebulosa)

In the Boreal Forest, Great Grey Owls are associated with extensive areas of mature coniferous forest that border on more open areas such as bogs, fens and meadows. The most important habitat features for this species are the availability of nest sites and suitable foraging habitat (COSEWIC, 1996). While mature dense coniferous forest or mixed forest is preferred for nesting, Great Grey Owl foraging areas

are often open treed habitats, bogs, fens and meadows with some tree structure as these owls are primarily perching hunters (Duncan, 1987). Great Grey Owls do not build their own nests, instead using old raptor or raven nests, or placing their eggs in the broken tops of large trees, or snags. Great Grey Owls have a moderate tolerance of humans but require large tracks of habitat (Demarchi and Bentley, 2005).

Herpetofauna – Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), American Toad (*Anaxyrus americanus*), Boreal Chorus Frog (*Pseudacris maculata*), Spring Peeper (*Pseudacris crucifer*), and Wood Frog (*Lithobates sylvaticus*)

Eastern Gartersnakes occupy a wide variety of habitats such as wetland edges, mixed forests, and rocky areas. During the winter they move below the frost line, using rock crevices, other natural underground cavities, and mammal burrows (Ontario Nature, 2024).

American Toads breed in a wide range of permanent and temporary shallow aquatic features. Outside of the breeding season, they can be found in a variety of terrestrial habitats including deciduous and mixed forests, forest clearings, rock barrens, and muskegs. During the winter, they move below the frost line by burrowing in sandy soils or using mammal burrows, crevices in bedrock, or other underground cavities (Ontario Nature, 2024).

Boreal Chorus Frogs breed in open wetlands that are small, shallow, and fish-free. Outside of the breeding season they remain close to their breeding sites, occupying deciduous and mixed Boreal coniferous forests. During the winter they use mammal burrows or tree root cavities, burrow under logs or rocks, or bury under leaf litter (Ontario Nature, 2024).

Spring Peepers breed in several different shallow, open aquatic habitats that are typically temporary and fish-free. Outside of the breeding season they inhabit forests near their breeding sites and can be found several metres off the ground in trees and vegetation. During the winter they move into mammal burrows, tree root cavities, under logs, or bury under leaf litter (Ontario Nature, 2024).

Wood Frogs are closely associated with deciduous and Boreal Forest, inhabiting open and forested muskegs and wet meadows. They breed in shallow, fish-free ephemeral wetlands within or near forests. During the winter they bury themselves under shallow leaf litter (Ontario Nature, 2024).

Table 12-4 shows the representative species for each or species group, associated ecosystem and summarizes the rationale for their selection.

Table 12-4: Representative Species for VC Species Groups

Species Group	Representative Species	Ecosystem	Rationale
Ungulates	▪ Moose	▪ All Communities	▪ Cultural and social importance ▪ Importance in wolf and caribou predation interactions
Furbearers	▪ American marten	▪ Upland Communities	▪ Importance in trapping ▪ Indicator of habitat connectivity and fragmentation
	▪ North American beaver	▪ Riparian and Aquatic Communities	▪ Importance in trapping ▪ Importance in wetland and riparian hydrology

Species Group	Representative Species	Ecosystem	Rationale
Bats	▪ Big brown bat ▪ Silver-haired bat ▪ Hoary bat	▪ Upland and Riparian Communities	▪ Some species are in decline ▪ Potential for short-term and long-term effects on habitat
Migratory Forest Birds	▪ Orange-crowned Warbler ▪ Tennessee Warbler	▪ Upland and Lowland Forest Communities	▪ Potential for short-term and long-term effects on species and habitat
Bog, Fen, and Other Wetland Birds	▪ Alder Flycatcher ▪ Palm Warbler	▪ Bogs, Fens, and Other Wetlands	▪ Potential for short-term and long-term effects on species and habitat
Waterfowl	▪ Canada Goose ▪ Mallard	▪ Aquatic and Wetland Communities	▪ Potential for short-term and long-term effects on species and habitat ▪ Cultural and social importance
Shorebirds	▪ Greater Yellowlegs	▪ Riparian and wetlands	▪ Potential for short-term and long-term effects on species and habitat
Raptors	▪ Red-tailed Hawk ▪ Great Grey Owl	▪ Aquatic and Riparian Communities	▪ Cultural and social importance ▪ Top Avian predator ▪ Sensitive to noise
Reptiles	▪ Eastern gartersnake	▪ All Communities	▪ Only reptile species known to inhabit local area
Amphibians	▪ American toad ▪ Spring peeper ▪ Boreal chorus frog ▪ Wood frog	▪ All Communities	▪ All species known to inhabit local area

The Project has the potential to result in changes in wildlife habitat, mortality risk, reproduction, and movement. Therefore, Wildlife and Wildlife Habitat, including Significant Wildlife Habitat and Migratory Birds are considered in this assessment. Indicators are used to assess potential effects to a VC. In general, indicators represent a resource, feature or issue related to a VC that if changed from the existing conditions may demonstrate a positive or negative effect. **Table 12-5** shows the VC subcomponents and indicators identified for the Wildlife and Wildlife Habitat assessment.

Table 12-5: Wildlife and Wildlife Habitat VC – Subcomponents, Indicators, and Rationale

Subcomponent(s)	Indicators	Rationale
Wildlife Habitat	▪ Wildlife Habitat Loss/Destruction (Changes to wildlife habitat availability (quantity – hectare and quality). ▪ Wildlife Habitat Alteration / Degradation (Changes to abundance and distribution of wildlife habitat (number/ha).	▪ The construction of the road could reduce available habitat, changing wildlife habitat and populations. ▪ Social and cultural importance to Indigenous communities. ▪ From IKLRU information, wildlife and wildlife habitat are considered an important element in the livelihood, cultural and economic resources for Indigenous communities.

Subcomponent(s)	Indicators	Rationale
		▪ The construction and operation of the road may cause changes to the habitat available, even if it is not destroyed. ▪ Altered habitat could cause changes in which wildlife species use areas adjacent to the road.
Wildlife Populations	▪ Wildlife Injury/Death (Changes in wildlife populations or wildlife mortality). ▪ Alteration in Wildlife Movement (Changes to distribution of wildlife species (i.e., configuration and connectivity) or changes in predator access, habitat use and populations).	▪ Construction activities may cause sensory disturbance to some wildlife species altering their movement patterns. ▪ The road may act as a hard or soft barrier for some species and act as a travel corridor for other species both short-term and long-term. ▪ Wildlife may be killed during construction activities. ▪ Wildlife could be killed by vehicles during construction and operations. ▪ Important harvested species to Indigenous Peoples and others (country foods). ▪ Social and cultural importance to Indigenous communities.

12.1.5 Spatial and Temporal Boundaries

The following subsections describe the assessment boundaries that have been defined for the Wildlife and Wildlife Habitat VC.

12.1.5.1 Spatial Boundaries

The spatial boundaries for the Wildlife and Wildlife Habitat VC are shown on **Figure 12.1** and include the following:

- **Project Footprint** – the area of direct disturbance (i.e., the physical area required for project construction and operations). The Project Footprint is defined as the 35-metre wide Webequie Supply Road Right-of-Way (ROW); and temporary or permanent areas needed to support the Project that include laydown yards, storage yards, construction camps, access roads and aggregate extraction sites.
- **Local Study Area (LSA)** – the area where potential largely direct, and indirect effects of the Project are likely to occur and can be predicted or measured for assessment. The LSA extends from the centreline of the preliminary recommended preferred route and from the boundary of the temporary and permanent supportive infrastructure. The extent of the LSA is specific to each Species at Risk/Guild and is selected in consideration of the geographic extent of potential effects on the given Species at Risk/Guild. (**Table 12-6**).
- **Regional Study Area (RSA)** – the area where potential largely indirect and cumulative effects of the Project in the broader, regional context may occur. The RSA includes the LSA and further extends from each side of the LSA boundaries to include the geographical extent to which potential effects from the Project may be expected on the given Species at Risk/Guild (**Table 12-6**).

Based on the specific study assessment requirements for Wildlife and Wildlife Habitat, the above noted study areas have been modified to meet study objectives. Specifically, the LSA for moose includes the standard LSA (1 km buffer from the Project Footprint) plus a 10-km buffer and will be spatially applied

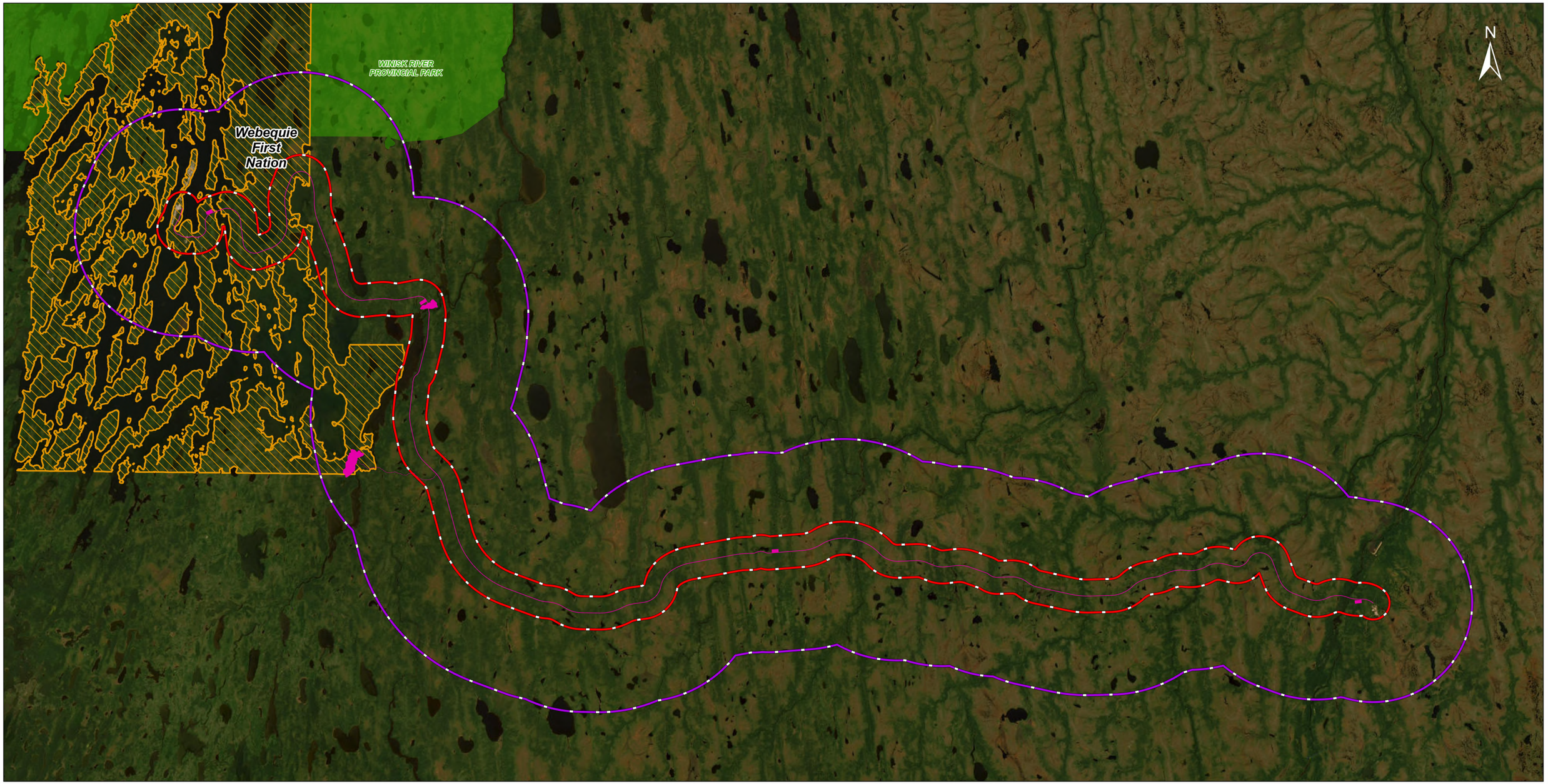
beyond the preliminary recommended preferred route for the road. This expanded LSA has also been applied for caribou, which is addressed in Section 13 (Species at Risk).



Indigenous community members noted that the proposed study area considerations described in the Terms of Reference are inadequate for considering ecological (e.g., caribou, wolverine, lake sturgeon, migratory birds, freshwater fish biodiversity, eskers, peatlands) and social (e.g., eskers, transportation, cultural and sacred sites, traditional land use) impacts.

Based on the existing conditions information assembled to date, and the Project Team's experience on the assessment of roads in similar northern environments, the proposed study areas are currently deemed adequate for assessing potential effects to the ecological and social valued components under consideration.

The spatial boundaries for Wildlife and Wildlife Habitat are defined in **Table 12-6** and presented in **Figure 12.1**. Modified spatial boundaries for moose as defined in **Table 12-6,** are presented in **Figure 12.2**.



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)
- First Nation Reserve
- Provincial Park

WSR
WEBEQUIE
SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information, and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

DISCLAIMER

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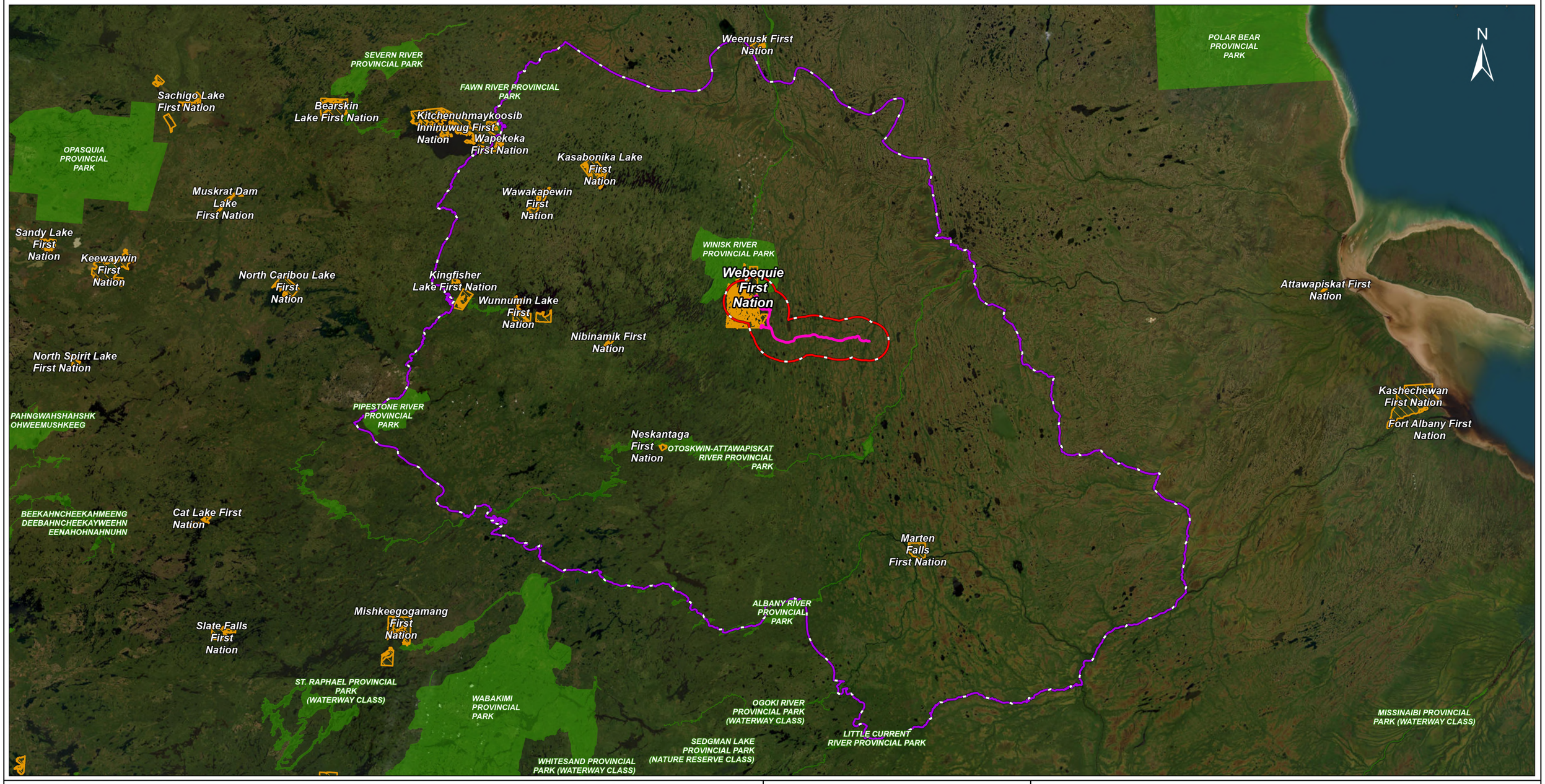
0 5 10 km

Webequie Supply Road

Wildlife and Wildlife Habitat Study Areas

Figure Number:	12-1			**REV:**	PA
Client:	Webequie First Nation	**Project Number:** 661910	**Date:** 5/14/2025		
DSC				**DRN**	**CHK**	**APP**
				TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_SARStudyArea_0001.aprx



Legend:

- Project Footprint
- Moose and Grey Wolf Local Study Area (LSA 11km from Preferred Route)
- Moose and Grey Wolf Regional Study Area (RSA Includes the Missisa and Ozhiski Ranges)
- First Nation Reserve
- Provincial Park

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 75 150 km

Webequie Supply Road

Moose and Gray Wolf Study Areas

Figure Number:	12-2	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/27/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_SARStudyArea_0001.aprx

Table 12-6: Spatial Boundaries and Rationale for Selection

Species/ Guild	Local Study Area (LSA)	Regional Study Area (RSA)	Rationale
Moose Gray Wolf	11 km (2,513 km^2)	Missisa and Ozhiski Caribou Ranges (108,600 km^2)	Moose and wolf will use the Caribou LSA due to interactions with Caribou and their influence on caribou movement and utilization. Moose and wolf will use the boundary of the Missisa and Ozhiski Caribou ranges as their RSA due to interactions with caribou and their influence on caribou movement and utilization.
Furbearers[1]	1 km (276 km^2)	6 km (1,340 km^2)	Standard Project LSA and RSA. Potential sensory effects are within the standard LSA.
Bats	1 km (276 km^2)	6 km (1,340 km^2)	Maternity colony Significant Wildlife Habitat (SWH) includes the entire woodland/forest Ecological Land Classification (ELC) ecosite or an eco-element containing the maternity colony. In lieu of conducting roost searches, all treed ecosites are being considered SWH. Ontario's SWH Technical Guide recommends 200m protection from the entrance of Bat hibernacula. Road distance buffer recommendations, 200m for foraging 2km for maturity and hibernacula (PCAP, 2020). Waterbodies, especially those with still water, are important when in relatively close proximity to the roost (within 2 km). Standard Project RSA.
Migratory Songbirds (Forest and Wetland) Waterfowl Shorebirds Raptors	1 km (276 km^2)	6 km (1,340 km^2)	Standard Project LSA and RSA. Habitat criteria for bird SWH types include the ELC Ecosite code or habitat feature plus a maximum 800m radius. Meta-analysis found that bird populations decline within 1km of human infrastructure, including roads (Benitez-Lopez et al. 2010).
Reptiles and Amphibians	1 km (276 km^2)	6 km (1,340 km^2)	Standard Project LSA and RSA. Project Sensory effects are within the standard LSA.

[1] For the purpose of this report, furbearers include Canada lynx, fisher, American marten, river otter, red fox, American mink, and snowshoe hare. Wolverine is detailed separately as a species at risk **in Section 13 – Species at Risk.**

[2] Includes LSA – 1 km either side from centerline of road the area where potential largely indirect and cumulative effects of the Project in the broader regional context may occur. The RSA includes the LSA and further extends 5 km from each side of the LSA boundaries.

12.1.5.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects of the Project over relevant timescales. The temporal boundaries for the Project consist of two main phases:

- **Construction Phase:** All the activities associated with the initial development of the road and supportive infrastructure from the start of construction to the start of the operation of the Project, which is estimated to be approximately five to six years in duration; and
- **Operations Phase:** All activities associated with operation and maintenance of the road and permanent supportive infrastructure (e.g., operations and maintenance yard, aggregate extraction, and processing areas) that will start after construction activities are complete, including site restoration and the decommissioning of temporary infrastructure (e.g., access roads). The operations phase of the Project is anticipated to be 75 years based on the expected timeline for when major refurbishment of road components (e.g., bridges) is deemed necessary.

The Project is proposed to be operated for an indeterminate period; therefore, future suspension, decommissioning and eventual abandonment is not evaluated in the EA/IA (refer to Project Description, Section 4.4).

12.1.6 Identification of Project Interactions with Wildlife and Wildlife Habitat

Table 12-7 identifies the Project activities that may interact with the Wildlife and Wildlife Habitat VC to result in a potential effect.

Table 12-7: Project Interactions with Wildlife and Wildlife Habitat VC and Potential Effects

Project Activities	Potential Effects			
	Wildlife Habitat Loss/Destruction	Wildlife Habitat Alteration/Degradation	Alteration in Wildlife Movement	Wildlife Injury/Death
Construction				
Mobilization of Equipment and Supplies: Transport of equipment, materials and supplies to the Project site area using the winter road network and airport in Webequie First Nation Reserve.	--	--	✓	✓
Surveying: Ground surveys are conducted to stake (physically delineate) the road right-of-way (ROW) and supportive infrastructure components of the Project (i.e., construction camps, access roads, laydown/storage areas, and aggregate extraction and processing areas).	--	--	✓	--
Vegetation Clearing and Grubbing: Clearing and grubbing of vegetation (forest & wetland), including removal, disposal and /or chipping.	✓	✓	✓	✓
Construction and Use of Supportive Infrastructure: This includes temporary construction camps, access roads and watercourse crossings, laydown/storage areas, aggregate extraction (pits & quarries) and processing areas (screening, crushing), including blasting.	✓	✓	✓	✓
Construction of Road: removal and stockpiling of organics, subgrade excavation, placement of fill and gravel, grading and drainage work (e.g., road ditches, erosion protection, etc.).	✓	✓	✓	✓
Construction of Structures at Waterbody Crossings: Culverts and bridges – foundations (e.g., pile driving and concrete works), bridge girders, bridge decks, installation of culverts.	✓	✓	✓	✓
Decommissioning / Closure of Temporary Aggregate Extraction and Processing Areas (pits and quarries): Demobilization of extracting and processing equipment, grading and site reclamation/revegetation. This also includes formalizing / re-purposing select pits and quarries proposed as permanent Project components during operations.	--	✓	✓	✓
Decommissioning of Temporary Construction Camps, Access Roads, and Laydown / Storage Areas: Grading and site reclamation/revegetation. This also includes formalizing / re-purposing select access roads to permanent pits and quarries and a construction camp to an operations and maintenance facility as Project components for use during operations.	–	✓	✓	✓
Emissions, Discharges and Wastes[1]: Noise, air emissions / greenhouse gases, water discharge, and hazardous and non-hazardous wastes.	✓	✓	–	✓

Project Activities	Potential Effects			
	Wildlife Habitat Loss/Destruction	Wildlife Habitat Alteration/Degradation	Alteration in Wildlife Movement	Wildlife Injury/Death
Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization: Clean-up of excess materials, site revegetation and demobilization of equipment and materials.	–	✓	✓	✓
Potential for Accidents and Malfunctions[2]: Spills, vehicle collisions, flooding, forest fire and vandalism.	✓	✓	✓	✓
Employment and Expenditures[3]	–	–	–	–
Operations				
Road Use: Light and heavy vehicles and maintenance equipment with average annual daily traffic volume of less than 500 vehicles.	–	–	✓	✓
Operation, Maintenance and Repair of Road: Includes vegetation management control within the road ROW, repairs/resurfacing of road granular surface and shoulders, dust control, winter/seasonal maintenance (i.e., snow clearing), road drainage system cleanout/repairs to culverts, ditches and drainage outfalls, rehabilitation and repairs to structural culverts and bridges, and road patrols for inspection.	–	✓	✓	✓
Operation of Pits, Quarries, and Maintenance Yard/Facility: Includes periodic extraction and blasting and processing operations (i.e., crushing, screening) and stockpiling of rock and aggregate materials. Also includes operation and repairs of the Maintenance Yard (Facility) and components within (office buildings, parking, storage of equipment and materials).	–	✓	✓	✓
Emissions, Discharges and Wastes[1]: Noise, air emissions / greenhouse gases, water discharge, and hazardous and non-hazardous wastes.	✓	✓	✓	✓
Potential for Accidents and Malfunctions[2]: Spills, vehicle collisions, flooding, forest fire and vandalism.	✓	✓	✓	✓
Employment and Expenditures[3]**.**	–	–	–	–

Notes:

✓ = Potential interaction

– = No interaction

[1] Emissions, Discharges, and Wastes (e.g., air, noise, light, solid wastes, and liquid effluents) are generated by many project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Wastes and Emissions” is an additional component under each project phase.

[2] Accidents and Malfunctions including spills, vehicle collisions, flooding, forest fire and vandalism may occur at any time during construction and operations of the Project. Rather than acknowledging this by placing a checkmark against each of these activities, “Potential for Accidents and Malfunctions” is an additional component under each project phase. The potential effects of accidental spills are assessed in Section 23 – Accidents and Malfunctions.

[3] Project employment and expenditures are generated by most project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is an additional component under each project phase.

12.2 Existing Conditions

This section summarizes the existing conditions for Wildlife and Wildlife Habitat found within the study areas, as identified in **Section 12.1.5.1** (Spatial Boundaries), based on the review of background information sources and field investigations. The purpose is to provide existing conditions upon which the potential effects of the Project on the Wildlife and Wildlife Habitat VC are assessed. Detailed descriptions of the methods for characterizing existing conditions and interpretations of the results for wildlife are provided in Appendix F – Natural Environment Existing Conditions Report (NEEC Report) of this EAR/IS.

For the purpose of this section, the term wildlife is inclusive of mammals, birds, reptiles, and amphibians, and provides a characterization of species diversity and composition within the study areas, as well as identifying and quantifying terrestrial wildlife habitat therein.

As an overview, the objectives of the existing conditions study were to identify and characterize the wildlife of ecological, economic, or human importance (particularly to Indigenous Peoples) within the study areas as well as to identify important terrestrial features related to wildlife usage, critical life cycle activities, and issues, including:

- Identify wildlife species and/or communities/guilds;
- Identify the presence, distribution, and abundance of terrestrial wildlife occurring within the study areas;
- Identify and characterize provincially significant terrestrial wildlife habitat within the study areas;
- Identify and characterize critical habitat for provincial and federal species at risk (SAR); and
- Support the determination of habitat of species of special concern.

The assessment of effects on Species at Risk and their habitat and the data collected for these species are presented separately in Section 13.

12.2.1 Methods

Indigenous community members are concerned that the existing data from breeding bird surveys has little coverage of the study area and therefore a poor ability to detect trends for most species. The description of bird survey techniques in the draft Terms of Reference makes no mention of the number of stations that will be visited in the planned breeding bird survey.



The scope and intensity of the field studies, and associated data collection methodologies have been established during the EA/IA process through consultation with Indigenous communities, federal/provincial agencies and stakeholders. This included the development of a Birds Study Plan at the outset of the EA/IA, including the opportunity for federal and provincial agencies to review the plan and provide guidance. Section 12.2.1.3 outlined the existing condition studies on Breeding Birds count and acoustic surveys as well as Waterfowl and Shorebird migration surveys. Potential effects to waterfowl are described in Section 12.3.9.

Wildlife surveys were conducted between 2018 and 2023 and included: winter aerial tracking surveys; breeding bird point count surveys, three-season bird acoustic surveys, aerial waterfowl and shorebird migration surveys, bat habitat assessment, and bat acoustic surveys. Existing conditions surveys were

designed with the purpose of gathering information on wildlife diversity and composition within the LSA, the presence of Significant Wildlife Habitat (SWH; MNRF, 2000) supporting critical wildlife life processes, as well as investigating the presence of provincial and federal SAR and species of Special Concern and their specialized habitat (refer to Section 13 – Assessment of Effects on Species at Risk). The availability and distribution of wildlife habitat was estimated as part of the existing conditions characterization. A summary of each survey methodology is provided in subsequent sections. Detailed methodology for all wildlife surveys, the sources for background information review, description of survey site selection, and habitat typing can be found in Appendix F – NEEC Report.

Significant Wildlife Habitat

As a Significant Wildlife Habitat (SWH) Ecoregional Criteria Schedule has not been developed for the study areas (i.e., Project Footprint, LSA and RSA) the Significant Wildlife Habitat Technical Guide (MNRF, 2000) was used as the primary guidance document for the Project, along with the Significant Wildlife Habitat Technical Guide Criteria Schedules for Ecoregions 3E, and 3W (MNRF 2015a, 2017a) which are the set of criteria developed for the Ecoregions geographically closest to the study areas.

These two guides were used to identify the following 12 SWH types for mammals:

- Moose Late Winter Cover;
- Moose Calving Areas;
- Bat Hibernacula;
- Bat Maternity Colonies;
- Seeps and Springs;
- Aquatic Feeding Habitat;
- Denning Sites for mink, otter, gray wolf, eastern wolf, Canada lynx, American marten, fisher, black bear;
- Wolf Rendezvous Sites;
- Mast Producing Areas;
- Cervid Movement Corridors;
- Furbearer Movement Corridors; and
- Forest areas providing a high diversity of habitats.

The Significant Wildlife Habitat Technical Guide Criteria Schedules identify Ecological Land Classification (ELC) ecosite types that are indicative of each type of SWH. Areas containing suitable vegetation communities for a given SWH type are referred to as candidate SWH. As there is no schedule for region 2W adjustments, we made changes based on specific conditions of local geographically; these are noted in individual sections where appropriate.

A candidate SWH becomes a confirmed SWH once defining criteria, as outlined in the criteria schedules, have been met. Summaries of the criteria used to identify candidate SWH and confirm SWH are provided in Appendix F – NEEC Report.

12.2.1.1 Resource Selection Function (RSF) Modelling

Observational data was used to locally estimate resource selection and produce Resource Selection Function (RSF) models for select species from the following wildlife groups: Amphibians, Mammals, Wetland Breeding Birds, and Waterbirds. RSF modelling provides a probability of use and allow for the

determination of areas of high functional habitat value. Species selection and modelling methodology is presented in detail in Section 9.4.4.2 and Section 9.4.4.3 in Appendix F – NEEC Report.

These values were summarized to the ELC polygon level for all species except for moose, which uses the Far North Land Cover (FNLC) (MNR, 2014) as the ELC does not completely cover the moose LSA. A quantile classification was applied to derive an aggregated functional habitat use value for each species analyzed. Five quantile categories were used and divided into High (top 20%), Moderate (middle 40%) and Low usage (bottom 40%).

Change in Use

Changes in wildlife species distribution following construction of the road was modelled by estimating probability of use (pUse) based on resource selection functions (RSFs) across the study areas (Project Footprint, LSA and RSA). Details of modelling methods are discussed in Section 11.2.1.2 (Existing Conditions Characterization Collection Methods, Assessment of Effects on Vegetation and Wildlife) and further details are provided in the Natural Environment and Existing Conditions (NEEC) report (Appendix F). RSFs were developed using a boosted-regression tree approach, with data from the FNLC and other environmental variables, including Landsat TM. Future disturbance effects were modelled by overlaying the Project Footprint with existing disturbances, including roads and aggregate sources on the FNLC map, and then reassigning wetland and upland values in the 3-ha hexagons underlying the anthropogenic layer as an upland anthropogenic disturbance. This modeling was done for the nine species/species groups used as Wildlife and Wildlife Habitat VC subcomponents.

Interpretation of these results is complicated by the fact that no roads are currently present in the RSA so current wildlife response to existing roads cannot be included in the model. To overcome this limitation, the Project Footprint was changed to an “anthropogenic disturbance” landcover type which represents a wide range of anthropogenic habitats. These disturbance habitats include the community, ice roads, and other clearings.

12.2.1.2 Mammals

12.2.1.2.1 Winter Aerial Surveys

Winter aerial surveys were conducted in 2018, 2019, and 2021 for mammals within the project area. These surveys were recommended by the MNR Nipigon District primarily to inventory caribou and caribou habitat, inventory moose and moose wintering habitat; and inventory the presence of furbearers and other wildlife, such as gray wolf, Canada lynx, fisher, American marten, river otter (*Lontra canadensis*), red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*), and muskrat (*Ondatra zibethicus*). Additional wildlife habitat was recorded if present, for example, bat roosting and hibernacula areas. As noted in **Section 12.1.5.1** (Spatial Boundaries) the Missisa and Ozhiski Caribou Ranges were used as the boundaries for the moose and gray wolf RSA due to the influence of these species on Caribou movement and habitat utilization.

Winter aerial surveys for mammals were conducted on consecutive days between February 1 and March 15 in 2018, 2019, and 2021. To the extent possible, they were completed according to standardized survey methodology for identifying and delineating caribou winter habitat provided by the MNR (Select Wildlife and Habitat Features: Inventory Manual, Ranta, 1997). The aerial survey consisted of flying a grid of parallel transects oriented in a north-south direction, using a helicopter. During this survey, biologists recorded large mammal species that were encountered (e.g., moose, wolf). The standardized parallel transect spacing of 2 km was used, as suggested in the MNR protocol. Detailed information and figures

regarding the transects that were surveyed in each year of this study are presented in Appendix F – NEEC Report.

All wildlife observations made during the survey were recorded immediately on a data sheet along with the date, time, transect number, Universal Transverse Mercator coordinates, species name, number of individuals, and habitat type. When possible, moose sex (i.e., male, female, unknown) and age (i.e., adult, yearling, calf) was noted, unless undue stress on the animals would result from the determination of these details. Other signs of moose or other wildlife presence were also recorded, including tracks of gray wolf or their kills. Fresh tracks were distinguished from old tracks and digital photographs of wildlife were taken whenever possible.

12.2.1.2.2 Bat Hibernacula Screening

Refer to Section 13.2 (Existing Conditions, Assessment of Effects on Species at Risk).

12.2.1.2.3 Bat Maternity Roost Habitat Screening

Refer to Section 13.2.1.1 (Existing Conditions, Mammals, Assessment of Effects on Species at Risk).

12.2.1.2.4 Bat Acoustic Surveys

Refer to Section 13.2.1.1 (Existing Conditions, Mammals, Assessment of Effects on Species at Risk).

12.2.1.2.5 Bat Activity Modelling

Refer to Section 13.2.1.1 (Existing Conditions, Mammals, Assessment of Effects on Species at Risk).

12.2.1.3 Birds

The Significant Wildlife Habitat Technical Guide Criteria Schedules for Ecoregions 3E, and 3W (MNRF 2015a, 2017a) were used to identify the following 14 SWH types for birds:

- Waterfowl Stopover and Staging Areas (Terrestrial);
- Waterfowl Stopover and Staging Areas (Aquatic);
- Shorebird Migration Stopover Areas;
- Colonial-Nesting Bird Breeding Habitat (Cliff);
- Colonial-Nesting Bird Breeding Habitat (Tree/Shrubs);
- Colonial-Nesting Bird Breeding Habitat (Ground);
- Rare Vegetation Communities: Marshes;
- Waterfowl Nesting Areas;
- Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat;
- Woodland Raptor Nesting Habitat;
- Sharp-tailed Grouse Leks;
- Marsh Bird Breeding Habitat;
- Open Country Breeding Bird Habitat;
- Shrub/Early Successional Bird Breeding Habitat; and
- Special Concern and Rare Wildlife Species.

The Significant Wildlife Habitat Technical Guide Criteria Schedules include descriptions of wildlife habitat, wildlife species and the criteria for determining SWH based on science and expert knowledge. The schedules include lists of ELC ecosite codes associated with each type of wildlife habitat. An area comprised of suitable vegetation communities for a given SWH type is referred to as candidate SWH. A candidate SWH becomes a confirmed SWH once defining criteria, as outlined in the criteria schedules, have been met. Since an Ecoregional Criteria Schedule has not been developed for the study areas identified in the Project, the Significant Wildlife guide was the primary guidance document that was used. Summaries of the criteria used to identify candidate SWH and confirm SWH are provided in Appendix F – NEEC Report.

12.2.1.3.1 Breeding Bird Point Count Surveys

Point count surveys followed the principles of the Forest Bird Monitoring Program, as well as the Ontario Breeding Bird Atlas (OBBA) survey protocols. These protocols are described in the MNR's publication Wildlife Monitoring Programs and Inventory Techniques (Konze and McLaren 1997), the Ontario Breeding Bird Atlas Participants Guide (OBBA, 2001) and more generally in Appendix 1 of the TISG.

Surveys were conducted between one half hour before sunrise until five hours after sunrise between June 1 and July 10, and the data collected included:

- Species;
- Number of individuals;
- Estimated distance from viewer (i.e., 0-50m, 50-100m, 100+ m);
- Minute interval first detected (i.e., 1, 2, 3….10);
- Breeding evidence (i.e., suitable habitat, singing male, pair, nest with eggs, nest with young, etc.); and
- Survey weather conditions (temperature, wind [Beaufort Scale], precipitation, cloud cover [%]).

Any incidental observations of non-target wildlife species or bird species observed between point counts were also recorded.

Each sample location was surveyed by a qualified biologist skilled in visual and aural identification of Ontario bird species. Surveys were conducted by qualified biologists using a standardized 10-minute point count and recorded. Each species encountered were recorded at one-minute intervals with distance estimates recorded between 0-50 m, 50-100 m and >100 m. Vegetation classification within 100 m of each sample were also assessed.

Point Count Site Selection

In 2019, breeding bird point counts were conducted at 113 pre-determined stations. In 2020, 186 breeding bird point counts were conducted. Of these, 86 were repeated from 2019 and 100 were new stations. In total, 258-point count stations were sampled; 122 stations were positioned within the bird LSA, while 136 stations were positioned within the bird RSA. Survey stations were positioned at least 300 m apart, and spread across six distinct habitat types, including:

- Hardwood Forest;
- Coniferous Forest;
- Mixed Forest;
- Disturbed Lands;

- Treed Wetland (swamp, treed bog/fen); and
- Open Wetland (bog/fen, marsh).

Efforts were made to position at least ten survey points in each of these habitat types to generate adequate species lists. In the instances where counts bordered on multiple vegetation communities (e.g., riparian areas, lake shorelines), field staff indicated on the data sheet which vegetation community each bird was located in.

Sample Representation

To demonstrate whether the number of breeding bird count locations were representative of the habitat in the LSA, a chi-squared (χ^2) test was performed comparing the number of survey stations in each habitat type to the expected number of survey stations in each habitat type within the LSA. The expected number of survey stations in each habitat type was calculated based on the proportion of each habitat type within the LSA. Statistically significant differences (i.e., p-value < 0.05) indicate under- or over-sampling of a habitat type.

The number of breeding bird survey stations that were surveyed were significantly different than the expected number of survey stations based on the proportion of habitat within the LSA ($\chi^2 = 113.67$, p-value < 0.01). According to this test, no habitat types were sampled in a manner representative of the habitat composition within the LSA. Conifer forest, mixed forest, disturbed habitat, and open wetland were over-sampled, while treed wetland habitat was under-sampled. Lake and river habitats were not considered as functional habitat types for the majority of species sampled during point counts. Vegetation communities along the shoreline of open water habitats were classified according to the other major habitat types. Forest habitats were over-sampled due to capturing greater diversity of species as well as uncommon species that could be expected in these habitat types, and the diversity of habitat structures and age classes that could be found with these habitat types.

Paired Acoustic Recording

In 2020, during each point count survey, observers deployed high-quality portable acoustic recording devices (i.e., with 360-degree recording in WAV format, selectable sampling rate, and adjustable microphone gain), mounted on a tripod. This survey type is suitable for sampling a representative species composition for the Project Footprint, LSA, and RSA including forest and bog/fen birds, as well as for locating most diurnal avian SAR that occur in the region.

Data recorded using ARUs during the morning breeding bird point counts was used to normalize data recorded during these counts and data recorded by ARU only.

12.2.1.3.2 Bird Acoustic Surveys

ARUs were deployed to survey bird presence in 2020 and 2021. Deployment of ARUs was used to augment data collection conducted during point count surveys, obtain data to support the abundance and distribution modelling process, and capture temporal variations in bird species presence, abundance, and distribution across a broad range of dates (including seasons) and times of day. ARUs were placed at least 500 m apart and proportionately sampled all major habitat types present within the LSA and RSA, as was done with the point count surveys. The recording schedule programmed into each ARU adhered to protocols prescribed in the federal TISG for the Project, recording daily, with a morning and evening schedule.

In 2020, a total of 55 Song Meter SM4 Mini (Wildlife Acoustics Inc.) recording devices were deployed across representative habitats for data collection. ARUs recorded until the batteries died or memory cards were filled. Batteries and memory cards in all 55 detectors were replaced between mid and late June of 2020 and 16 detectors were moved to secondary supplemental locations to record for the rest of the avian breeding season (i.e., late July), or until either the batteries or memory card capacity was exhausted. In total, 70 survey locations were sampled through the core avian breeding season through remote ARU use. Following this, ARUs were left at their location to record during the fall migration period (August 1 through September 30, 2020) and during the winter (December 1, 2020, through to March 31, 2021) (i.e., collectively, Fall/Winter Recordings).

In 2021, an additional 21 ARUs were deployed in habitats that were underrepresented in the initial deployment and in areas that had poor spatial coverage. Nine ARUs were also removed from habitats that were over-represented, namely conifer swamp and conifer forests. In total, 82 survey locations were sampled through the core avian breeding season in 2021 through remote ARU use. Batteries and memory cards in all 82 detectors were replaced in mid-late July of 2021. Once the breeding season ended, ARUs were left at their location to record during the fall migration period. In total, 49 ARUs were positioned within the LSA and 33 were located within the RSA. At the end of the fall migration period ARU's were collected from the field, and no winter data collection was conducted.

All acoustic files were analysed according to methodologies described in the TISG for the Project.

Acoustic Subsampling

The amount of annual data gathered by each ARU was extensive: up to 12,000 recordings were collected at each station, providing over 600 hours of audio data. To reduce the data to a manageable amount for acoustic processing, a random subsampling process was conducted using RStudio software (RStudio Team, 2020).

Acoustic data was first divided into three time periods: breeding season (May 1 through July 10), fall migration (August 1 through September 30) and winter season (November 1 through March 31). For each of these seasons a separate subsampling process was conducted. The seasonal datasets were further subdivided into dawn (one hour before sunrise to five hours after), dusk (half an hour before sunset to two hours after sunset), and nighttime (midnight to one hour before sunrise). Days with heavy precipitation (>10mm) were removed from the sample by importing Environment Canada historical weather data using the R package WeatherCan (LaZerte and Albers, 2018).

Using these filtered lists, a pre-determined number of files were randomly selected using the dplyr package (Wickham et al., 2021) within RStudio. For the breeding season, eight samples for the dawn period, four for the dusk period and for the nighttime period were selected. For the fall and winter season, eight samples were taken only from the dawn period. Under normal conditions the subsampling process only selected one random file per day from a given ARU station to reduce temporal correlation; however, due to weather conditions and short recording timeframes of some ARUs, up to two recordings were analyzed on the same day in a small percentage of cases (0.71%).

Prior to full acoustic interpretation, a short segment of each recording was listened to in order to determine if the recordings were suitable for analysis. Files with substantial wind, rain or other environmental noise were excluded. A minimum of four samples were required for analysis in dawn periods and two for evening and dusk periods. If multiple samples were excluded, leaving an insufficient number of recordings, additional subsampling was conducted until enough samples were available for each station. In some environments (riparian, open wetlands) background noise was always present to

some degree, so files with some noises were included in the final subsample. This higher level of noise will have to be accounted for in the analysis.

Avian Modelling

Avian Modeling was conducted using the 405 total breeding bird plots sampled in 2019 and 2020. The suggested statistical analysis of bird distribution and abundance, as described in the Project's TISG, is rigorous and requires accounting for observational bias and modelling habitat-specific abundance and density estimates. The following were calculated using data and are further detailed in Appendix F – NEEC Report:

- Observational Bias Correction;
- Species Abundance and Distribution Models;
  - Boosted Regression Tree;
  - Generalized Linear Models;
- Spatial Analyses Layer (applied to all models);
- Simulation and Assessment of Survey Design and Precision;
- Simulation Study Area and Methods; and
- Resource Selection Function Modelling.

12.2.1.3.3 Waterfowl Migration Surveys

Survey timing and locations for waterfowl were informed by a background information review along with coordination with Webequie First Nation hunters and community members. Surveys typically bookended the local goose hunt as not to disturb the traditional hunting practices and critical food-gathering period for the Webequie First Nation. Spring surveys were conducted between mid-May and early June, while fall surveys were conducted between early September and mid-October.

Each survey consisted of flying the entire length of the proposed route alternatives and circling over each lake or open wetland within 1 km of the alternative routes, paying particular attention to those areas identified during the background data review and from the consultation. The field crew included two biologists experienced in the identification of waterfowl: one primary observer and one secondary observer/recorder. Surveys followed national and provincial standards for presence/not detected (United States Fish and Wildlife Service and CWS 1987; RIC 1999a; Ducks Unlimited Canada 2003), although abundance data were also recorded. Three helicopter flights took place over 10 days to account for daily variations and were dependent on weather conditions. Each flight was accompanied by a Webequie First Nation community member. Data collected included:

- Date;
- Time started and time ended;
- Weather conditions;
- Species observed;
- GPS location, and
- Number of individuals.

A total of 119 wetlands/waterbodies were visited during the surveys. While the surveys were intended to focus on migrating waterfowl, all wildlife observed during the flights were recorded.

12.2.1.3.4 Shorebird Migration Surveys

In northern Ontario, spring shorebird migration typically peaks later than waterfowl migration (late May) and occurs during a relatively short time period (mid–May to early June). Conversely, fall shorebird migration typically begins and peaks earlier than waterfowl migration, yet spans up to four months (late July – October). Overall, timing of waterbird surveys did not coincide well with peak shorebird migration in Ontario; however, it is expected that shorebird migration across the LSA for the Project is minimal. This assumption is based on the limited extent of suitable shoreline habitat present within the LSA as well as the fact that shorebirds are well-known to stage and migrate along the shoreline of James Bay from which they travel to the Atlantic coast or to fall staging locations along the Great Lakes.

In 2019 and 2020, shorebirds were recorded when observed during waterbird migration and staging flight surveys within the LSA, as well as during surveys of a reference route along the Winisk River – extending 50 km north from Winisk Lake. This additional survey route was identified as having the potential to provide the best shoreline habitat in proximity to the Project and provided a possible movement route for northbound migrant shorebirds. This route was identified through consultation with Webequie First Nation. The survey consisted of flying 50 km of the Winisk River north of Winisk Lake.

Shorebird data collected included:

- Date;
- Time started and time ended;
- Weather conditions;
- Species observed;
- GPS location; and
- Number of individuals.

As per the James Bay Shorebird Project (2019) methodology, shorebirds observed were identified to the extent possible; however, similar species were typically grouped depending on their similarities. For the purpose of the survey, determining shorebird numbers was deemed more important than absolute species identification.

12.2.1.3.5 Raptors

Raptor nests were noted when they were observed during winter aerial surveys (see **Section 12.2.1.2.1**) and during surveys for waterfowl and shorebirds (see **Section 12.2.1.3.3** and **Section 12.2.1.3.4**). During these survey flights, particular attention was given to stick nest searches in the vicinity of rivers and lake shorelines, and unburned mature hardwood/conifer stands. The classification of nest type was determined through a combination of staff knowledge, habitat type, stick and nest size, nest placement, and raptor sightings, and photos when possible. If the species associated with the nest could not be determined, the nest was simply recorded as a stick nest. Typically, stick nests are most readily found during leaf-off.

Stick nests were also recorded when they were found during breeding bird point count surveys (see **Section 12.2.1.3.1**). Data recorded for each raptor nest included GPS location, associated species (if possible), relative size and characteristics (if species cannot be determined), tree species used, and a description of surrounding vegetation community and structure.

12.2.1.4 Herpetofauna

The Significant Wildlife Habitat Technical Guide Criteria Schedules for Ecoregions 3E and 3W identify five SWH types for herptiles that include:

- Turtle Wintering Areas;
- Turtle Nesting Areas;
- Reptile Hibernacula;
- Amphibian Breeding Habitat (Wetland and Woodland); and
- Amphibian Movement Corridors.

The Significant Wildlife Habitat Technical Guide Criteria Schedules provide ELC ecosite types that are indicative of SWH. Areas comprised of suitable vegetation communities for a given SWH type are referred to as candidate SWH. A candidate SWH becomes a confirmed SWH once defining criteria, as outlined in the criteria schedules, have been met. The Significant Wildlife guide was the primary guidance document for the project, as a SWH Ecoregional Criteria Schedule has not been developed for the area containing the Project Footprint. Summaries of the criteria used to identify candidate SWH and confirm SWH are provided in Appendix F – NEEC Report.

12.2.1.4.1 Frog Acoustic Surveys

Amphibians were surveyed using ARUs that were deployed in 2020 and 2021 as described in **Section 12.2.1.3.2** for Bird Acoustic Surveys. Song Meter SM4 Mini (Wildlife Acoustics Inc.) were deployed to record wildlife acoustic data that included frog vocalizations as well as birds.

Amphibian data were collected at the 63 stations established for the bird monitoring program in the spring of 2020. For transcription each station had 3-minute recordings randomly selected that had been collected during the dusk period (30 minutes before to two hours after local sunset) and night period (midnight to one hour before sunrise). Only the dusk and night recordings were used in the analysis due to the higher probability of amphibians being detected. As identified during the background review, transcription of the ARU recordings focused on identifying the presence of five amphibian species. Ordinal date was recorded as breeding period varies between each species; weather was also recorded.

The initial dataset consisted of amphibian detections recorded opportunistically during the bird acoustic program and the goal was to have four recordings at each station. To account for species differences in generalized breeding periods, selected recordings were spaced throughout the breeding period in the RSA (end of May to the beginning of July).

Processing additional recordings were required at several stations due to bird listening conditions being different from those required for amphibians (too early or too late in season, warm dry conditions, recordings not spaced throughout season). Additionally, several stations were eliminated from analysis either due to failure early in the season or because they were established too late in the season. Overall, a total of 48 stations were used in the analysis for Wood Frogs (*Lithobates sylvatica*), Boreal Chorus Frogs (*Pseudacris maculata*), and Spring Peepers (*Pseudacris crucifer*); and 46 stations were used in the analysis for American Toads (*Anaxyrus americanus*).

The data was collapsed into either presence or not observed per station, and this data was used to create a presence – absence model using logistic regression for each species similar to the process used by the Environmental Monitoring Committee of Lower Athabasca amphibian monitoring report (Bayne, E. and T. Muhly, 2015). The model included habitat proportions based on the FNLC. Due to the large number of habitat categories, the habitats were simplified into more general categories:

- SWAMP: including all swamp ecosites;
- BOGS: consisting of all Bog ecosites;
- FENS: consisting of all Fen ecosites; and
- UPLAND: consisting of all non-wetland categories.

The model also included distance to open water and the number of recordings that were listened to at each station was included as a covariate.

12.2.1.4.2 Reptiles

No targeted surveys were conducted for reptiles. Incidental detections of reptiles were recorded as they were observed.

12.2.2 Results

A summary of survey results from the existing conditions studies conducted for wildlife and wildlife habitat is provided in subsequent sections. Detailed results for all wildlife surveys can be found in Appendix F – NEEC Report.

12.2.2.1 Mammals

12.2.2.1.1 Background Information Review

A review of background information sources indicates that 41 mammal species may potentially occur within the RSA for the Project. A compiled list of all species known or anticipated to occur within the RSA can be found in Appendix F – NEEC Report. A review of Bat Conservation International (BCI, 2018) species ranges indicates that up to six bat species may occur along the WSR preliminary proposed corridor (BCI, 2018). The Noront Eagle's Nest Project EA (2013) reported the potential for 36 mammal species to occur within their local study area (Noront, 2013). Results of the background information review with regards to mammalian SAR (four species) are described in Section 13 (Assessment of Effects on Species at Risk).

Wildlife surveys were conducted in 2017, as reported in the *Baseline Environmental and Geotechnical Studies Report – Webequie Community Supply Road (TPA1B) and Nibinamik-Webequie Community Road (TPA1A)* (2018). The results of these surveys produced records of ten mammal species, of which four were seen or heard, and six were recorded based only on the presence of sign, such as tracks, scat, gnaw marks, and houses. Nine mammal species were recorded across the TPA1A route, while three species were recorded across the TPA1B route. All recorded species recorded have been reported by the Atlas of the Mammals of Ontario (Dobbyn, 1994) and were accounted for through winter tracking surveys, with the exception of Caribou (Boreal population).

12.2.2.1.2 Winter Aerial Surveys

A total of 16 species, including ten mammal species, were recorded during winter aerial surveys.

RSF Modelling

Sufficient data was collected during winter aerial surveys to support winter RSF modelling for American marten, moose, caribou, river otter, snowshoe hare, and fox (typically red fox). Modelling results can be found in Appendix F – NEEC Report. Modelling results and resulting mapping is presented for each target species, provided in the following sections. Caribou is addressed separately in Section 13 (Assessment of Effects on Species at Risk).

Moose

A total of 38 moose were recorded during the 2018 winter aerial survey across 27 sightings. Group size ranged from one to three individuals. Areas with fresh tracks were briefly searched for individuals; however, some moose may have been missed during aerial search efforts possibly due to dense vegetation obscuring views.

In general, moose were observed throughout the entire survey area but were more prevalent west of Webequie. In this area, new regeneration of mixed hardwood and coniferous forests was present from a prescribed burn 40 years ago. Moose tracks were often observed at the sides of lakes or rivers providing evidence of browsing. Additionally, moose were commonly observed browsing, lying down, or walking within open forested areas.

In 2018, it was possible to identify the sex of 22 individuals, which were 15 cows (68%) and seven bulls (32%). Of all Moose observations (38), two yearlings (5.3%) and two calves (5.3%) were identified with a cow.

In 2019, evidence of moose was found extensively throughout the survey grid, with observations made on 40 of the 48 transects. A total of 33 individual moose were recorded across 19 locations. Of the moose that the survey team were able to identify by sex and age, seven were cows, 12 were bulls, and seven were calves.

In 2021, only two moose were recorded across the survey area.

RSF probability modelling for this species, based on winter aerial survey data, indicates that areas of high moose occurrence are distributed evenly across the moose LSA and that these areas follow rivers and other waterbodies. It stands to reason that riparian forest stands would provide suitable late winter cover for moose, as trees in these areas are typically taller than in surrounding areas. Maps detailing RSF modelling mapping for moose can be found in **Section 12.3.1** (Threat Assessment Approach)**.**

Gray Wolf

The 2018 winter aerial survey recorded two packs of wolves (two and seven, respectively), totalling nine individuals. The pack of two individuals was observed on Winisk Lake southeast of the Webequie garbage dump, while the pack of seven individuals was observed farther southeast of Webequie along the shore of a forested peninsula. Additionally, wolf tracks were observed at four locations to the south and southeast of Webequie and near the southeastern perimeter of the survey area. Typically, tracks were detected on or beside lakes or rivers, or in open forested areas where tracks were not obstructed by dense vegetation.

In 2019, Gray Wolf observations were uncommon and sporadic; however, two packs of 11 and 13 individuals were observed, and tracks were recorded at an additional four locations. Locations of wolf tracks and observations can be found in Appendix F – NEEC Report.

No wolves were observed during the 2021 winter aerial survey; however, tracks were observed at ten locations across the survey area. Similar to previous years, tracks were concentrated around the Webequie garbage dump.

Furbearers

Other mammal species recorded during this survey included American marten, red fox, North American river otter, lynx, snowshoe hare, American mink, and weasel species (*Mustela* sp.). American marten was typically the most abundant and widely occurring furbearer across the LSA. Locations of furbearer observations made during winter aerial surveys in 2018, 2019, and 2021 can be found in Appendix F – NEEC Report.

Mammal observational data were used to estimate local resource selection and produce RSF models for three furbearer species, American marten, otter and red fox. RSF modelling provides a probability of use and allow for the determination of areas of high functional habitat value. These values are then summarized to the ELC polygon level, and a quantile classification was applied to derive an aggregated functional habitat use value (high-medium-low) for each species analyzed. Species selection and modelling methodology is presented in detail in Section 9.4.8 of the NEEC Report (Appendix F). Maps detailing RSF modelling mapping for American marten can be found in **Section 12.3.4** (Identification of Potential Effects, Pathways and Indicators).

12.2.2.1.3 North American beaver

The wildlife crews were not required to note North American beaver lodges as part of the methodology for winter aerial surveys; however, the aquatic field survey personnel recorded the presence of North American beaver lodges within the waterbodies assessed and the findings are documented in the Fish and Fish Habitat section of Appendix F – NEEC Report. Additionally, North American beaver lodges were documented during the 2020 waterfowl surveys. The locations of North American beaver dams and lodges are shown in Figure 10.14 of the NEEC Report with 31 unique observations within the LSA. As aquatic surveys were concentrated within the LSA, no observations of North American beaver dams or lodges were made within the RSA.

North American Beaver Habitat Suitability Model

As North American beaver was not specifically targeted by field studies, a Habitat Suitability Index Model (HSI) was developed to map high value North American beaver habitats in the RSA. Habitat suitability rankings were developed for the RSA based on known habitat requirements that have been identified in literature and through expert review. The model was developed using the vegetation layers developed as part of vegetation surveys, through the process described in Section 11 (Assessment of Effects on Vegetation and Wetlands). Rankings and model development are described in Appendix F – NEEC Report. Existing conditions model results for the habitat suitability model are found in **Table 12-8**. While the LSA and RSA have similar distributions of North American beaver habitat with just over 5% of the RSA being high quality North American beaver habitat the Project Footprint has a much lower percentage of 1.5%. Maps detailing Beaver Habitat Suitability can be found in **Section 12.3.3** (Identification of Potential Effects, Pathways and Indicators).

Table 12-8: North American beaver Suitability Ratings for Landcover Types

Habitat Suitability Index Model	Project Footprint (ha)	Percent Area (%)	LSA Existing Conditions Area (ha)	Percent Area (%)	RSA Existing Conditions Area (ha)	Percent Area (%)
High	8.1	1.5%	1,386.2	5.0%	6,796.6	5.1%
Moderate	1.7	0.3%	284.5	1.0%	1,430.9	1.1%
Low	20.4	3.7%	4,036.7	14.6%	22,733.0	17.0%
Poor	521.1	94.5%	21,945.7	79.4%	103,048.2	76.9%

12.2.2.1.4 Muskrat

Muskrats generally inhabit freshwater marshes, marshy areas of lakes, and slow-moving streams, using partially dried and decayed plant material as building materials to construct houses for shelter (Aleksiuk and Parker, 1986). Muskrats can also dig burrows in firm banks of mossy soil or clay when vegetation is sparse, allowing them to access deep waters, escape from predators, and access food supply under the ice during winter.

No targeted surveys for muskrat were conducted, but observations of muskrat were recorded during aerial surveys as incidental data. A review of these data indicated no muskrat houses were recorded in these surveys. The lack of muskrat records may be due to the incidental nature of these records, the smaller size of muskrat house vs North American beaver lodges (North American beaver was recorded incidentally multiple times within the same surveys), the use of burrows instead of houses in northern areas which are less visible during aerial surveys, and the small number of marsh habitats.

12.2.2.1.5 Incidental Observations

Trail cameras were deployed at 25 stations as part of a Wolverine Occupancy Study (refer to Section 13 – Species at Risk). These resulted in the capture of 31,037 wildlife photos, which documented 11 mammal species.

12.2.2.1.6 Bat Hibernacula Screening

Refer to Section 13.2.2 (Results, Assessment of Effects on Species at Risk).

12.2.2.1.7 Bat Maternity Roost Habitat Screening

Refer to Section 13.2.2 (Results, Assessment of Effects on Species at Risk).

12.2.2.1.8 Bat Acoustic Surveys

Refer to Section 13.2.2 (Results, Assessment of Effects on Species at Risk).

12.2.2.1.9 Bat Activity Modelling

Refer to Section 13.2.2 (Results, Assessment of Effects on Species at Risk).

12.2.2.1.10 Significant Wildlife Habitat

Moose Late Winter Cover

Background Information Review: The LSA and RSA for moose occurs within the 1D Wildlife Management Unit, which has not been mapped for moose late wintering areas thus existing late winter habitat data for moose was not available from the MNR. Candidate moose late winter habitat areas were mapped based on available vegetation communities within the LSA. These candidate areas can be found in Appendix F – NEEC Report. These data indicate that 110 moose late winter habitat areas are located within the LSA, covering a total area of 18.9 ha. Across the moose RSA, 320 candidate late winter habitat areas are present, which cover a total of 84.3 ha. According to vegetation community distribution across the moose LSA, late winter habitat is concentrated at both the western and eastern termini of the WSR Project.

Field Survey Results: Moose track and animal occurrence was recorded across three winter aerial surveys. Probability modelling for this species, based on winter aerial survey data, indicates that areas of high moose occurrence are distributed evenly across the moose LSA and that these areas follow rivers and other waterbodies. Riparian forest stands provide suitable late winter cover for moose, as trees in these areas are typically taller than in surrounding areas.

Moose Calving Areas

Background Information Review: No data indicating the location of moose calving sites were found during the background information review.

Field Survey Results: No formal surveys for this habitat type were conducted due to the complexity in finding such habitat features.

Bat Hibernacula

Refer to Section 13.2.2 (Results, Assessment of Effects on Species at Risk).

Bat Maternity Roost Habitat

Refer to Section 13.2.2 (Results, Assessment of Effects on Species at Risk).

Seeps and Springs

Background Information Review: No data indicating the location of seeps or springs were found during the background information review.

Field Survey Results: No seeps or springs were found during field surveys. No formal surveys for this habitat type were conducted due to the complexity in finding such habitat features.

Aquatic Feeding Habitat

Background Information Review: No candidate aquatic feeding habitat areas were identified within the LSA from the review of background information sources.

Field Survey Results: No aquatic feeding habitat areas were confirmed within the LSA. No targeted searches for aquatic feeding habitat were completed. Aquatic feeding habitats were noted during the waterfowl surveys by incidental observation; however, these surveys took place earlier than the recommended window for targeted aquatic feeding habit surveys.

Mineral Licks

Background Information Review: No data indicating the location of mineral licks were identified during the background information review.

Field Survey Results: No formal surveys for mineral licks were conducted during existing conditions field investigations due to the complexity in finding such habitat features.

Denning Sites for Mink, Otter, Gray wolf, Eastern wolf, Canada lynx, American marten, Fisher, Black bear

Background Information Review: Information regarding den sites was either identified during the background information search or through Indigenous Knowledge gathering.

Field Survey Results: No denning sites were noted during field investigations. A Black Bear den was identified by Webequie community members. The den was described as being 24 km northwest of Webequie; however, the coordinates provided could not be verified.

Rendezvous Sites for Gray Wolves

Background Information Review: No data indicating the location of rendezvous sites for Gray Wolves were found during the background information review.

Field Survey Results: No formal surveys for rendezvous sites for Gray Wolves were conducted due to the complexity in finding such habitat features. No rendezvous sites were confirmed during field surveys.

Mast Producing Areas

Background Information Review: No data indicating the location of mast producing sites (i.e., where trees and shrubs produce nuts, seeds and fruits that provide critical food source for wildlife) were found during the background information review.

Field Survey Results: No formal surveys for this habitat type were conducted due to the complexity in finding such habitat features.

Cervid Movement Corridors

Background Information Review: No information regarding cervid (hooved mammals) movement corridors, aquatic feeding habitats, or mineral licks within the moose LSA or RSA was obtained through either the background information review or through Indigenous Knowledge consultation. Inspection of satellite imagery indicates that areas of physical geography (e.g., ravines and ridges) are absent from the LSA. Eskers are present along the eastern and western termini of the proposed corridor.

Field Survey Results: The presence of moose within the LSA and RSA was confirmed through field surveys; however, no movement corridors, aquatic feeding habitats, or mineral licks were determined with certainty. Moose were recorded on wildlife cameras deployed at Wolverine Occupancy Study stations, which were situated in riparian forests along expected movement corridors for Wolverine. Moose were recorded occasionally, and this data is difficult to attribute to intentional movement along the waterways sampled.

Winter occurrence modelling for moose within the LSA indicated that moose are most likely to occur along riparian habitats. While riparian habitats provide a tall forest structure for winter movement and protection from the elements, this habitat type typically runs adjacent to shrubby shoreline, which

provides a readily available year-round food source and access to aquatic feeding habitat. It is anticipated that riparian zones within the RSA are used favourably year-round by moose to move efficiently across the landscape and access preferred foraging areas.

Furbearer Movement Corridors

Background Information Review: No data indicating or confirming the location of furbearer movement corridors was found during the background information review.

Candidate furbearer movement corridor SWH were identified by mapping riparian areas within 30 m of waterbodies within the LSA and RSA. Candidate corridors can be found in Appendix F – NEEC Report. This mapping exercise indicates that 301 sites covering a total of 3,656 ha occur within the LSA and that 653 sites covering 20,595 ha are present across the RSA.

Field Survey Results: No data confirming the location of furbearer movement corridors was found during field surveys. While aerial surveys were conducted to survey mammal tracks and sign, no formal surveys for this habitat type were conducted due to the complexity in finding such habitat features. The presence of many furbearer species within the LSA was confirmed through winter aerial surveys in 2018, 2019, and 2022 and through incidental observations during other field surveys. Furbearers noted included gray wolf, American marten, Canada lynx, river otter.

Forest Areas Providing a High Diversity of Habitats

Background Information Review: Hardwood and mixedwood sites that meet the requirements for candidate bat maternity roost habitat also may meet the requirements for candidate forest stands providing a diversity of habitats: these areas can be seen in Appendix F – NEEC Report. Stands containing the identified bird of prey nests may also be candidate forest areas with a high diversity of habitats. Additional areas with super canopy trees and ground structure are likely present within the LSA but were not identified during the background information review.

Field Survey Results: No formal surveys for this habitat type were conducted due to the complexity in finding such habitat features. No high diversity of habitats was confirmed during field surveys.

12.2.2.1.11 Summary of Field Results

A total of 23 mammal species were recorded during the natural environment field surveys conducted between 2018 and 2021. These field studies included three aerial caribou surveys conducted in 2018, 2019, and 2021, which were also used to capture data on furbearers (moose, Gray Wolf and Wolverine etc.) and larger avian species within the LSA and RSA. This data also included all incidental observations made during the execution of all field programs conducted in support of the EA/IA (e.g., Breeding bird, Waterfowl, Vegetation, Aquatic etc.). A compiled list of mammals encountered within the RSA is presented below in **Table 12-9**.

Table 12-9: Mammals Known or Expected to Occur within the WSR RSA

Common Name	Scientific Name	Provincial S-Rank	SARA (federal)	ESA (provincial)	Observed During Field Program
American Black Bear	*Ursus americanus*	S5	No status	No status	Yes
American Marten	*Martes americana*	S5	No status	No status	Yes
American Mink	*Neovison vison*	S4	No status	No status	Yes
Arctic Fox	*Alopex lagopus*	S3	No status	No status	-
Arctic Shrew	*Sorex arcticus*	S5	No status	No status	-
North American Beaver	*Castor canadensis*	S5	No status	No status	Yes
Big Brown Bat	*Eptesicus fuscus*	S4	No status	No status	Yes
Canada Lynx	*Lynx canadensis*	S5	No status	No status	Yes
Caribou (Boreal population)	*Rangifer tarandus caribou*	S4	Threatened	Threatened	Yes
Caribou (Eastern Migratory population)	*Rangifer tarandus*	S4	No status	Special Concern	Yes
Deer Mouse	*Peromyscus maniculatus*	S5	No status	No status	-
Eastern Chipmunk	*Tamias striatus*	S5	No status	No status	-
Eastern Heather Vole	*Phenacomys ungava*	S4	No status	No status	-
Eastern Red Bat	*Lasiurus borealis*	S4	No status	No status	Yes
Ermine	*Mustela ermina*	S5	No status	No status	Yes
Fisher	*Martes pennanti*	S5	No status	No status	-
Hoary Bat	*Lasiurus cinereus*	S4	No status	No status	Yes
Least Chipmunk	*Neotamias minimus*	S5	No status	No status	-
Little Brown Myotis	*Myotis lucifugus*	S3	Endangered	Endangered	Yes
Masked Shrew	*Sorex cinereus*	S5	No status	No status	-
Meadow Jumping Mouse	*Zapus hudsonius*	S5	No status	No status	-
Meadow Vole	*Microtus pennsylvanicus*	S5	No status	No status	-
Moose	*Alces americanus*	S5	No status	No status	Yes
Muskrat	*Ondatra zibethicus*	S5	No status	No status	Yes
North American River Otter	*Lontra canadensis*	S5	No status	No status	Yes
Northern Bog Lemming	*Synaptomys borealis*	S4	No status	No status	-

Common Name	Scientific Name	Provincial S-Rank	SARA (federal)	ESA (provincial)	Observed During Field Program
Northern Flying Squirrel	*Glaucomys sabrinus*	S5	No status	No status	Yes
Northern Gray Wolf	*Canis lupus occidentalis*	S4	No status	No status	Yes
Northern Raccoon	*Procyon lotor*	S5	No status	No status	-
North American Porcupine	*Erethizon dorsatum*	S5	No status	No status	Yes
Pygmy Shrew	*Sorex hoyi*	S4	No status	No status	-
Red Fox	*Vulpes vulpes*	S5	No status	No status	Yes
Red Squirrel	*Tamiasciurus hudsonicus*	S5	No status	No status	Yes
Silver-haired Bat	*Lasionycteris noctivagans*	S4	No status	No status	Yes
Snowshoe Hare	*Lepus americanus*	S5	No status	No status	Yes
Southern Bog Lemming	*Synaptomys cooperi*	S4	No status	No status	-
Southern Red-backed Vole	*Clethrionomys gapperi*	S5	No status	No status	-
Star-nosed Mole	*Condylura cristata*	S5	No status	No status	-
Water Shrew	*Sorex palustris*	S5	No status	No status	-
White-tailed Deer	*Odocoileus virginianus*	S5	No status	No status	-
Wolverine	*Gulo gulo*	S2S3	Threatened	Threatened	Yes
Woodchuck	*Marmota monax*	S5	No status	No status	-

Notes:
* Status ranks from NatureServe Explorer https://explorer.natureserve.org/AboutTheData/Statuses (Accessed: 27 July 2023)
ESA – Environmental Site Assessment
S1 – Critically Imperiled— At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2- Imperiled— At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3 – Vulnerable— At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4 – Apparently Secure— At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
S5 – Secure— At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.
SU – Unrankable due to lack of information.
SNR – Unranked, status not yet assessed.
B – Breeding—Conservation status refers to the breeding population of the species in the province.
N – Non-breeding—Conservation status refers to the non-breeding population of the species in the province.
M – Migrant—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

12.2.2.2 Birds

12.2.2.2.1 Background Information Review

Regional Context

The area in which the WSR is proposed falls within the boundary of two distinct Bird Conservation Regions (BCR); these are BCR 7 – Taiga Shield and Hudson Plains and BCR 8 – Boreal Softwood Shield.

Most of the bird species present in BCR 7 ON are migratory. Consequently, the conservation of birds and their habitats in BCR 7 ON is of critical importance not only for Ontarians, but for countries throughout the Western Hemisphere. A total of 196 bird species occurs in this region and 66 qualify as priority species (based on criteria developed by the North American Bird Conservation Initiative). All bird groups were represented, with 36% of the priority species list consisting of land birds, 32% shorebirds, 18% waterfowl and 14% waterbirds.

Within BCR 8 ON, 229 species of birds breed, overwinter, reside year-round or pass through during their migration. Of these, 71 species are identified as priorities in this BCR, a list that is dominated by landbirds (65% of the priority list). Other birds include waterfowl (17%), waterbirds (12%), and shorebirds (6%).

Regional Data

A review of the citizen science database eBird.org (eBird, 2018), run by the Cornell University Laboratory of Ornithology, focussed on county/district, natural areas, and “hotspot” occurrences along the preliminary recommended route for the WSR. Overall, limited eBird data are available for the project area. Species summaries generated for Nipigon District (termed “County” using eBird filters), in which the Project is located, indicated that at least 303 bird species have been recorded across this area (eBird, 2018). According to eBird (2019) data, the median annual species total in the last five years (between 2014 and 2018) for this district is 214. Between 2014 and 2018, the median number of bird species reported during June and July (months constituting Ontario’s bird breeding season) was 181 (eBird, 2019); however, this number likely includes many species in the process of migrating further north to their coastal breeding sites.

Limited information is available for birds and their habitat in the RSA and adjacent region (Phoenix, 2013); however, two publications that have focused on much larger regions and have included the Project RSA are the Atlas of the Breeding Birds of Ontario, 2001-2005 (Cadman et al., 2007) and Population Trend Status of Ontario’s Forest Birds (Blancher et al., 2009).

The 2001-2005 OBBA divides Ontario into five regions, of which the Northern Shield and Hudson’s Bay Lowlands regions are similar in geographic extent to Ontario BCRs 8 and 7, respectively. According to OBBA (Cadman et al., 2007), 220 species were recorded across the Northern Shield and 192 species were confirmed breeders. A total of 199 species were recorded across the Hudson’s Bay Lowlands, of which 140 were confirmed breeders. Data from seven OBBA squares (each 10 km x 10 km in size) that occur in close proximity to Winisk Lake and Webequie First Nation confirmed 85 species were recorded in proximity to the RSA. SAR recorded in these squares included Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Common Nighthawk (*Chordeiles minor*), Olive-sided Flycatcher (*Contopus cooperi*), Rusty Blackbird (*Euphagus carolinus*), and Short-eared Owl (*Asio flammeus*). SAR birds are further discussed in Section 13 (Assessment of Effects on Species at Risk). The average number of species recorded per Atlas square (10 km x 10 km) in the Northern Shield was 68 (Cadman *et al*., 2007). According to the OBBA, species with the highest probability of observations in the Northern Shield

included White-throated Sparrow (*Zonotrichia albicollis*), Red-eyed Vireo (*Vireo olivaceus*), Yellow-rumped Warbler (*Setophaga coronata*), Swainson's Thrush (*Catharus ustulatus*) and Winter Wren (*Troglodytes hiemalis*).

In 2010, the Northeast Science and Information Section of the Ontario Ministry of Natural Resources conducted studies in and near the RSA as part of their Far North Terrestrial Biodiversity study from early June to mid-July (Phoenix, 2013). Ninety-six breeding species were detected across 42 stations, including three species that were listed as Special Concern at that time: Bald Eagle (*Haliaeetus leucocephalus*), Common Nighthawk, and Olive-sided Flycatcher (Phoenix pers. comm., 2013).

Previous Studies in the Vicinity of the Project

In 2009, AECOM (2010) conducted a preliminary baseline bird survey around the Noront Eagle's Nest mine site and recorded 31 species. Purple Sandpiper (*Calidris maritima*) was the only species detected via ArcGIS analysis that was not documented in any other surveys for the area, including Birds Canada's OBBA. Birds Canada concluded that the probability of Purple Sandpiper breeding in Ontario is low due to limited suitable habitat. As such, it was most likely that this species was observed while migrating to its Arctic breeding grounds and that it was not breeding in the RSA.

Studies conducted in support of the Noront Eagle's Nest Project EA (2013), consisting of the Eagle's Nest Mine and associated infrastructure, tallied 130 bird species during the field studies, which spanned multiple seasons across three years. Noront breeding bird point count surveys were conducted in 2011 and 2012 to identify and characterize baseline existing conditions in support of the Eagle's Nest Project EA. Of the five study areas where point counts were conducted, only those conducted at the mine site are considered close enough to be relevant to the Project. Although a portion of the mine transportation corridor is similar to the east-west segment of the preliminary proposed WSR corridor, the closest representative bird data location was at Dearden Lake on the east-central section of the mine transportation corridor, southwest of Webequie. Overall, a total of 64 bird species were detected during point count surveys at the mine site. Across the three major habitat types, more bird species were detected in the non-woody wetlands (bogs; 55 species) than at the forest sites (44 species) or woody wetland sites (30 species). The Noront Eagle's Nest Project EA (2013) notes that increased diversity recorded in wetland sites could be at least partly due to there being more bog plots and the fact that the bog sites were sampled over the course of two field seasons (2011 and 2012), whereas all other plots at the mine site were sampled only during 2011.

Three SAR were found in the mine site area: Common Nighthawk, Olive-sided Flycatcher and Rusty Blackbird. Bird species richness (64 species) was the highest at the mine site of all infrastructure locations.

12.2.2.2.2 Breeding Bird Point Count Survey

2019 Breeding Bird Point Count Survey

Point count surveys conducted in 2019 recorded a total of 83 species across 113-point count stations. All species, that were identified during the breeding bird point count surveys have a provincial S-rank status of either S4 (Apparently Secure) or S5 (Secure). Across all survey sites, the most widely occurring species included Ruby-crowned Kinglet (*Regulus calendula*; 80.5%), White-throated Sparrow (62.8%), Hermit Thrush (C*atharus guttatus*; 56.6%), Palm Warbler (50.4%), and Yellow-rumped Warbler (42.5%). Similarly, the most abundant species recorded across all survey points included Ruby-crowned Kinglet (0.920 birds/count), White-throated Sparrow (0.655 birds/count), Hermit Thrush (0.496 birds/count), Palm Warbler (0.482 birds/count), and Lincoln's Sparrow (*Melospiza lincolnii*; 0.372 birds/count).

Ruby-crowned Kinglet (80.5%), White-throated Sparrow (62.8%) were dominant species across all habitat types, except non-woody wetlands.

Overall, upland forested sites exhibited the greatest overall diversity of breeding birds despite a much lower number of survey areas. The greatest avian diversity was recorded within coniferous forest, where 55 species were noted. Despite only having surveyed by 15-point count stations, biologists detected 52 species in the mixed forests. The greater diversity at upland sites, compared to the prevalent treed/open wetland habitat types (44 species) can perhaps be attributed to the variety and increased complexity of habitat structure in those communities, which includes a greater variety of trees, large-diameter cavity trees, and snags. Indeed, some of this increased diversity may be attributed to transition zones at the edges of these habitats, which were captured in the point count results.

2020 Breeding Bird Point Count Survey

In 2020, point count surveys were conducted within the LSA for the Project at 186 different stations and a total of 91 species were recorded. All species that were identified during the breeding bird point count surveys have a provincial S-rank status of either S4 (Apparently Secure) or S5 (Secure). Two species observed during the point counts are listed federally and provincially as Species at Risk. The Olive-sided Flycatcher is listed as Threatened federally and Special Concern provincially. The Rusty Blackbird is listed as Special Concern both federally and provincially. The most common and abundant species was Ruby-crowned Kinglet (66.13% and 0.83 birds/count, respectively). The next most common species were White-throated Sparrow (53.23%), Dark-eyed Junco (*Junco hyemalis*) (39.25%), Palm Warbler (29.03%), and Hermit Thrush (27.96%). These most common species are similar to those from 2019, the only difference being Dark-eyed Junco occurring more often in 2020 than 2019.

The most abundant species after Ruby-crowned Kinglet were: White-winged Crossbill (*Loxia leucoptera*) at 0.66 birds/count, Dark-eyed Junco at 0.45 birds/count, Palm Warbler at 0.4 birds/count, and Hermit Thrush at 0.35 birds/count. Although White-winged Crossbills were abundant when observed during a point count, this species did not occur at many point counts (4.3%).

Summary and Species of Conservation Concern

A total of 95 species were recorded across the 2019 and 2020 breeding bird point counts. A total of 38 Species of Conservation Concern were recorded, including four SAR and 38 BCR 8 priority species. The most frequently occurring BCR 8 priority species was the Ruby-crowned Kinglet, while other widely occurring BCR 8 species included White-throated Sparrow, Yellow-bellied Flycatcher (E*mpidonax flaviventris*), Alder Flycatcher (*Empidonax alnorum*) and Swamp Sparrow (*Melospiza georgiana*).

SAR observed during breeding bird point count surveys included Canada Warbler (*Cardellina canadensis*), Olive-sided Flycatcher, Evening Grosbeak (*Coccothraustes vespertinus*), and Rusty Blackbird. SAR Birds are further discussed in Section 13 (Assessment of Effects on Species at Risk).

12.2.2.2.3 Breeding Bird Point Acoustic Surveys

Breeding Season – Dawn Phase

A total of 87 bird ARU stations were sampled during the 2020 and 2021 breeding bird seasons (May 24 to July 10). A subsample of 808 acoustic recordings during the dawn recording phase was analyzed manually. A subsample of 292 recordings were analyzed for 2020 and 516 recordings were analyzed for 2021. Recordings were analyzed for each of the 87 stations that recorded viable data, where between

4 and 11 recordings were analyzed per station, with an average of 4.29 recordings per station in 2020 and 6.88 recordings per station in 2021.

Across all survey sites, the most widely occurring species included Hermit Thrush (85.1%), White-throated Sparrow (82.8%), Dark-eyed Junco (78.2%), Ruby-crowned Kinglet (77.0%), Common Loon (*Gavia immer*; 72.4%), and Swainson's Thrush (59.8%). Overall, species composition was similar between ARU and point count data. Species which were notably more likely to be detected through ARU sampling included Common Redpoll (*Acanthis flammea*, 37.9% vs 2.5%), Common Nighthawk (41.3% vs 0%), and Connecticut Warbler (*Oporornis agilis*, 16.1% vs 1.77%).

Habitats within the combined LSA and RSA supported an average of 54.8 species. The greatest diversity of species was recorded within hardwood/mixedwood forest, which disturbed sites supported 35 species. Disturbed sites were limited across the LSA and RSA and the sample size for this habitat type was small.

Diversity results for the ARU sampling was similar to results compiled for the point count sampling. Mixed forest was the second most diverse habitat (52 species) and disturbed habitat supported the lowest diversity (20 species).

Breeding Season – Dusk Phase

A total of 136 dusk recordings were analyzed. Recordings were analyzed for each of 68 stations that recorded viable data and between one and three recordings were analyzed per station, with an average of two recordings per station.

Crepuscular species of note that were recorded included Common Nighthawk (18 stations), Wilson's Snipe (*Gallinago delicata*, 12 stations), and Great Gray Owl (*Strix nebulosa*, one station).

Breeding Season – Night Phase

A total of 145 night-phase recordings were analyzed. Recordings were analyzed for each of 68 stations that recorded viable data and between two and five recordings were analyzed per station, with an average of 2.13 recordings per station.

Crepuscular species of note that were recorded included Common Nighthawk (16 stations), Wilson's Snipe (8 stations), American Bittern (*Botaurus lengtiginosus*, one station) and Boreal Owl (*Aegolius funereus,* one station). These 2020 records of American Bittern and Boreal Owl were the first field records of these species for the WSR existing conditions study.

Fall Migration Season

A total of 148 fall acoustic recordings were analyzed from 2020, and another 393 recordings were analysed from 2021. Of those stations that recorded viable data, recordings were analyzed for 30 stations from 2020 and 68 stations in 2021. For 2022, between one and five recordings were analyzed per station, with an average of 4.9 recordings per station. For 2021 between four and eight recordings were analyzed per station, with an average of 5.8 recordings per station. Analysis of Fall Migration Data ARU data yielded a total 839 detections of 54, with 34 species detected in 2020 and 49 species detected in 2021; 25 species were detected in both years. Sixteen percent of recordings processed from 2020 and 15% of recordings processed from 2021 had no identifiable species.

Across all survey sites, the most widely occurring species included Canada Jay (*Perisoreus canadensis*) (69.3%), Common Loon (59.2%), Dark-eyed Junco (59.2%), White-throated Sparrow (43.9%), Common Raven (*Corvus corax*) (33.7%), Common Redpoll (32.7%), and Sandhill Crane (*Antigone canadensis*)

(30.6%). Most of these species were common in both years except for Common Redpoll, which was only detected at 13.3% of stations in 2020 and 41.2% of stations in 2021. Other species of note that were recorded included Common Nighthawk (nine stations), Black-billed Cuckoo (*Coccyzus erythropthalmus,* five stations), Gray Catbird (*Dumetella carolinensis,* two stations), Great Grey Owl (two stations), and Wilson's Snipe (one station). These 2021 records of Black-billed Cuckoo and Gray Catbird are the first field records for the WSR existing conditions study.

The Noront Eagle's Nest Project EA (Noront, 2013) conducted fall bird surveys at two locations close to the WSR. Although the data analysis for the WSR Project detected 54 species, the Noront's Eagle's Nest Project EA only recorded 19 of these. Notable terrestrial species detected on the acoustic recordings for WSR that were not recorded by the Noront project included: Orange-crowned Warbler (*Leiothlypis celata*), White-winged Crossbill, Ruffed Grouse (*Bonasa umbellus*), Great Horned Owl (*Bubo viginianus*), Boreal Owl, and Northern Hawk Owl (*Surnia ulula*). The owl species may have been missed due to only dawn recordings being processed for the Fall Migration period.

Habitat

The number of species detected in the major habitat types found within the RSA across both years of study for the Project ranged from 18 to 35. Open wetland habitats had the highest number of species detected (35 species) followed by mixedwood forest (34 species). Only 18 species were record in disturbed areas, but this is likely reflective of the low sampling effort as only four plots were located within that habitat type. Looking at the number of species identified on each recording, disturbed areas had the highest number of species identified on individual recordings with 3.05 species identified on average. In comparison, treed wetlands only had an average of 1.31 species identified on individual recordings. Overall, the ARU data suggest fall species richness in treed wetlands is lower than other habitats, particularly mixedwood forests, riparian areas, and open wetlands, based on the small number of individuals detected on each recording and the relatively low total number of species detected despite the highest number of sampling locations.

All 53 species of birds were classified based on the frequency of detection within the major habitat types. Several BCR priority species were detected:

- White-throated Sparrow, a generalist species, was the third most commonly detected bird in the fall. Although it was detected in all habitat types, few recordings made in coniferous forests or wetlands included this species.
- Alder Flycatcher, a facultative wetland species, was most detected on recordings made in disturbed areas (15% of recordings) followed by riparian habitats (11.9%). It was not detected at all in coniferous forest.
- Greater Yellowlegs, another facultative wetland species, was detected in all non-forested habitats, with the highest detection rate (8.9%) occurring in open wetlands.
- Olive-sided Flycatcher, which is considered threatened federally and special concern provincially, was detected in all habitats except disturbed sites and hardwood/mixedwood forests. The highest detection levels were in open wetlands (7.3%), followed by riparian communities (4.8%).
- Ruby-crowned Kinglet is a coniferous forest breeder but was not heard on recordings made in coniferous habitat during the fall migration period. Instead, recordings made in riparian communities most frequently detecting Ruby-crowned Kinglets (8.3%), followed by hardwood/mixedwood forests and disturbed areas. Based on ARU data, treed and open wetlands were also not generally used in the fall migration season by Ruby-crowned Kinglets, with only one detection occurring within these habitats.

- The high levels of detection for Common Loon in all habitats (11.4-60.0% of recordings) is reflective of the long carrying distance of the call of the loon and also the need to consider variation in detectability when utilizing ARU data, as all of the recorded calls would have been coming from adjacent aquatic habitats.

Winter Season

A total of 80 winter recordings collected during November were analyzed. Recordings were analyzed for each of 17 stations that recorded viable data (14 stations in 2020 and three stations in 2021) and between four and five recordings were analyzed per station, with an average 4.7 recordings per station.

Analysis of winter ARU data yielded a total of seven species; there also were also an additional five stations that recorded a bird that could not be identified to species. Only 36% of recordings analyzed contained a detected bird, with four stations having no bird detections.

Comparing these results to expected winter bird species is difficult as none of the background studies, either regionally or locally, have conducted winter data collection. The Thunder Bay Field Naturalists' Northwestern Ontario Winter Bird Count List (Thunder Bay Field Naturalists, 2021) encompasses the RSA and lists a total of 131 species in Northwestern Ontario, with 57 species recorded every year of the project (2014-2021).

The small number of species detected by ARU in the present study is likely a result of several factors. The short collection time frame and small number of operational stations provided limited coverage across the RSA. Additionally, the habitat found within the RSA is more limiting than that found across Northwestern Ontario as a whole, for example waterfowl species described in the bird count require open water, which is not present in the RSA during the winter. Finally, many bird species are not vocal during the winter, especially the early winter, so many species documented by the Northwestern Ontario Winter Bird Count were likely located visually, especially larger species such as, hawks, owls, woodpeckers and eagles.

Species of note that were recorded included Sandhill Crane (one station) which was likely a result of the data being collected in near the tail end of the fall migration season; however, Sandhill Crane was also recorded in the Northwestern Ontario Winter Bird Count List indicating it is not unknown for Cranes to remain in the area until late in the year.

12.2.2.2.4 Avian Distribution and Abundance Modelling

Canonical Correspondence Analysis

A constrained Canonical Correspondence Analysis revealed 14.3% of variance explained by explanatory variables, with permutation test on first axis significant (pseudo-F=12.8, P=0.002). Species relationships interpreted from the results include an association between Ovenbird and Yellow-bellied Sapsucker (*Sphyrapicus varius*) with hardwood forest, Blackburnian Warbler (*Setophaga fusca*) and Golden-crowned Kinglet (*Regulus satrapa*) with mixedwoods and Palm Warbler, Greater Yellowlegs, Savannah Sparrow (*Passerculus sandwichensis*), and Lincoln Sparrow with open and treed fens. Complete results and data visualizations can be found in Appendix F – NEEC Report.

Estimated Bird Density – BRT Model

Boosted Regression Tree (BRT) models were developed to predict density for 45 species that had greater than 20 observations. A strong relationship with habitat was observed at a scale of 60 ha, based on correlation of predicted use with observed use, and as such this scale was selected for modelling.

Complete model performance statistics for all species and receptor of concern plots for all species can be found in Appendix F – NEEC Report.

Mapped Distribution by ELC Type

Model predictions from the BRT model were applied to all hexagons across the RSA and LSA. Polygons for winter survey area, RSA, LSA, and the Project Footprint areas were overlayed onto the 3-ha hexagon map of predicted density, and density of the 45 common species summarized for each area. In addition, the ELC vegetation map was linked to the mapped density surface and predicted mean densities for each species summarized by area and ELC. Alder Flycatcher most frequently occurred in River Shore Fen, Open Shore Fen, and Sparse Treed Swamp in both the LSA and RSA. Alder Flycatcher was also common in River Marsh in the RSA which is absent in the LSA. Due to the small area of the Project Footprint, may ELC classes are absent, so River Shore Fen was the single class with high density in the Project Footprint. While most classes are similar in predicted density, there are some differences: for example, Burn/Shrub had a 39% higher predicted density for Alder Flycatcher in the LSA compared to the RSA. Complete details and BRT density for each ELC community type for all applicable species can be found in
Appendix F – NEEC Report.

Habitat Selection – Generalizes Linnear Model

Generalized Linnear Model regression coefficients help in understanding the habitat types driving model predictions for the BRT model. For example, Cedar Waxwing (*Bombycilla cedorum*) and Common Raven both select Open Shore Shrub Fen, while Winter Wren, White-Winged Crossbill, and Yellow-bellied Flycatcher select Conifer Swamp. Mixed Forest is important for Common Raven, Magnolia Warbler (*Setophaga magnolia*), and White-Winged Crossbill. For Cedar Waxwing, Open Shore Fen is avoided. Shoreline edge is important for Common Yellowthroat (*Geothlypis trichas*), Canada Jay, Swamp Sparrow, and Greater Yellowlegs. A fulsome explanation of the model with complete results can be found in Appendix F – NEEC Report.

Density of Low Abundance Species

For 77 low abundance species (<= 22 observations) where sample size was insufficient to estimate habitat specific models, a simple regression model using % forest as the sole explanatory variable was created. Full results can be found in Appendix F – NEEC Report.

Assessment of Survey Design and Power (Simulation Results)

Avian Modelling was conducted using the 338 total breeding bird plots sampled in 2019 – 2021. The random stratified bird surveys began before the final TISG design was specified, so the design was assessed through simulation modelling to evaluate possible biases that might arise from the non-random systematic TISG design and the SNC implemented design. The assessment of the design can be found in Section 10.2.4.4 of Appendix F – NEEC Report.

RSF Modelling

RSF modelling was conducted for the breeding habitat of 18 bird species using breeding bird point count and ARU survey data. Detailed results can be found in Appendix F – NEEC Report.

12.2.2.3 Bird Valued Components

Section 8.9 of the TISG indicates that the following groups of migratory and non-migratory birds should be considered as VCs:

- Forest birds;
- Raptors;
- Waterfowl;
- Shorebirds; and
- Bog/fen birds, and other wetland birds.

The following subsections summarize existing conditions findings for each VC.

12.2.2.3.1 Forest Birds

Forest communities comprised a small area of the LSA and RSA, when compared to wetland habitats. Mixed and hardwood stands were exceptionally limited across the RSA and, as a result, far fewer study stations occurred in these habitats compared to more widespread habitats. Species that notably selected for forested habitat, as interpreted from the results of the Generalized Linear Model regression coefficients, included White-winged Crossbill, Red-eyed Vireo, Blue-headed Vireo (*Vireo solitarius*), Golden-crowned Kinglet, and American Robin (*Turdus migratorius*). Species rarely recorded in forested habitats, which are otherwise known to prefer forests, included Ruffed Grouse, Bay-breasted Warbler (*Setophaga castanea*), Cape May Warbler (*Setophaga tigrine*), Black-throated Green Warbler (*Setophaga virens*), Ovenbird (*Seiurus aurocapilla*), Downy Woodpecker (*Dryobates pubescens*), Pileated Woodpecker (*Dryocopus pileatus*), Yellow-bellied Sapsucker, Brown Creeper, and Red-breasted Nuthatch (*Sitta canadensis*).

Based on the results of the Generalized Linear Modelling, Tennessee Warbler selected for mixed forests, deciduous forests and open water areas while open wetlands. Orange-crowned Warbler selected for mixed forests and coniferous swamps while avoiding open wetlands and burns. Details of the probability modelling (in the RSA) for Tennesse Warbler and Orange-crowned Warbler can be found in Appendix F – NEEC Report.

12.2.2.3.2 Raptors

Eight raptor species were detected during bird surveys and incidentally which included:

- Bald Eagle;
- Rough-legged Hawk (*Buteo lagopus*);
- Red-tailed Hawk;
- Sharp-shinned Hawk (*Accipiter striatus*);
- American Goshawk (Astur atricapillus);
- Great Gray Owl;
- Boreal Owl; and
- Long-eared Owl (*Asio otus*).

Raptors and raptor nesting habitat is further addressed in **Section 12.2.2.3.6** (Significant Wildlife Habitat – Birds).

12.2.2.3.3 Waterfowl

Waterfowl Migration Survey

A total of 22 waterfowl species (including Common Loon), were identified during the Waterfowl Stopover Surveys. Mallards (*Anas platyrhynchos*) are typically the most abundant species observed; however, Bufflehead (*Bucephala albeola*), Common Merganser (*Mergus merganser*), and Canada Goose (*Branta canadensis*) can also be abundant during migration.

Overall, larger bodies of water within the LSA typically held large numbers of staging waterfowl. Large lakes, such as Winisk Lake, Bender Lake, Odobass Lake, and the Winiskisis Channel tended to be used in late fall by large aggregations of diving ducks, such as Bufflehead, Common Merganser and, to a lesser extent, Common Goldeneye (*Bucephala clangula*), Hooded Merganser (*Lophodytes cucullatus*) and Ring-necked Duck (*Aythya collaris*).

Survey data indicate that these larger waterbodies sustain aggregations of 100 or more individuals of waterfowl species for seven days, which results in > 700 waterfowl use days during either the spring or fall of each year, confirming presence of aquatic stopover and staging SWH. No terrestrial stopover and staging features were identified as a result of field studies.

Sufficient data for Canada Goose were collected such that statistically robust density modelling (in the RSA) could be produced for this species, which can be found in Appendix F – NEEC Report.

12.2.2.3.4 Shorebirds

Shorebird Breeding

Breeding bird point count surveys in 2019 and 2020 recorded four shorebird species: Greater Yellowlegs, Solitary Sandpiper (*Tringa solitaria*), Spotted Sandpiper (*Actitis macularius*), and Wilson's Snipe. ARU recordings further detected Lesser Yellowlegs (*Tringa flavipes*).

Overall, Greater Yellowlegs were the most common breeding shorebird across the LSA. This species was detected at 30.9% of ARU stations and between 17.7-22.1% of point count stations. Sufficient data for Greater Yellowlegs was collected via breeding bird point counts and ARU recordings that statistically robust probability of occurrence (in the LSA) and density modelling (in the RSA) were produced for this species, which can be found in Appendix F – NEEC Report.

ARU data indicate that Wilson's Snipe is also a common breeding species; however, point count surveys did not frequently detect this species. This is likely due to the crepuscular nature of the species, which could not be captured during helicopter-access site visits. Sufficient data for Wilson's Snipe was collected such that statistically robust density modelling (in the RSA) could be produced for this species, which can be found in Appendix F – NEEC Report.

The other three breeding shorebird species occurred in low numbers, as neither point count surveys, nor ARU data captured these species beyond a handful of detections. Insufficient data was collected to generate statistically robust probability of occurrence modelling for these shorebird species.

Shorebird migration and shorebird migration stopover areas are addressed in **Section 12.2.2.3.6** (Significant Wildlife Habitat – Birds), below.

12.2.2.3.5 Bog/Fen Birds and Other Wetland Birds

Wetland communities comprise the vast majority of vegetation communities, at 92% of terrestrial communities in the RSA. The largest communities are Low Treed Bog (23.6%), Conifer Swamp (20.5%) and Poor Conifer Swamp (17.0%). Species that notably selected for forested habitat, as interpreted from the results of the Generalized Linear Model regression coefficients, included for Low Treed Bog are Wilson's Snipe, White-winged Crossbill and Common Redpoll. For Conifer Swamps Wilson's Snipe, Chestnut-sided Warbler (*Dendroica pensylvanica*) and Blue-headed Vireo were positively associated.

Based on the results of the Generalized Linear Modelling, Palm Warbler selected for sparse treed fen and sparse treed bogs while avoiding the upland esker areas. Alder Flycatcher selected for edge communities and river/fen communities while avoiding conifer forests and open bogs. Details of the probability modelling (in the RSA) for Tennesse Warbler and Orange-crowned Warbler can be found in Appendix F – NEEC Report.

Bog/Fen birds and waterbirds, particularly Sharp-tailed Grouse (*Typmanuchus phasianellus*), open country species, and marsh obligate species are further addressed in **Section 12.2.2.3.6** (Significant Wildlife Habitat – Birds).

12.2.2.3.6 Significant Wildlife Habitat – Birds

Waterfowl Stopover and Staging (Aquatic)

Background Information Review: Waterfowl stopover and staging SWH identified by the MNR is typically presented in Forest Management Plans for each Forest Management Unit; however, a search through the Wildlife Value Areas data available on Geohub found that there are no existing data available in regard to waterfowl stopover and staging SWH for the LSA or RSA for birds. Candidate aquatic waterfowl stopover and staging SWH were mapped, based on available vegetation communities within the LSA. These data indicate that 152 candidate aquatic waterfowl stopover and staging SWH are located within the LSA, covering a total area of 829 ha. Across the bird RSA, 446 candidate aquatic waterfowl stopover and staging SWH are present, which cover a total of 4,060 ha. According to vegetation community distribution across the bird LSA, candidate aquatic waterfowl stopover and staging SWH is distributed widely and closely follows the paths of watercourses and lake shorelines across the LSA.

Field Survey Results: Overall, larger bodies of water within the LSA typically held large numbers of staging waterfowl. Large lakes, such as Winisk Lake, Bender Lake, Odobass Lake, and the Winiskisis Channel tended to be used in late fall by large aggregations of diving ducks, such as Bufflehead, Common Merganser and, to a lesser extent, Common Goldeneye, Hooded Merganser and Ring-necked Duck.

Survey data indicate that these larger waterbodies sustain aggregations of 100 or more individuals of waterfowl species for seven days, resulting in > 700 waterfowl use days during either the spring or fall of each year, which confirms presence of this SWH type in the LSA.

Waterfowl Stopover and Staging (Terrestrial)

Background Information Review: Candidate terrestrial waterfowl stopover and staging SWH were mapped, based on available vegetation communities within the LSA. The data indicate that four candidate terrestrial waterfowl stopover and staging SWH are located within the LSA, covering a total area of 85 ha. Across the bird RSA, nine candidate terrestrial waterfowl stopover and staging SWH are present, which cover a total of 188 ha. This assessment indicates that terrestrial waterfowl stopover and staging SWH is very rare if present at all within the LSA and RSA.

Field Survey Results: Field survey results indicate that no terrestrial stopover and staging features are present within the WSR LSA.

Shorebird Migration Stopover Areas

Background Information Review: A review of ELC vegetation communities available within the LSA and RSA for the Project indicates that no candidate SWH of this type is present. A review of satellite imagery of the LSA largely agrees with this assessment, as little shoreline habitat in the form of beaches, gravel bars, marshes, or possible mudflats appear to be present.

Field Survey Results: Overall, shorebird occurrence across the survey route was low and shorebirds were not observed in great numbers at any particular staging feature. No staging features, such as beaches or mudflats were particularly notable within the LSA. Even in the fall of 2020, when water levels were very low and shoreline was exposed along larger lakes and river in the area, overall shorebird occurrence was low.

Colonial-Nesting Bird Breeding Habitat (Cliff)

Background Information Review: OBBA data indicate that the Cliff Swallow does not occur in proximity to the proposed preliminary recommended route for the WSR. The closest records are along the Winisk and Attawapiskat rivers, both more than 100km away from the RSA. OBBA data also indicate that Bank Swallow does not occur in proximity to the proposed preliminary recommended preferred route for the WSR. The closest records are along the Winisk river approximately 75 km north of the RSA.

Confirmed Colonially – Nesting Bird Breeding Habitat (Bank/Cliff) has not been previously identified in the area of the LSA or RSA. No candidate SWH of this type was identified using ELC data for either the bird LSA or RSA.

Field Survey Results: No formal surveys were conducted specifically to detect the presence of Colonially nesting Bird Habitat (Cliff/Bank), but any Cliff/Bank Swallow habitat observed during avian field surveys were recorded. No cliff-nesting colonial bird species were anticipated to occur within the LSA, as rocky cliff habitat is absent from the landscape therein. No Cliffs Swallows were recorded during breeding bird surveys, nor were any incidental observations of this species made.

Colonial-Nesting Bird Breeding Habitat (Tree/Shrubs)

Background Information Review: Confirmed Colonially nesting Bird Breeding Habitat (Tree/Shrub) has not been previously identified in either the LSA or RSA. ELC data indicate the presence of 227 candidate SWH of this type, covering 11,105 ha across the LSA and 757 sites covering 46,966 ha across the RSA.

Field Survey Results: No formal surveys were conducted specifically to detect the presence of Colonially Nesting Bird Habitat (Tree/Shrub), but any Tree/Shrub habitat observed during avian field surveys were recorded. Only Bonaparte's Gull was recorded within the LSA and RSA during field studies; however, no colonies on the species were identified.

Colonial-Nesting Bird Breeding Habitat (Ground)

Background Information Review: Confirmed Colonially nesting Bird Breeding Habitat (Ground) has not been previously identified in either the LSA or RSA. ELC data indicate the presence of 152 candidate SWH of this type covering 829 ha across the LSA and 446 sites covering 4063 ha across the RSA. While suitable ELC types may be present, few, if any suitable nesting islands for colonial waterbirds are

present. The range for Brewer's Blackbird (*Euphagus cyanocephalus*) does not extend into either the LSA or RSA; thus, this species is not expected to occur.

Field Survey Results: No formal surveys were conducted specifically to detect the presence of Colonially nesting Bird Habitat (Ground), but any ground habitat observed during avian field surveys were recorded. Herring and Ring-billed Gulls (*Larus argentatus* and *L. delawarensis*) are often observed standing on exposed rocks within local lakes; however, no breeding colonies or suitable islands have been observed during countless flights over the LSA by the Project Team.

The LSA and RSA occur outside of the accepted range for Brewers's Blackbird in Ontario and no rocky islands are present within the RSA.

Waterfowl Nesting Areas

Background Information Review: ELC data indicate the presence of 217 candidate SWH of this type covering 6,754 ha across the LSA and 587 sites covering 26,303 ha across the RSA.

Field Survey Results: No targeted surveys were done to identify or confirm Waterfowl Nesting Areas as SWH. Some migration surveys were completed later in the season and stretched into the beginning of the nesting period. Waterfowl were also detected during point counts and on ARU recordings. Field data indicate that a variety of waterfowl nesting within the LSA and RSA, including Canada Goose, Mallard, American Wigeon (*Mareca americana*), Ring-necked Duck, Common Merganser, and Hooded Merganser. While this identified nesting species, the data did not allow for the confirmation of any nesting area as SWH within either the LSA or RSA.

Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat

Background Information Review: Data from the Noront Eagle's Nest EA study indicates that aggregations of Bald Eagles may occur in proximity to the preferred route for the WSR during migration. ELC data indicates the presence of 111 candidate SWH of this type covering 1,659 ha across the LSA and 301 sites covering 6,557 ha across the RSA.

Field Survey Results: Formal surveys for Bald Eagle and Osprey (*Pandion haliaetus*) nests were not completed; however, raptor nests were noted when encountered. Extensive use of helicopters to access summer survey locations, as well as during the spring waterfowl, winter aerial, and caribou calving surveys, contributed to a rigorous census of Bald Eagle and Osprey nests across the RSA. At least 29 Bald Eagle nests have been recorded during field studies. Bald Eagle nests are located primarily along the expansive shoreline of Winisk Lake and among the many lakes west of Webequie. No Bald Eagle nests were observed within 1 km of the route for the WSR. Bald Eagles are further discussed in Section 13 (Assessment of Effects on Species at Risk). To date, at least 20 Osprey nests have been recorded, with 19 of these located to the west and southwest of the RSA. No Osprey nests were identified within the LSA and only one was found within the RSA. Seven unidentified hawk nests were recorded, with only one located within the LSA and the rest outside of the RSA.

Woodland Raptor Nesting Habitat

Background Information Review: The existing information review revealed that 11 woodland-nesting raptor species have been recorded in proximity to the Project, including Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, Broad-winged Hawk, Red-tailed Hawk, Merlin, Barred Owl, Boreal Owl, Great Horned Owl, Long-eared Owl, and Northern Hawk-Owl. Based on the Noront Baseline Terrestrial Studies: Birds report (Noront 2013), coniferous forest, mixed forest, and hardwood forest covered a combined

33% (542,791 ha) of their regional study area. Hardwood and mixed forest, which are most likely to provide large diameter trees (typically *Populus* sp.) suitable for supporting stick-nests or large cavities for cavity-nesting species comprised 8% (126,937 ha). No records of woodland raptor nesting were reported.

Field Survey Results: Compared to the Noront mine study area, upland areas of coniferous forest, mixed forest, and hardwood forest covered a much smaller percentage of the RSA, with a combined percentage of 6.7% (8,939 ha). Hardwood and mixed forest, which are the most suitable for supporting stick-nests or large cavities for cavity-nesting species, are extremely rare making up only 0.4% (537 ha) of the RSA.

Formal surveys for raptor nests were not completed; however, raptor nests were noted when encountered. Extensive use of helicopters to access summer survey locations, as well as complete the spring waterfowl, winter aerial, and caribou calving surveys, contributed to a rigorous census stick nests across the LSA and RSA. Nests of other raptor species (i.e., hawks, owls, ravens) were noted as encountered.

In total, one confirmed Great Gray Owl nest, two confirmed Common Raven (*Corvus corax*) nests (including one within the Webequie community), and five additional nests of unknown origin were observed. Based on the criteria found in schedule 3W, the Great Grey Owl nest and a buffer of 400 m should be considered as SWH.

Sharp-tailed Grouse Leks

Background Information Review: Sharp-tailed Grouse is widely distributed in suitable habitat across northern Ontario (Cadman et al, 2007; Ebird, 2022). Confirmed Sharp-tailed Grouse Lek SWH has not been previously identified within either the LSA or RSA. ELC data indicates the presence of 195 candidate SWH of this type covering 11,896 ha across the LSA and 505 sites covering 57,216 ha within the RSA.

Field Survey Results: Sharp-tailed Grouse was not recorded at any breeding bird point count stations but were recorded at a total of 11 ARU stations. This species was recorded year-after-year at three stations. Of these, two were in open wetland and one was in treed wetland habitats. Regular use of these sites may suggest proximity to a lekking site.

No formal surveys for lekking sites were conducted due to the complexity in finding such habitat features; however, incidental observations of Sharp-tailed Grouse and potential leks were recorded during avian surveys. No suitable candidate lek habitat was found during other survey activities.

Marsh Bird Breeding Habitat

Background Information Review: ELC data indicates the presence of 695 candidate SWH of this type covering 7,280 ha within the LSA and 1,660 sites covering 28,920 ha within the RSA. Presence of this habitat type was not otherwise confirmed during the background information review.

Field Survey Results: The results of the breeding bird point count surveys in marsh habitats were used to determine whether an area is a SWH. Marsh obligate species recorded during passive ARU surveys included American Bittern and Sora (*Porzana carolina*). American Bittern was recorded at a single station in 2020 and at two stations in 2021. Sora was recorded at two stations in 2021 only. Both species were never recorded at the same station. Yellow Rail and Black Tern were not recorded during breeding bird point counts or by ARUs.

Field surveys did not confirm the presence of any marsh breeding bird SWH.

Rare Vegetation Communities: Marshes

Background Information Review: ELC data indicates marshes are regionally rare vegetation communities in the RSA with only eight polygons totaling 13.1 ha or 0.01% of the RSA. Only three of these areas are larger than one hectare in size. In addition, there are numerous small marsh areas that are mosaiced into other ELC polygons but are not large enough to be independently mapped.

Field Survey Results: Although there were marshes within the RSA, their rarity within the environment resulted in no marsh ELC polygons being assessed during field studies (refer to Section 9 in Appendix F: NEEC). All marsh ELC polygons were considered candidate SWH.

Open Country Breeding Bird Habitat

Background Information Review: ELC data indicates the presence of four candidate SWH of this type covering 85 ha across the LSA and six sites covering 103 ha across the RSA. All open country habitat in the RSA is associated with human settlement and infrastructure (airports and clearings).

Field Survey Results: Savannah Sparrow was readily observed at large expanses open bog and fen habitat. Analysis of ARU data indicates that a single LeConte's Sparrow (*Ammospiza leconteii*) was recorded in 2021. Field surveys did not confirm the presence of any open country breeding bird SWH.

Shrub/Early Successional Bird Breeding Habitat

Background Information Review: Very few shrub/early successional habitat communities of appreciable area are present within the LSA. ELC data indicates the presence of 70 candidate SWH of this type covering 412 ha across the LSA and 141 sites covering 1,259 ha within the RSA. The background information review did not indicate that his habitat type has been confirmed in the RSA.

Field Survey Results: Field surveys did not confirm the presence of any shrub/early succession breeding bird SWH.

Special Concern and Rare Wildlife Species

Habitat for species of Special Concern are addressed along with other SAR in Section 13 (Assessment of Effects on Species at Risk).

12.2.2.4 Reptiles and Amphibians

12.2.2.4.1 Background Information Review

Background information sources indicate that five amphibians and one reptile may occur within the RSA. Baseline studies conducted in support of the proposed Noront Eagle's Nest Mine (Noront 2013) did not include formal reptile or amphibian surveys; however, five anuran species were recorded, including American Toad (*Anaxyrus americanus*), Boreal Chorus Frog (*Pseudacris maculata*), Northern Leopard Frog (*Lithobates pipiens*), Spring Peeper (*Pseudacris crucifer*), and Wood Frog (*Lithobates sylvaticus*). Eastern Garter Snake (*Thamnophis sirtalis sirtalis*) was also recorded along each study section of the transportation corridor (Noront 2013). These species all have the potential to occur within the LSA and have a provincial S-rank status of S5 (Secure) and none are listed either federally or provincially as SAR.

Data from the Ontario Reptile and Amphibian Atlas (ORAA, 2019) indicate that Western Painted Turtle (*Chrysemys picta bellii*) and Snapping Turtle (*Chelydra serpentina*) do not occur farther north than Woodland Caribou Provincial Park, while Midland Painted Turtle (*Chrysemys picta marginata*) does not occur farther north than Pukaskwa National Park, on the eastern shoreline of Lake Superior. As a result, it is unlikely that turtles and turtle SWH, such as Turtle Wintering Areas and Turtle Nesting Areas, occur within the LSA.

12.2.2.4.2 Frog Acoustic Surveys

Acoustic surveys in 2020 detected four anuran species: American Toad, Boreal Chorus Frog, Spring Peeper, and Wood Frog. For each species, the probability of detection per recording was calculated, i.e., the product of whether the species was present and produced a call that the observer detected. The four amphibian species were detected within the recordings in the following decreasing rank order of detection: Spring Peeper (71.8%), Wood Frog (30%), American Toad (24.6%), and Boreal Chorus Frog (8.6%).

Collapsed by station, Spring Peepers were recorded at 48 of 49 stations (97.9%), Wood Frogs were recorded at 44 of 49 stations (89,6%), American toads at 38 of 46 stations (82.6%), and Boreal Chorus Frogs at 17 of 48 stations (35.4%).

Spring Peepers were detected at all but one station and on 201 unique recordings with the earliest detection occurring on May 18 and the latest on June 30, 2020. The only station (CF9) that didn't record the presence of Spring Peepers only had two recordings included due to the early end of its operation on May 24th, however, it was included in the analysis for Spring Peepers as they were detected at other stations at similar and earlier dates. Almost every station recorded the presence of Spring Peepers on multiple occasions, with one station recording their presence on all seven recordings that were analyzed.

Due to the ubiquitous nature of Spring Peepers, the logistic model had a poor fit, no habitat classes were statistically significant, and all habitat classes were predicted to have a 100% probability of observing Spring Peepers. While observers noted the distance based on sound levels in recording, no distance variable was used in the modeling and all calls were included in the model. As a full chorus of Spring Peppers can be heard over a kilometre away (Ontario Nature, 2021), the detection of Spring Peepers on a recording is not indicative of local habitat use and likely influenced the habitat estimates as many calls on the recordings were more distant in nature.

Wood Frogs were heard on 84 unique recordings with the earliest detection occurring on May 18 and the latest on June 30, 2020. Wood Frogs were recorded up to five times at a station; however, most stations only recorded their presence once or twice (72% of stations). None of the habitat classes were statistically significant predictors of Wood Frog, nor was the distance to open water or the number of recordings processed at each station. While not statistically significant, Wood Frog was least likely to be heard in upland areas and most likely to be observed in bogs and swamps.

American Toads were heard on 69 unique recordings with the earliest detection occurring on May 24 and the latest on June 25, 2020. American Toads were recorded up to four times at a station; however, at the majority of the stations American Toads were detected only once (50%) or twice (26%). None of the habitat classes were not statistically significant predictors of American Toad, nor was the number of recordings processed at each station. The distance to open water was significant. American Toads were most common in areas near open water and the probability of observation dropped as the distance increased, especially after 500 meters. While not statistically significant, American Toad was less likely to be heard in upland areas and most likely to be observed in fens with all three wetland classes having a high probability.

Boreal Chorus Frogs (BCFR) were only detected at 17 out of 48 stations and heard on 23 unique recordings, with the earliest detection occurring on May 25th and the latest on June 21, 2020. BCFR were recorded up to three times at a station; however, this species was recorded only one time at 70.5% of the stations. None of the habitat classes were statistically significant predictors of Wood Frog, nor was the distance to open water or the number of recordings processed at each station. While not statistically significant, BCFR was most likely to be heard in fens and least likely to be heard in bogs. The relatively low numbers of recorded BCFR may be due in part to the overlapping frequency of BCFR and Spring Peepers, with the high decibel levels of Spring Peepers in full chorus masking the presence of BCFR. When recordings were specifically listened to for amphibian presence, BCFR were detected in 16 out of 47 recordings, i.e., 34% of the time, which is similar to the overall detection rate of Wood Frog. Comparatively, BCFR were only detected in seven of the 233 recordings (3%) processed for the bird acoustic study where amphibians were noted incidentally.

12.2.2.4.3 Incidental Observations

Four amphibian species were identified incidentally during the field survey programs in June, July, and August 2019, including American Toad, Boreal Chorus Frog, Spring Peeper, and Wood Frog. All four species were identified visually and by call during daytime breeding bird, vegetation, and caribou nursery surveys.

Boreal Chorus Frogs were the most widely occurring species and were documented across the extent of LSA. The majority of observations for the remaining species occurred east of Webequie First Nation. Frog calls were generally heard as individuals, without calls overlapping. Wood Frogs were observed exclusively in August.

Evidence of one reptile species was documented in August 2019. A shed snakeskin was found, likely belonging to a local subspecies of the Common Gartersnake (*Thamnophis sirtalis*), which is the most northerly ranging snake in North America. The Eastern Gartersnake has been recorded near Webequie in Summer Beaver (Nibinamik), while the Red-sided Gartersnake (*T. sirtalis parietalis*) has been detected slightly further southwest near Pipestone River Provincial Park (Ontario Nature, 2019).

12.2.2.4.4 Significant Wildlife Habitat – Herpetofauna

Turtle Wintering Areas

Background Information Review: The LSA is north of the range of all eight of Ontario's turtle species; therefore, no turtle wintering areas or nesting areas are expected within the LSA.

Field Survey Results: No formal surveys for this habitat type were conducted as the LSA is north of the range of Ontario's turtle species.

Turtle Nesting Areas

Background Information Review: The LSA is north of the range of all eight of Ontario's turtle species.

Field Survey Results: No formal surveys were conducted as the LSA is north of the range for Ontario's turtle species.

Reptile Hibernacula

Background Information Review: The Eastern Garter Snake is the only reptile species known to occur within the LSA. This species may hibernate, often communally, in a wide variety of sites including mammal burrows, fractures in rock outcrops, talus slopes, and anthropogenic sites such as cisterns or fencepost holes (Yagi, 2020).

No data indicating the location of reptile hibernacula along the proposed WSR were found during the background information review.

Field Survey Results: Reptile hibernacula were not detected during field surveys conducted along the preferred route. No formal surveys for this habitat type were conducted due to the complexity in finding such habitat features. No snakes or other reptiles were observed during the 2019-2021 field surveys; however, an incidental snakeskin observation was made in June 2020 and August 2021, indicating the presence of snakes within the LSA.

Amphibian Breeding Habitat (Wetland and Woodland)

Background Information Review: ORAA (2019) data indicate five frog species are known to occur in proximity to the Project. ELC data indicates the presence of 22 candidate SWH of this type covering 183 ha across the LSA and 36 sites covering 539 ha across the RSA.

No additional data indicating the location of amphibian movement corridors between amphibian breeding habitats were found during the background information review.

Field Survey Results: All 49 ARU stations sampled during the spring calling period recorded at least one frog species and 47 of 49 ARU stations sampled recorded two or more species. While results indicate that frogs of at least four species occur widely across the LSA, total numbers of frogs occurring within sampled habitats were not determined with confidence using the ARU survey method. As such, the presence of this habitat type was unable to be confirmed during field studies.

Amphibian Movement Corridors

Background Information Review: A large portion of the LSA may contain amphibian movement corridors between potential breeding habitats. No additional data indicating the location of amphibian movement corridors between amphibian breeding habitats were found during the background information review.

Field Survey Results: No data indicating the location of amphibian movement corridors between amphibian breeding habitats were found during the existing conditions field surveys. Targeted surveys for amphibian movement corridors were not conducted.

12.3 Identification of Potential Effects, Pathways and Indicators

In accordance with Section 13 (Effects Assessment) of the TISG, the effects assessment for the Project must describe in detail the potential adverse and positive effects in relation to the construction and operation phases of the WSR. For the Wildlife and Wildlife Habitat VC, potential environmental effects and measurable parameters were selected based on a review of similar environmental assessments for linear projects (such as roadways, transmission lines, and pipelines) in Ontario and within Canada,

feedback received during the engagement and consultation process, and professional judgement. While potential effects may be similar across the different wildlife criteria, each of the key species and species groups are evaluated individually.

The primary potential effects of the Project on the Wildlife and Wildlife VC include:

- Habitat Loss;
- Habitat Alteration or Degradation;
- Alteration in Movement; and
- Injury or Death.

Potential effects, indicators, nature of the interactions, and threat assessments for the Wildlife and Wildlife Habitat VC are described in the following subsections and are summarized in **Table 12-40**.

12.3.1 Threat Assessment Approach

As required in the TISG (Section 13) the methodology for the effects assessment for wildlife and wildlife habitat is a staged approach involving an initial assessment of the effects of the Project or "Threat Assessment" (without consideration of mitigation), followed by an assessment of the predicted net effects with application of mitigative measures as presented in **Section 12.5**. These two assessments differ in that the Threat Assessment is limited to the physical direct removals or alteration of wildlife habitat, while the predicted net effects assessment incorporates a qualitative and quantitative description of the effects using criteria to assess adverse effects, taking into account any important contextual factors and mitigation. For the Wildlife and Wildlife Habitat VC, the criteria proposed for the Threat Assessment are defined below; they are Scope, Severity, Irreversibility (Permanence), Magnitude, which is determined using Scope and Severity), and Degree of Effect, which is determined using Magnitude and Irreversibility (Permanence).

- **Scope** – defined spatially as the proportion of the valued component's occurrence or population within the study areas (Project Footprint, LSA and RSA) that can reasonably be expected to be affected by the predicted effect within 10 years:
  - pervasive: the effect is likely to be pervasive in its scope, affecting the valued component across all or most (71-100%) of its occurrence or population within the study areas;
  - large: the effect is likely to be widespread in its scope, affecting the valued component across much (31-70%) of its occurrence or population within the study areas;
  - restricted: the effect is likely to be restricted in its scope, affecting the valued component across some (11-30%) of its occurrence or population within the study areas; and
  - small: the effect is likely to be very narrow in its scope, affecting the valued component across a small proportion (1-10%) of its occurrence or population within the study areas.
- **Severity** – defined as, within the scope, the level of damage to the valued component from the effect that can reasonably be expected; typically measured as the degree of destruction or degradation within the scope or the degree of reduction of the population within the scope:
  - extreme: within the scope, the effect is likely to destroy or eliminate the valued component or reduce its population by 71-100% within ten years or three generations;
  - serious: within the scope, the effect is likely to seriously degrade/reduce the valued component or reduce its population by 31-70% within ten years or three generations;

- moderate: within the scope, the effect is likely to moderately degrade/reduce the valued component or reduce its population by 11-30% within ten years or three generations; and
- slight: within the scope, the effect is likely to only slightly degrade/reduce the valued component or reduce its population by 1-10% within ten years or three generations.

- **Irreversibility (or permanence)** – defined as the degree to which the effect can be reversed and the valued component restored, if the effect no longer existed:
  - very high: the effects cannot be reversed, and it is very unlikely the valued component can be restored, and/or it would take more than 100 years to achieve this (e.g., wetlands converted to a shopping center);
  - high: the effects can technically be reversed and the valued component restored, but it is not practically affordable and/or it would take 21-100 years to achieve this (e.g., wetland converted to agriculture);
  - medium: the effects can be reversed and the valued component restored with a reasonable commitment of resources and/or within 6-20 years (e.g., ditching and draining of wetland); and
  - low: the effects are easily reversible, and the valued component can be easily restored at a relatively low cost and/or within 0-5 years (e.g., off-road vehicles trespassing in wetland).

- **Magnitude** – Magnitude of the effect is determined using Scope and Severity values as follows (Magnitude = scope x severity):

		SCOPE			
		Pervasive	**Large**	**Restricted**	**Small**
SEVERITY	**Extreme**	Very High	High	Medium	Low
	Serious	High	High	Medium	Low
	Moderate	Medium	Medium	Medium	Low
	Slight	Low	Low	Low	Low

- **Degree of effect –** Degree of effect is determined using Magnitude and Irreversibility values as follows (Degree of effect = magnitude):

		IRREVERSIBILITY			
		Very High	**High**	**Medium**	**Low**
MAGNITUDE	**Very High**	Very High	Very High	Very High	High
	High	Very High	High	High	Medium
	Medium	High	Medium	Medium	Low
	Low	Medium	Low	Low	Low

A Summary of the Threats Assessment is included at the end of the potential effects assessment for each of the SAR species. The evaluation criteria within the net effects section (**Section 12.7**) uses additional evaluation criteria, but the criteria used in the threats assessment are accounted for through the use of magnitude and irreversibility within the net effects evaluation. Similarly, the degree of effect found in the threat assessment is a component of the evaluation of significance completed in **Section 12.8**.

Given that the application of the threat assessment process to a project level spatial scale is new and requires adapting a process designed for Global and National assessments of populations there are some limitations that should be considered.

- The assessment results are highly susceptible to study area size, as scope will be proportional to the study area, and evaluations of severity are based within the scope;
- Evaluation at very small scales (project footprint) are questionable as species rarely have closed populations at this scale;
- The choice of study area size will affect the scoring results so may be susceptible manipulation (only evaluate impacts at larger scales); and
- Importance is not factored into the assessment, removal of a few sensitive features, or spatially important features may be more important than loss of a larger number of less sensitive features.

Given that the process was designed for global and national population assessments, issues at smaller scales can be problematic. The NatureServe document on which the threat assessment is based on (NatureServe, 2012) quotes the International Union for the Conservation of Nature (IUCN) in its discussion of scale "The choice of scale ... may thus, itself, influence the outcome of ... assessments and could be a source of inconsistency and bias." While this is in a discussion of mapping scale, it is also an important consideration when determining the appropriate scale of the evaluation.

12.3.2 Wildlife and Wildlife Habitat

The following potential effects are common to all Wildlife and Wildlife Habitat criteria. Additionally, with the implementation of mitigation measures, described in **Section 12.4** the effects are adequately mitigated and are not expected to cause net effects and were therefore not carried forward for further assessment.

12.3.2.1 Habitat Alteration or Degradation

Accidental Spills

Chemical or hazardous materials stored on or spills of such materials in the Project Footprint could affect wildlife survival and reproduction. Spills, should they occur, are predicted to be generally localized in nature. Given the types of activities that will be associated with the Project, the most likely types of spills would be fuel and/or oil-based products from machinery and equipment.

Deposition of Dust and Other Airborne Particles

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO_x), including sulphur dioxide (SO_2), oxides of nitrogen (NO_x), particulate matter (e.g., $PM_{2.5}$) and total suspended particulate matter (SPM). Air emissions such as SO_x and NO_x will result from the use of fossil fuels in generators, vehicles, and equipment during the Project. Air emission, and subsequent deposition, can affect upland, riparian and wetland ecosystems through changes to soil quality by altering soil pH, nutrient content and soil composition.

Accumulation of dust produced from the Project may result in localized changes to vegetation in the LSA. Changes in plant community structure may affect habitat use by many species of wildlife. Dust resulting from the disturbance, transport and stockpiling of earth materials and vehicle and equipment movement on the road during construction and operations have the potential to affect vegetation through direct interaction (e.g., smothering over time), and/or transport of harmful chemicals or nutrients which alter soil

and water conditions (Forman and Alexander, 1998). While road dust can fertilize nutrient-limited peatlands and affect their plant assemblages and ecosystem functions, these alterations are general found only along roadways with high traffic and dust deposition levels (Li et al., 2023).

The modelling results for the Assessment of Effects on the Atmospheric Environment are found in Section 9. During construction, the results of the modelling indicate a maximum dust deposition value of 10 g/m^2, 143% greater than the provincial ambient air quality criteria (AAQC) even with dust controls. However, due to the intermittent and localized nature of these potential effects during the construction phase their impact is anticipated to be low. These values drop during operations to 4.3 g/m^2 (61% of the AAQC) over 30 days at 50 m of the road centerline. Additionally, dust depositions during the operations phase will only be present for the first three years as the road is forecasted to be paved at that point.

Vibration

Vibration is discussed in Appendix J - Webequie Supply Road Noise and Vibration Technical Report: Existing Conditions and Impact Assessment. Vibration during road and bridge construction was assessed using 3 mm/s as the target level criteria. Based on equipment type 24 m was the largest setback required to reach this level. At greater distances vibration minimal, for the largest source of vibration, an impact pile driver during bridge construction, vibration levels were 0.271 mm/s at 165 m and 0.094 mm/s at 350 mm/s. While minimum vibration perception by individual wildlife species is generally unknown, perception by humans starts between 0.14 and 0.25 mm/s.

Based on the relatively low volumes of rock needed for the Project, blasting of rock requiring the use of explosives during construction and operation activities is expected to occur on an infrequent basis when aggregate and/or rock materials are required for construction and maintenance activities. Vibration generated by blasting is expected to be temporary and the potential effects will be centered around blasting locations.

In terms of Operations ground vibration impacts from the operations phase of the Project were deemed highly unlikely, and therefore an assessment of vibrations from operations was not required under the Provincial Terms of Reference.

Invasive Plant Species

The introduction and spread of invasive plant species can affect vegetation community structure and composition, which can affect the habitat availability and distribution. Invasive plants could structurally affect habitats that function as shelter, while composition changes could alter the availability of forage. Invasive plant species could be brought into the Project Footprint during construction along with equipment and supplies. Road construction and associated infrastructure may also create abiotic conditions in which invasive species thrive, allowing them to spread from temporary areas of disturbance (e.g., construction camps, staging areas).



Indigenous community members noted about the need to adequately assess impacts to birds and bird habitat, including the utilization of best available resources and models, as well as Indigenous Knowledge.

Sections 12.3.7 through 12.3.11 outline the potential effects of the Project on birds, including shorebirds, waterfowl, raptors and migratory wetland songbirds. Table 12-3 includes a summary of Indigenous Knowledge received from Indigenous communities.

12.3.2.2 Injury or Death

Wildlife Attractants

Human-wildlife interactions may increase during the construction phase if wildlife, or their predators are attracted to the Project Footprint by such things as food waste, sewage, or petroleum-based products. These materials can also change predator-prey relationships, which can affect survival and abundance of wildlife.

During operations phase, attractants could also increase human-wildlife interactions and change predator-prey relationships, thereby affecting the survival and reproduction of wildlife. One example of an operational attractant would be roadkill, which, if not removed, could attract scavengers to the ROW and lead to collisions, incidental take, or changes to predator-prey relationships.



Indigenous community members raised concerns about animals which will end up travelling and foraging along the road(s).

Section 12.4 outlines proposed mitigation measures to address potential effects of the Project on wildlife including the risk of injury and death of wildlife during the construction and operations phases of the Project.

12.3.3 Moose



Indigenous community members are concerned about the current moose population, having observed local declines in population that may be exacerbated by increased human traffic and tourism in the North. Indigenous community members noted that the planes already scare moose in the Project area(s) and that additional vehicle traffic could scare the moose even more.

Existing conditions of Moose in the project study areas are described in the NEEC Report (Appendix F of the EAR/IS) and summarized in Section 12.2. Potential project effects on Moose are assessed in Section 12.3.3 and Section 21 (Cumulative Effects Assessment). With the implementation of proposed mitigation measures outlined in Section 12.4, the net effects of the Project on Moose are predicted to be not significant (refer to Sections 12.7.1 and 12.8.1).

12.3.3.1 Habitat Loss

Moose Habitat Loss is described as a reduction in total habitat available for moose within the study areas. There will be moose habitat loss resulting from vegetation clearing, hydrological changes and disturbance during construction. The pathways that may result in loss or destruction of moose habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Removal of vegetation → Loss of moose habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Loss of moose habitat.

Construction

Clearing Activities

Site preparation and construction activities will reduce the availability of suitable moose habitat in the Project Footprint, most areas in the Project Footprint will be permanently removed during construction of the road.

Moose utilization was modelled by estimating probability of use based on resource selection functions (RSFs) across the moose LSA. For moose, RSF modeling was done using the Far North Land Cover (FNLC) as vegetation mapping at the ELC level was only available for part of the moose LSA (See Section 11.2.1: Methods, Assessment of Effects on Vegetation and Wetlands) for the use of FNLC in vegetation modeling. Based on the results of RSF habitat modeling, the Project will result in the removal of 163.95 ha of high winter use moose habitat from the standard LSA and 235.76 ha of high use moose habitat from the Moose LSA due to construction activities (refer to **Table 12-10** and **Figure 12.3**). This represents 2.34% of high rated moose habitat in the standard LSA and 0.47% of high moose habitat in the moose LSA. Modeled probability of use ranged from 0.0 to 0.97 with the highest quantile (highest 20%) starting at 0.189.

Table 12-10: Changes to Available Habitat for Moose by Study Area

Habitat Use	Standard LSA (1 km)			Moose LSA (11 km)		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	163.95	7,008.52	2.34	235.76	50400.41	0.47
Moderate	195.48	11,731.89	1.67	224.01	100,984.31	0.22
Low	84.81	8,912.83	0.95	91.52	101,106.98	0.09

Based on the assessment of habitat ELC mapping, 147.48 ha of moose late winter cover (Upland Conifer Forest) is estimated to be removed during construction activities, this represents 8.38 % of moose late winter cover in the project LSA (1 km buffer of the proposed ROW). While ELC mapping does not exist for the full extent of the moose LSA, FNLC can be used to provide a similar estimate. Using FNLC, 74.5 ha of moose late winter cover is estimated to be removed during construction activities, this represents 0.77% of moose late winter cover in the moose LSA.

Hydrological Changes

Construction activities have the potential to cause the destruction of moose habitat through changes to groundwater and surface water flows. As described in Section 11.2.2 (Results, Assessment of Effects on Vegetation and Wetlands), most of the Project RSA is wetlands, primarily peatlands susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by roads. Changes in surface water conditions can also occur with the installation of crossing structures. Such changes are generally concentrated downstream of the effect but can also take place on the upstream side if channel restriction causes water impoundment which can cause death of vegetation (Bocking et al., 2017). While likely small in scale, long term impoundment of conifer forests could lead to loss of moose winter habitat. Change in hydrology could lead to loss of seasonally inundated habitats that are commonly used by moose (Morris, 2014)

N

Legend:

- Project Footprint
- Moose Local Study Area (LSA 11km from Preferred Route)

Relative Probability of Use

- 0.011 - 0.049
- 0.049 - 0.073
- 0.073 - 0.109
- 0.109 - 0.175
- 0.175 - 0.859

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

RSF Modeling for Moose based on Probability of Use Under Existing Conditions

Figure Number: 12-3		**REV:** PA	
Client: Webequie First Nation	**Project Number:** 661910	**Date:** 5/14/2025	
DSC		**DRN** TE	**CHK** GS	**APP** GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

Operations

Clearance Activities

Operation of the roadway is unlikely to result in additional loss of habitat through vegetation removal. Most maintenance activities will be involve managing re-growth of vegetation along the ROW within the Project Footprint and losses are accounted for in the construction phase. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations, but it is predicted that these effects would be short-term and of limited size. Quarries will remain operational following construction as additional material may be needed for maintenance activities; however, no additional habitat loss or destruction is anticipated to occur as the Project Footprint will not be expanded during operations. Should repair or rehabilitation of bridges and/or culverts be required that necessitate in-water works, it is predicted that only minor losses or temporary alterations of riparian moose habitat may occur.

Hydrological Changes

Moose habitat loss through changes to hydrology could also potentially occur during the operations phase due to culvert and crossing structure maintenance but is unlikely. Culverts and other crossings could become partially or fully blocked from either sediment or beaver activity. If culvert maintenance is ignored, given sufficient time, death of vegetation and loss of habitat could occur near the roadway (Bocking et al., 2017).

12.3.3.2 Habitat Alteration or Degradation

There could be alterations to moose habitat resulting from vegetation clearing, hydrological changes and sensory disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of moose habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration and degradation of moose habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration and degradation of moose habitat.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of moose habitat.

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect → Alteration and degradation of moose habitat.

Construction and maintenance activities → Introduction of invasive species → Alteration and degradation of moose habitat.

Construction

Accidental Spills

Accidental spills and releases that occur during construction phase may result in moose habitat degradation. Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds throughout which pollutants can spread. Depending on

concentrations and material spilled, an accidental spill could cause death of vegetation, lower productivity and alter the vegetation community (Hutchinson and Freedman, 2011; Lednev et al., 2023). Accidental spills would more likely affect moose Aquatic Feeding Habitat than Wintering Habitat as they could be hydrologically connected through subsurface flows (Smerdon et al., 2005).

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020). Changes in wetland drainage patterns, resulting in lower or higher water levels, can alter the plant community (Miller et al. 2015), which could locally affect browse availability for moose. These changes can be extensive: a study within boreal fens in Alberta found pronounced differences in canopy cover up to 250 m from road edges in both rich and poor treed fens (Willier et al., 2022). As described in Section 11.3.2.3 (Indirect Effect Pathways on Vegetation and Wetlands), for the purpose of the habitat alteration assessment the project team used this distance value, with high effects occurring within 20 m, moderate effects within 60 m and minimal effects at 250 m. Potential changes in surface water drainage patterns and increases or decreases in flows and surface water levels in waterbodies, as well as changes to groundwater, are described in detail in Section 7 (Assessment of Effects on Surface Water Resources) and Section 8 (Assessment of Effects on Groundwater Resources).

Sensory Disturbance

Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for moose adjacent to the Project Footprint. Sensory disturbance may be especially high during construction when activities such as blasting, quarrying, hauling and clearing may occur during all hours causing moose to avoid the ROW and supportive infrastructure. Construction noise is less continuous and more impulsive than traffic noise; however, moose have been shown to habituate to it. The presence of workers may stimulate a large avoidance response (Andersen et al., 1996). Industrial noise has also been shown to reduce ungulate use of areas with higher levels of noise (Landon et al., 2003).

Habitat Structural Change

Changes to vegetation structure during road construction activities may either alter or degrade moose habitat near the Project Footprint due to vegetation clearing activities and removals. These vegetation removals may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat after the implementation of mitigation measures. It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation.

The effect of habitat structural change on moose is likely relatively low due to their use of early seral communities for foraging. Clearing of the Project Footprint will promote vegetative growth which can provide optimal moose foraging habitat (Tanner and Leroux, 2015). The conversion of areas of mature conifer forest into early seral communities could lead to the degradation of the Moose Late Winter Habitat as the areas would be more fragmented and reduced in size.

Figure 12.4 shows the probability of use under future conditions. For moose, the RSF modeling based on anticipated habitat change predicts moose utilization of the Project Footprint to decrease by 25.3%, use of the LSA to decrease 8.7% and use of the moose LSA to decrease 1.2% (**Table 12-11**). Given the use of the disturbance habitat category as the representative for the road ROW in the RSF modeling, the

results can be interpreted to indicate that moose would use the vegetated areas of the ROW at a lower rate than the existing vegetation communities that were removed.

Table 12-11: Moose Probability of Habitat Use Percent Change by Study Area

Species	% Change by Study Area		
	Project Footprint	Standard LSA	Moose LSA
Moose	-25.3%	-8.7%	-1.2%

This probability of use also carries over to a negative change in the LSA. Changes in the RSA, while negative are small and given the uncertainty in the model can be interpreted as no significant change. The negative response of moose to conversion of the Project Footprint is likely based on the use of the anthropogenic upland disturbance class to represent the areas of removed which are not necessarily representative of the temporary construction related disturbances that would be regenerating with early seral vegetation that can attract moose as many of the cleared areas will be lowland habitats.

Introduction of Invasive Species

Construction activities have the potential to introduce invasive plant species to the wetland habitats used by moose. One of the pathways of spread for invasive plants is through construction equipment. Improperly cleaned construction equipment has the potential to transport and spread invasive plants, with cleared areas, including roads sides being susceptible to invasion (Hanen and Clevenger, 2005). Once established, invasive plant species can affect multiple ecosystem aspects including structure, diversity and function (CFIA, 2008). Moose can also act as conduit for invasive plant introduction through dispersal of propagules (Rose and Hermanutz, 2004); however, while invasive plants are known to spread along transportation corridors, few invasive species have been found in naturally occurring boreal wetland habitats used by moose (Langor et al. 2014) with most invasive wetland species found well to the south of the RSA (EDDMAps, 2024).

N

Legend:

- Project Footprint
- Moose Local Study Area (LSA 11km from Preferred Route)

Relative Probability of Use

- 0.011 - 0.049
- 0.049 - 0.073
- 0.073 - 0.107
- 0.107 - 0.171
- 0.171 - 0.859

WSR
WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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0 5 10 km

Webequie Supply Road

RSF Modeling for Moose based on Probability of Use Under Future Conditions

Figure Number: 12-4		REV: PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

Operations

Accidental Spills

Similar to the effects during the construction phase, there could be effects to moose habitat quality during the operations phase from accidental spills, which may result in moose habitat degradation, especially aquatic feeding habitats. Spills during operations would most likely originate from accidental releases from vehicles traveling to and from the community. The road is forecasted to have low traffic volumes, and traffic along the roadway will be primarily personal and commercial vehicles and transport trucks associated with the community. While estimate frequency of spills is low (0.00000019 spills per mile, or 0.00000012 spills per kilometer [Harwood and Russell, 1990]), its predicted that minor spills and release are possible.

Sensory disturbances

Road operations may affect moose habitat through sensory disturbance. High traffic roads have been found to cause avoidance of the area due to the associated noise and light (Niemi et al., 2017). Laurian (2010) found that moose avoided areas that were within 500 m of a road but 20% of moose still visited areas close to highways. Shanley and Pyrare (2011) found the road effect zone to be at least 500 m for male moose and greater than 1 km for female moose on rural roads. Along roads with less traffic this response is diminished but moose still use the area at lower than expected values (Laurian et al., 2010). Local concentrations of moose may still occur if high value habitats like salt licks or high sodium vegetation is present near the road (Grosman, et al., 2011; Laurian et al., 2010). While lighting along roads may act as sensory disturbance for moose, the WSR road will not have lighting except near the community limiting its effect.

Habitat Structural Change

Changes to vegetation structure during operations will have similar effects on moose and their habitat as during the construction phase. While it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW. Roadside vegetation cutting aimed at maintaining line of site could have the consequence of attracting moose to the roadside to feed on new vegetative growth and the continuous maintenance of these areas will prevent succession from occurring maintaining optimal moose foraging habitat (Rea, 2003).

Introduction of Invasive Species

The introduction and spread of noxious and invasive plant species could also occur during operations and will have similar potential effects on moose habitat as during construction. Transportation corridors are avenues of dispersal for invasive plants (Langor et al. 2014), and given the longer timeframe, operation of the road has a greater chance for introduction of invasive plant species; however, while the timeframe is longer, introductions of plants into moose habitat are likely limited in the ability to spread beyond disturbed areas of the road ROW (Kent et al., 2018).

12.3.3.3 Alteration in Movement

There may be alterations in moose movement stemming from construction activities and operation of the road. The pathways or activities which may result in changes in wildlife movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of moose.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of moose.

Construction

Loss of Connectivity

Vegetation clearing, earth grading activities and the use of fencing to demarcate construction areas are likely to create short-term negative physical barriers to moose movement similar to highway exclusion fencing that has been found to act as a barrier to moose movement (Olsson, 2009). Construction activities may limit movement. Horejsi (1979) found that moose were less likely to cross seismic lines when exploration activity was being conducted on the line.

The creation of the ROW may also act as a soft barrier during construction, effecting habitat connectivity. Moose may avoid risky habitats such as open areas as they are more likely to encounter a predator (landscape of fear). While moose have been found to avoid crossing large linear openings (Joyal et al, 1984), crossing rates of more narrow ROWs, like the 35 m ROW proposed for the Project, were not found to be affected (Bartzke et al., 2015).

Sensory Disturbance

Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of moose as they avoid the Project ROW and supportive infrastructure. Unlike sensory disturbances in the operations phase, many of these disturbances will be abrupt, and occur randomly and at different locations. While little direct information exists on the effect of construction noise on moose, they are known to respond to noise stimuli. Sound stimuli have been used to change moose behavior with recording of human voices causing moose to move away from the source of noise (Almas, 2021). Moose have also shown to have shorter flushing distances in response to vehicles as compared to humans, likely as recognition of humans as a threat (Anderson, et al. 1996). In terms of mechanical stimuli, helicopter overflights elicited the greatest flight response (Anderson, et al. 1996). Moose were also shown to move out of areas when seismic line operations were underway and in open terrain were likely to leave the immediate area if a vehicle came within 250 m (Horejsi, 1979).

Operations

Loss of Connectivity

Similar to the construction phase, alteration in moose movement due to loss of connectivity may occur during road operation. Maintenance activities will maintain vegetation the openness of the ROW. During the winter snow clearing along the road may create barriers to crossing, although moose may use the road as a travel corridor once on the road due to reduced snow cover (Collins and Helm, 1997). Moose are known to be reluctant to move across roads and while some of the reluctance is due to the adjacent

structure of the forest (Forman et al. 2003) and their visibility from the road (Montgomery et al., 2012). Moose may alter their travel trajectory as they approach the road and travel parallel to the road instead of crossing (Bartzke et al., 2015). Sensory disturbance from traffic is known to contribute and is discussed in the next section.

Sensory Disturbance

Vehicle noise is anticipated to be the primary sensory impact on moose during operations. Disturbance from traffic is known to reduce moose crossings (Alexander et al. 2005). Moose are also more likely to move parallel to the road as they get closer to the road (Bartzke et al., 2015). Traffic levels are also known to influence moose movement as multiple studies have found road avoidance increases with increased disturbance (Bartzke et al., 2015; Wattles et al. 2018). Moose may also change their travel speed as they approach or cross a road. Studies have both found increases in speed (Dulssault et al., 2010) and decreases (McDonald, 2024). The difference in reaction could be dependent on local condition such as predator avoidance or structural differences in adjacent habitat. Human presence may also alter moose movement if the human activity increase along the roadside, for example male moose may avoid the road during the hunting season (Mumma et al., 2019) While lighting along roads can be a sensory disturbance for moose, the WSR road will not have lighting except near the community limiting its effect.

12.3.3.4 Injury or Death

The Project may lead to both direct and indirect mortality to moose. There could be increases in either injury or death stemming from vehicle traffic during both construction and operation of the road, indirect mortalities arising from increased energy expenditures and habitat change, and mortality due to increased human access. The current population estimates for moose in the wildlife management unit (1D) which contains the RSA is 2990 or 0.24 moose per km and is within the target population (MNR, 2025). The pathways or activities that may result in moose injury or death include the following:

Equipment and vehicles moving within Project Footprint → Collisions with moose within Project Footprint → Injury or Death of moose.

Construction and operations activities clear vegetation → Increased access for moose predators → Injury or Death of moose.

Construction of Road → Increased access to moose habitat by hunters → Injury or Death of moose.

Construction of Road → Increased access to area by infected white-tailed deer → Spread of Brainworm into moose population → Injury or Death of moose.

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within Project Footprint could result in increased death and injury of moose. Vehicles will be travelling between camps and construction locations; these trips could occur at all hours and encounters with moose would not be unexpected. Due to their size and center of gravity, during collisions moose often contact the passenger compartment, often killing the moose and resulting in extensive damage to the vehicle and passengers. Road edges often create early seral vegetation that can attract moose, leading to higher numbers of collisions especially as they are

more likely to use roadsides during the night (Elegard et al., 2012). Behavior factors also influence collision rates for moose, for example collision rates are higher during the rut due to higher movement rates (Laliberte and St-Laurent, 2019).

Changes to Predator-Prey Dynamics

Effects on moose survival from improved predator access and movement rates is possible during the construction phase. Linear features are known to facilitate predator movement in the boreal (Dickie et al., 2017; Benoit-Pepin et al., 2024) and creation of new roads connected to human activity is known to spread predators into previously unoccupied areas (Lantham et al. 2011). In northwestern Ontario wolves are the primary predator of moose (Found et al., 2018)., although black bears will often prey on moose calves. For wolves, roads act as high-speed travel corridors that allow wolves to move large distances across their home range (Bojarska et al., 2020) while spending relatively little time on them, especially on those with high traffic levels, the minimizing of time spent on roads allows wolves to minimize human encounters (Zimmermann et al., 2014). The use of roads also allows wolves to have higher kill rates of moose (Vander Vennen et al., 2016). Selection of roads by wolves has been found to be dependant on the existing road density in Northwestern Ontario with increased selection for roads with increasing road density (Newton et al., 2017).

Increased Access

The development of the Project could result in a negative effect on the abundance of moose through increased human access to habitats where populations are present. Opening up new areas to human development can often result in increased hunting (Courtois and Beaumont, 1999). Access to previously undisturbed areas introduces opportunity for increased harvesting for recreational hunting and by Indigenous communities and groups. Construction and other temporary workers may contribute to increased harvest during construction of the Project. These workers may exploit the local area to hunt during their time-off or post-shift, and hunting pressure is influenced by distance from communities (Courtois and Beaumont, 1999).

Introduction of Disease

Brainworm is a roundworm often found in the brain of white-tailed deer. While brainworm is non-fatal in deer, in moose the infection is usually fatal (MNR, 2025). While brainworm is found in moose populations in northwestern Ontario, it is not currently found in the project area. Brainworm is forecasted to shift its range northward into the boreal ecoregion (Pickles et al., 2013). The expansion of Brainworm is linked to the range expansion of its host, white-tailed deer (Dawe and Boutin, 2016). Anthropogenic alterations to the landscape increase interactions between white-tailed deer and other ungulates like moose. The geographic spread of brainworm is important for moose as moose population declines have been linked to higher rates of infection (Lankester, 2010)

Operations

Collisions with Vehicles

Vehicles traveling along the road during operations could collide with moose causing injury or death. During operations, the predicted maximum vehicles travelling on the road is 500 per day, with the majority of travel anticipated to take place during daylight hours. This may mitigate the number of collisions as the highest level of vehicle collisions with moose occur during the first couple hours after sunset and before dawn (Borowik et al., 2021). Moose collisions are often related to greater speed limits and the lower

levels of control along the road during the operations phase may lead to higher numbers of moose collisions (Neumann et al. 2012).

Changes to Predator-Prey Dynamics

Effects on moose from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Maintenance clearing during operations will maintain openness along the ROW which will allow predators increased access to moose habitat exposing moose to increased predation. Conversely the road may act as refuge for moose from predation as predators often avoid areas of high human activity (Berger, 2007) however the low traffic levels along the road may decrease the human shielding effect.

Increased Access

Access to moose habitat will continue during operations, potentially leading to increased harvest of moose along the corridor. Creation of roads in previously inaccessible areas can often lead to increased use by hunters (Crichton et al., 2004; Boston 2016). For moose, the construction of new roads is linked to increased hunting mortality (Timmerman and Gollat, 1982) as most hunting takes place within a few hundred meters of a road (Boer, 1990). Increased browse along the ROW may act as an attractant for moose and correspondingly lead to higher moose harvest (Remple et al., 1997). The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase.

12.3.3.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP (International Union for the Conservation of Nature-Conservation Measures Partnership) unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (Natureserve, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. Moose can have large home ranges in northwestern Ontario 6-90 km^2 in size (Addison, 1980), based on the potentially large size of the home range they were evaluated at the RSA level.

Scope is small for all threats to moose as the percent of the population affected is less than 10% of the available habitat and population within the LSA.

Moose have threat severity ratings ranging from slight to serious. The threat related to Clearance Activities is serious for moose, as within the scope based on the high degree of habitat loss. Moose has a severity rating of moderate for sensory disturbances for both habitat alteration and for movement as moose is known to change use and behavior around roads. Injury or death related to collisions with vehicles, changes to predator-prey dynamics and increased access are also all moderate severity as they are known to locally affect moose populations. All other severity ratings are slight. Magnitude is rated as low for all threats.

Irreversibility is high for hydrological changes and very high for vegetation removal as the roadbed will likely never be removed and such changes are challenging to reverse in short time, if ever. irreversibility is also high for spills, loss of connectivity, invasive species, increased access and predation because while the effects can technically be reversed it would take time and considerable effort. The rest of the

threats were deemed low and can be easily reversed. The degree of effect was low for all except habitat loss due to clearance activities, which was moderate.

A summary of the threat assessment for moose habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-12**.

Table 12-12: Summary of Threat Assessment for Potential Effects on Moose

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Clearing Activities
Habitat Loss – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Accidental Spills	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Sensory Disturbance	Small	Moderate	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	High	Low
Alteration in Movement – Sensory Disturbance	Small	Moderate	Low	Low	Low
Injury or Death – Collisions with Vehicles	Small	Moderate	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Small	Moderate	Low	High	Low
Injury or Death – Increased Access	Small	Moderate	Low	High	Low
Injury or Death – Introduction of Disease	Small	Slight	Low	Low	Low

12.3.4 Furbearers (American Marten)

12.3.4.1 Habitat Loss

American marten was chosen based on its importance to the indigenous community, ecological importance and its range of habitat use. American marten (marten) habitat loss is described as a reduction in total habitat available for marten within the study areas. There will be marten habitat loss resulting from vegetation clearing, hydrological changes and other disturbance during construction. The pathways which may result in loss or destruction of marten habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Removal of vegetation → Loss of American marten habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Loss of American marten habitat.

Construction

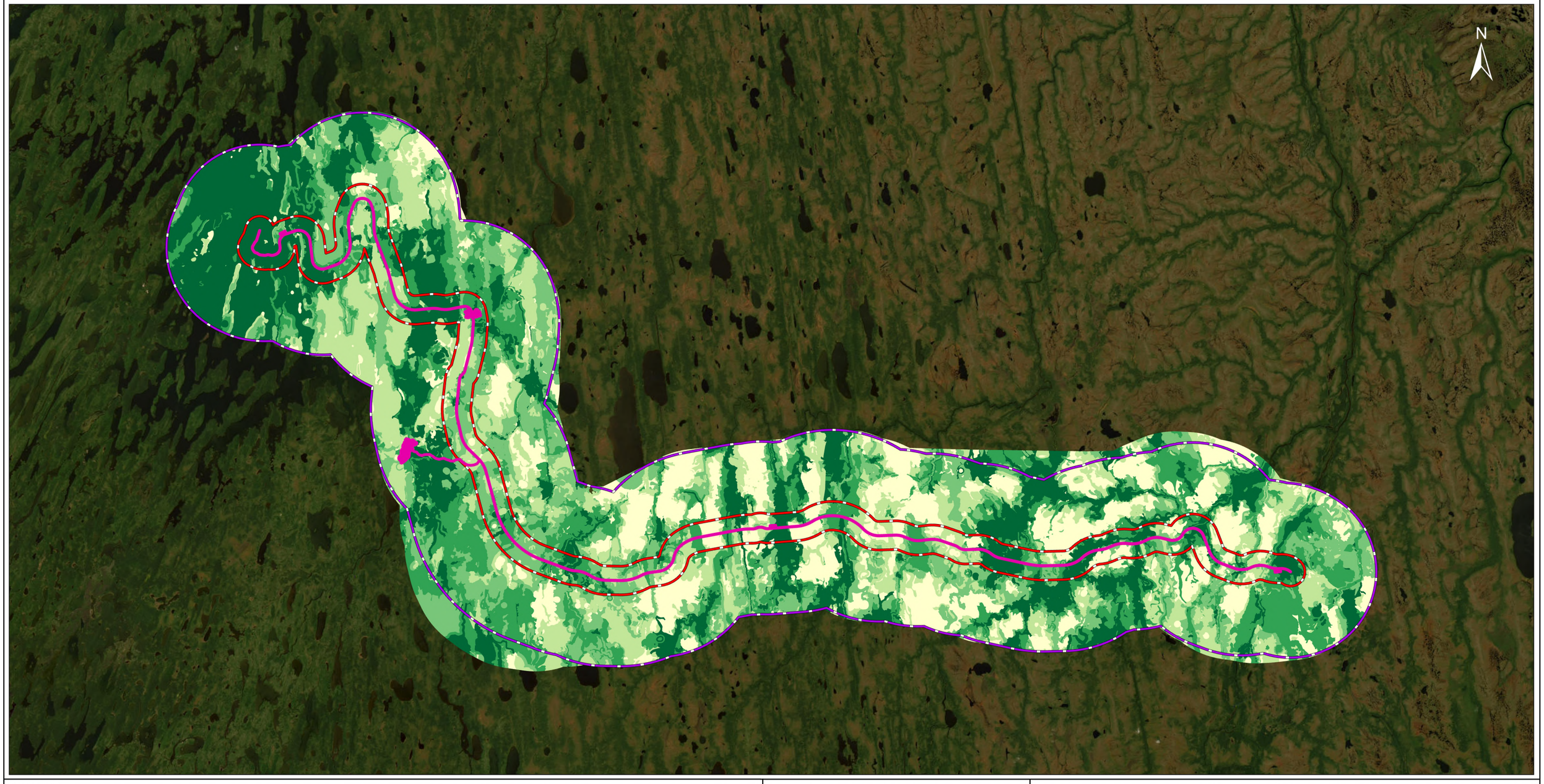
Clearing Activities

Removal of vegetation during site preparation, clearing, quarrying and placement of roadbed materials would reduce the availability of suitable furbearer habitat in the Project Footprint, most areas in the Project Footprint will be permanently removed during the construction phase for the road. Based on an understanding of marten habitat preferences, the results of habitat modelling for Ecological Land Classification (refer to Section 11: Assessment of Effects on Vegetation and Wetlands), were used to estimate removals of preferred habitat during construction. Predicted construction activities will result in the removal of 60.68 ha (1.13%) of Low Treed Bog, 120.42 ha (2.03%) of Conifer Swamp, 81.53 ha (4.3%) of Conifer Forest, and 4.21 ha (3.32%) of Mixedwood Forest in the LSA, representing approximately 2.0% of the most suitable American marten habitat in the LSA. Overall, suitable marten habitat is common throughout the study areas with 48.42% of the LSA and 51.78% of the RSA consisting of these vegetation communities. These estimates are likely an overestimation as age class and height information for forests is limited in the area and marten are less likely to use younger forests and smaller forests (Buskirk and Ruggiero, 1994).

Resource Selection Functions (RSFs) modelling was also done for probability of use for marten using ARU data.
Figure 12.5 show the probability of use for marten within the RSA under existing conditions for marten. When the Project Footprint is overlayed it shows a loss of approximately 1.90% of highest-use habitat in the LSA and a loss of 0.46% of high-use habitat in the RSA due to road construction (**Table 12-13**). Modeled probability of use ranged from 0.0 to 0.834 % with the highest quantile (highest 20%) starting at 0.596.

Table 12-13: Changes to Available Habitat for American Marten by Study Area based on RDF Modeling

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	86.99	4,566.81	1.90	89.65	19,349.09	0.46
Moderate	250.53	12,642.72	1.98	354.06	61,597.98	0.57
Low	106.73	10,443.77	1.02	107.58	53,014.04	0.20



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.027
- 0.027 - 0.038
- 0.038 - 0.052
- 0.052 - 0.079
- 0.079 - 0.872

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

RSF Modeling for American Marten based on Probability of Use Under Existing Conditions

Figure Number:	12-5	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Operations

Clearing Activities

Operation of the roadway is unlikely to result in additional loss of habitat through vegetation removal. Most maintenance activities will be involve managing re-growth of vegetation along the ROW within the Project Footprint and losses are accounted for in the construction phase. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations, but it is predicted that these effects would be short-term and of limited size. These regenerating areas are also poorer habitat in general due to the lack of vertical structure and CWD. While aggregate (sand, gravel) and rock material will be required for road maintenance and repair activities, and vegetation clearing will occur. Progressive rehabilitation will occur within the quarry footprint and activities will only occur within the maximized quarry footprint delineated during the construction phase; however, no additional habitat loss or destruction is anticipated to occur as the footprints will not be expanded during operations.

12.3.4.2 Habitat Alteration or Degradation

There could be alterations to American marten habitat resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of furbearer habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration and degradation of American marten habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration and degradation of American marten habitat.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of American marten habitat.

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect → Alteration and degradation of American marten habitat.

Construction and maintenance activities → Introduction of invasive species → Alteration and degradation of American marten habitat.

Construction

Accidental Spills

Accidental spills and releases that occur during construction phase may result in American marten habitat degradation. Depending on concentrations and material spilled, an accidental spill could cause death of vegetation, lower productivity and alter the vegetation community (Hutchinson and Freedman, 2011; Lednev et al., 2023). While spills in uplands may cause local soil contamination and vegetation degradation these upland areas and associated wildlife species are likely less effected than lowland areas that are often hydrologically connected through subsurface flows (Smerdon et al., 2005).

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020). Changes in wetland drainage patterns, resulting in lower or higher water levels, can alter the plant community (Miller et al. 2015). These changes can be extensive: a study within boreal fens in Alberta found pronounced differences in canopy cover up to 250 m from road edges in both rich and poor treed fens
(Willier et al., 2022). For marten hydrological changes could affect habitat quality either through loss of denning sites or through reduced canopy cover which is an important habitat characteristic (Woolard et al. 2024); however, marten can adapt to a wide range of forest types and some disturbance can benefit marten through the creation of habitat structures like snags and CWD (Chapin et al., 1997). Potential changes in surface water drainage patterns and increases or decreases in flows and surface water levels in waterbodies, as well as changes to groundwater, are described in detail in Section 7 (Assessment of Effects on Surface Water Resources) and Section 8 (Assessment of Effects on Groundwater Resources).

Sensory Disturbances

Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for American marten adjacent to the Project Footprint. Sensory disturbance may be especially high during construction when activities such as blasting, quarrying, hauling and clearing may occur during all hours causing marten to avoid the ROW and supportive infrastructure.

The effects of construction disturbance such as noise and lighting has not been studied on American marten, but industrial disturbance has been shown to impact on a range of mammal guilds (Benitez-Lopez et al., 2010). Movement of construction vehicles may cause sensory disturbance as marten have been shown to reduce use of areas around low traffic roads (Robitaille and Aubry 1990); however, Zielinski et al. (2008) found that low level disturbance by OHV did not alter marten space and time use of their home ranges. Additionally, Jung and Slough (2021) found that marten will use human occupied structures for rest and den sites in the Yukon indicating marten are adaptable to some human disturbance.

Habitat Structural Change

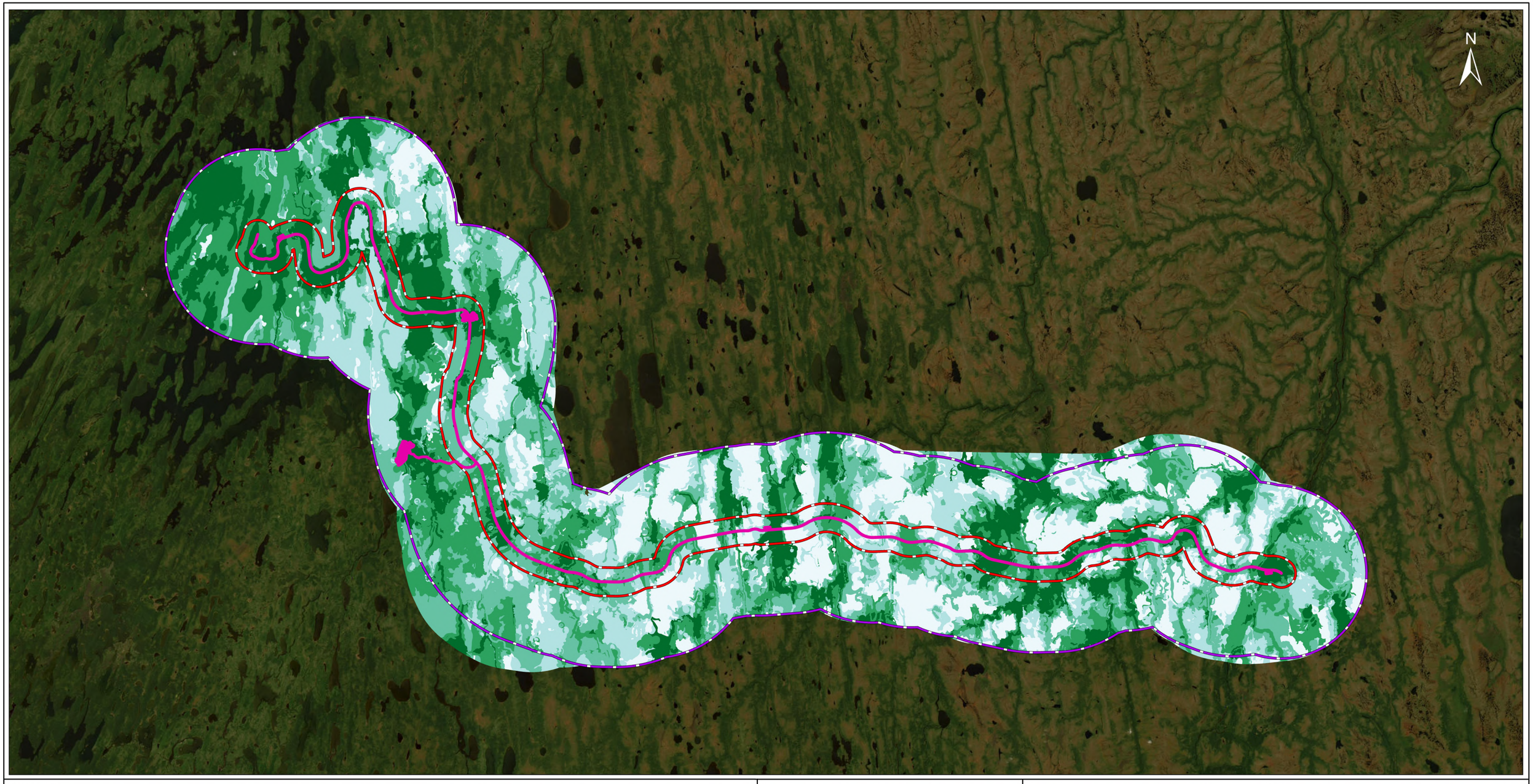
Changes to vegetation structure during road construction activities may alter or degrade American marten habitat near the Project Footprint due to vegetation clearing activities and removals. These vegetation removals may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat after the implementation of mitigation measures. It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation.

For American marten, in terms of habitat degradation, most of the effect is associated with removal of mature upland forests and replacement with early seral communities in these temporary areas and with road ROW. If the proportion of good quality mature forest habitat declines, marten abundance could decline (Lavoie et al., 2019). While the camps, laydowns and access roads are scheduled for restoration, regrowth of forests in the boreal is slow and any subsequent disturbance could take time to recover. American marten are likely to avoid these cleared areas due to a number of factors including low canopy cover and low levels of CWD, which can affect both prey availability and predation risk (Potvin et al. 2000; Potvin and Breton, 1997; Andreuskiw et al., 2008).

Figure 12.6 shows the probability of winter use under future conditions. For marten the RSF modeling based on anticipated habitat change predicts marten utilization of the Project Footprint to increase by 62.6%, use of the LSA to increase 18.1% and use of the RSA to increase 4.2%. Given the use of the disturbance habitat category as the representative for the road ROW in the RSF modeling, the results can be interpreted as marten would use the vegetated areas of the ROW at a higher rate than the existing vegetation communities that were removed. The predictions of higher use for American marten in the Project Footprint are counter intuitive and may be a result of the model using the disturbances category to model projected use of the ROW. The disturbance category includes young forests that some studies have shown to be viable habitat for marten in the winter if there is sufficient structure and prey (Proulx, 2006).

Introduction of Invasive Species

Construction activities have the potential to introduce invasive plant species to the forested habitats used by American marten. One of the pathways of spread for invasive plants is through construction equipment. Improperly cleaned construction equipment has the potential to transport and spread invasive plants, with cleared areas, including roads sides being susceptible to invasion (Hanen and Clevenger, 2005); however, while invasive plants are known to spread along transportation corridors, few invasive species have been found in naturally occurring boreal forest habitats used by American marten and when established often only spread a few meters into the adjacent forest (Langor et al. 2014).



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.028
- 0.028 - 0.040
- 0.040 - 0.057
- 0.057 - 0.091
- 0.091 - 0.878

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

RSF Modeling for American Marten based on Probability of Use Under Future Conditions

Figure Number:	12-6	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Operations

Accidental Spills

Similar to the effects during construction, accidental spills could occur during the operations phase, which may result in American marten habitat degradation. Spills during operations would most likely originate from accidental releases from vehicles. Accidental spills and releases during road operations may occur due to mechanical failure, human error, poor visibility or slippery road conditions. The road is forecasted to have low traffic volumes, and traffic along the roadway will be primarily personal and commercial vehicles and transport trucks associated with the community. While estimate frequency of spills is low (0.00000019 spills per mile, or 0.00000012 spills per kilometer, (Harwood and Russell, 1990), its predicted that minor spills and release are possible but likely limited in effect.

Hydrological Changes

Changes to hydrology could also occur during the operations phase due to culvert and crossing structure maintenance. Localized changes to hydrology could occur if culvert maintenance along the road is ignored, either in terms of repairs to the structure or removal of accumulated debris. The area effected would be dependent on the amount of time the culvert remains blocked as well as the size of the impounded area. Effects are expected to be relatively small in scale and therefore have limited effect on individual American marten given their large home ranges.

Sensory Disturbance

Road operations may affect American marten habitat. During operations, most sensory effects will be related to traffic noise, as road lighting will not be used outside of the community. Marten tend to use areas with roads less than areas without roads (Aylward et al., 2018; Robitaille and Aubry, 1990) and home ranges tend to be larger in areas with higher road density suggesting these areas are lower in quality (Godbout and Ouelett, 2008); however, this avoidance may not be due to noise disturbance as Zielinski et al. (2008) found that American marten tolerate noise disturbance from recreational off-highway vehicle use.

Habitat Structural Change

Habitat structural change during operations will have similar effects on American marten and their habitats. While it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW. These open areas with their low structural complexity and higher predation risk (Tignor et al., 2015) are likely to continue as areas with low use by marten.

Introduction of Invasive Species

The introduction and spread of noxious and invasive plant species could also occur during operations and will have similar potential effects on American Marten habitat as during construction. Transportation corridors are avenues of dispersal for invasive plants (Langor et al. 2014), and given the longer timeframe, operation of the road has the potential to have larger effects than construction in terms of habitat alteration/degradation from introduction of invasive species; however, the spread of invasive

plants along transportation corridors in the boreal forest has been found to be limited beyond the ROW (Langor et al. 2014).

12.3.4.3 Alteration in Movement

There may be alterations in American marten movement stemming from construction activities and operation of the road. The pathways or activities which may result in changes in wildlife movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of American marten.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of American marten.

Construction

Loss of Connectivity

For American marten, the Project Footprint is likely to act as a soft barrier during construction affecting connectivity. American marten has been found to avoid open areas including linear features like road ROWs, and while larger openings may act as a greater barrier, narrow feature can cause avoidance (Robitaille and Aubry 2000;
Tigner et al. 2015). Avoidance of crossing frozen rivers wider than 15 m was found in southeastern Manitoba (Raine, 1983). Avoidance of these areas may be due to risk of predation (Wollard et al., 2024) and while some studies have found that marten can use younger regenerating areas (Poole et al., 2004), these areas generally have structural complexity like CWD, which is often not present in anthropogenically cleared areas. Depending on the area removed within an individual's home range, clearing can cause shifts in their home range or abandonment of the home range (Poole et al., 2004). While vegetation clearing and windrowing, earth grading activities and the use of fencing to demarcate construction areas are likely to create short-term negative physical barriers to movement for some wildlife species, fencing and windrows will likely not be a barrier to marten due to their climbing ability and windrows potential acting as refuge sites from predators.

Sensory Disturbance

Sensory impacts may also lead to America marten actively avoiding and moving out of the area around the Project Footprint. During construction activities such as blasting, clearing, hauling and grading will create disturbances that could cause American marten to move out and avoid the immediate area. Construction noises, which can often be unpredictable, may cause wildlife to flee an area or alter when they use an area (Francis and Barber, 2013). While marten often avoid areas of high human activity, marten will continue to use areas with motorized vehicle activity suggesting noise is not the primary driver for avoidance (Zielinski et al. 2010); however, human voices have been found to reduce locomotor activity in mink (*Mustela lutreola*) suggesting the presence of humans outside of vehicles may alter movement behavior of marten around construction areas due to the voice being perceived as a predator (Ortiz-Jimenez et al., 2022).

Operations

Loss of Connectivity

Similar to the construction phase, alteration in movement due to loss of connectivity may occur during road operation. Maintenance activities will maintain vegetation the openness of the ROW. American martens have been found to avoid areas around roads (Wasserman et al. 2012) while other studies have found they still use the areas around secondary roads but move more quickly through the landscape likely related to road traffic (Robitaille and Aubry 2000). Other studies have found that gene flow in American marten is negatively affected by major roads suggesting they limit the ability of American marten to cross these linear features (Howell et al. 2016).

Sensory Disturbance

Vehicle noise is anticipated be the primary sensory impact on marten during operations. While traffic levels are expected to be low some marten may still alter their movement temporally or to avoid the road altogether; however, marten can continue to use areas with low levels of motorized vehicle activity (Zielinski et al. 2010). Human presence may also alter marten movement if the human activity increase along the roadside (Ortiz-Jimenez et al., 2022), but marten can tolerate humans in some circumstances (Jung and Slough, 2021), which may be related to resource availability (Viau et al., 2024). While lighting along roads may be a sensory disturbance for marten, the WSR will not have lighting except near the community limiting its effect on marten.

12.3.4.4 Injury or Death

The Project may lead to both direct and indirect American marten mortality. There could be increases in wildlife injury or death stemming from increased vehicle traffic during both construction and operation of the road, indirect mortalities arising from increased predator access and mortality due to increased human access. The pathways or activities which may result in American marten injury or death include the following:

Equipment and vehicles moving within Project Footprint → Collisions with American marten within Project Footprint → Injury or Death of American marten.

Construction and operations activities clear vegetation → Incidental encounters with individuals or dens → Injury or Death of American marten.

Construction and operations activities clear vegetation → Increased access for American marten predators → Injury or Death of American marten.

Construction of Road → Increased access to American marten habitat by trappers → Injury or Death of American marten.

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within the Project Footprint could result in increased death and injury of American marten. Vehicles will be travelling between camps and construction locations; these trips could occur at all hours and encounters with marten would not be unexpected. Roads and traffic affect a wide range of species and species groups, with mortality effecting on

populations, demographic structure and connectivity (Coffin et al., 2007; Moore et al., 2023). Travel speed and traffic volume are known to increase collision risk (Gunson et al., 2011), as does the behavior of the animal around the road and how the species reacts to the threat (Jacobsen et al., 2016). While few records of American marten deaths by vehicles exists, small mammal deaths are known to be underreported due to lack of vehicular damage. In a three-year study in US National Park in Michigan, one out of 35 collared marten was killed by a vehicle (Belant et al., 2007).

Incidental Take

Vegetation clearing in American marten habitat during road construction, and/or movement of equipment/vehicles though vegetated areas, may result in marten death or injury if management of vegetation is carried out, especially during the denning season, even after mitigation measures have been applied. Marten use large caliber CWD, tree cavities and red squirrel middens as dens, and marten will use multiple maternal dens throughout the breeding season. These dens are well concealed to avoid predation making them difficult to spot and may be incidentally removed during clearing activities. Occupancy of the dens will from parturition until weening and the recommend protection window federally is from April 1 to June 30 (GOC, 2025).

Changes to Predator-Prey Dynamics

Effects on American marten survival from improved predator access and movement rates is also possible within the Project Footprint during the construction phase. Linear features are known to facilitate predator movement in the boreal (Dickie et al., 2017; Benoit-Pepin et al., 2024). Fishers, lynx, fox and raptors such as Great horned Owls are known predators of marten (COSEWIC, 2007) and may use the ROW and secondary access roads for movement/hunting. Avoidance of roads and other openings by marten has often been tied to avoidance of an increased predation risk, but there are limits on the functional response to avoid these areas and beyond a threshold declines in marten populations may occur (Wollard et al., 2024). The avoidance of roads may also be seasonal in marten and marten may use areas closer to roads when resources are more limiting (Viau et al., 2024) exposing them to higher predation risk.

Increased Access

The development of the Project could result in a negative effect on the abundance of American marten through increased human access to habitats where marten populations are present. The American marten is a heavily trapped furbearer, in Canada it accounts for about 20% of fur sales (Lavoie et al., 2019). American martens are also potentially vulnerable to over trapping due to commercial logging and development in some areas, and this increase in harvest is often associated with better access (Weibe et al. 2012). Opening new areas to human development can often result in increased hunting and trapping (COSEWIC, 2022). Access to previously undisturbed areas introduces opportunity for recreational hunting and/or increased harvesting by Indigenous communities and groups. Distance from a road is a common predictor for presence of a trapline (Wiebe et al., 2012). Construction and other temporary workers may contribute to increased harvest during construction of the Project as these workers may exploit the local area to hunt or trap during their time-off or post-shift.

Operations

Collisions with Vehicles

Vehicles traveling along the road during operations could collide with American marten causing injury or death. During operations, the predicted maximum vehicles travelling on the road is 500 per day, with the majority of travel anticipated to take place during daylight hours. While marten often avoid roads, dispersing juveniles may be more at risk of crossing a road and colliding with a vehicle (COSEWIC, 2022). Lower levels of control along the road during the operations phase may lead to higher numbers of marten collisions due to higher speeds.

Incidental Take

Vegetation clearing in American marten habitat during road operations, and/or movement of equipment/vehicles though vegetated areas is less likely to effect on marten and cause injury or death. Den sites are often located in large logs, large snags, and large, live trees (Ruggio, 1998), which would be removed during clearing activities. In areas that are expected to undergo maintenance clearing these habitat structures would not be present.

Changes to Predator-Prey Dynamics

Effects on American marten from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Maintenance clearing during operations will maintain openness along the ROW which will allow predators increased access to marten habitat exposing marten to increased predation. Clearing of the ROW also exposes marten to increased predation risk in these areas by removing escape cover. Roadkill may attract marten predators and also attract marten which can feed on carcass of large animals like deer (Carlson et al., 2014) potentially exposing marten to greater predation risk.

Increased Access

Access to American marten habitat will continue during operations, potentially leading to increased harvest of marten along the corridor. Linear structures like roads are inherently risky environments to marten as they provide opportunity for trappers to operate easily (Viau et al. 2024). While temporary access roads will be closed and restored these areas may still be exploited by trappers as linear features take a long time to regenerate and repeated use by trappers or other users may maintain their openness. The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase.

12.3.4.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP (International Union for the Conservation of Nature-Conservation Measures Partnership) unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (Natureserve, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. American marten can have large home ranges in ranging from 2-45km^2 in size, based on the potentially large size of the home range they were evaluated at their RSA level.

Scope is small for all threats to marten as the percent of the population affected is less than 10% of the available habitat and population within the RSA.

Marten have threat severity ratings ranging from slight to serious. The threat related to Clearance Activities is serious for marten, as within the scope based on the high degree of habitat loss. Marten has a severity rating of moderate for sensory disturbances for both habitat alteration and for movement as marten is known to change use and behavior around roads. Habitat alteration related to habitat structural change and alteration in movement related to connectivity are also moderate severity as marten are known to reduce use and avoid open and early seral areas. Injury or death related to increased access is also moderate severity as trappers are known to establish traplines based on accessibility. All other severity ratings are slight. Magnitude is rated as low for all threats.

Irreversibility is high for hydrological changes and very high for vegetation removal as the roadbed will likely never be removed and such changes are challenging to reverse in short time, if ever. Irreversibility is also high for spills, loss of connectivity, invasive species, increased access and predation because while the effects can technically be reversed it would take time and considerable effort. The rest of the threats were deemed low and can be easily reversed. The degree of effect was low for all except habitat loss due to clearance activities, which was moderate.

A summary of the threat assessment for American marten habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-14**.

Table 12-14: Summary of Threat Assessment for Potential Effects on American Marten

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Moderate
Habitat Loss – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Accidental Spills	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Sensory Disturbance	Small	Moderate	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Moderate	Low	High	Low
Alteration in Movement – Sensory Disturbance	Small	Moderate	Low	Low	Low
Injury or Death – Collisions with Vehicles	Small	Slight	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Small	Slight	Low	High	Low
Injury or Death – Increased Access	Small	Moderate	Low	High	Low

12.3.5 Furbearer (North American beaver)

12.3.5.1 Habitat Loss

For North American beaver, the principal drivers of North American beaver populations are habitat loss and habitat degradation (Boyle and Owens, 2007). Loss of habitat resulting from the construction and operations phases of the project are largely expected to be limited in geographic extent to the Project Footprint, apart from hydrological changes which may extend to the LSA. The pathways which may result in loss or destruction of marten habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Removal of vegetation → Loss of North American beaver habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Loss of North American beaver habitat.

Construction

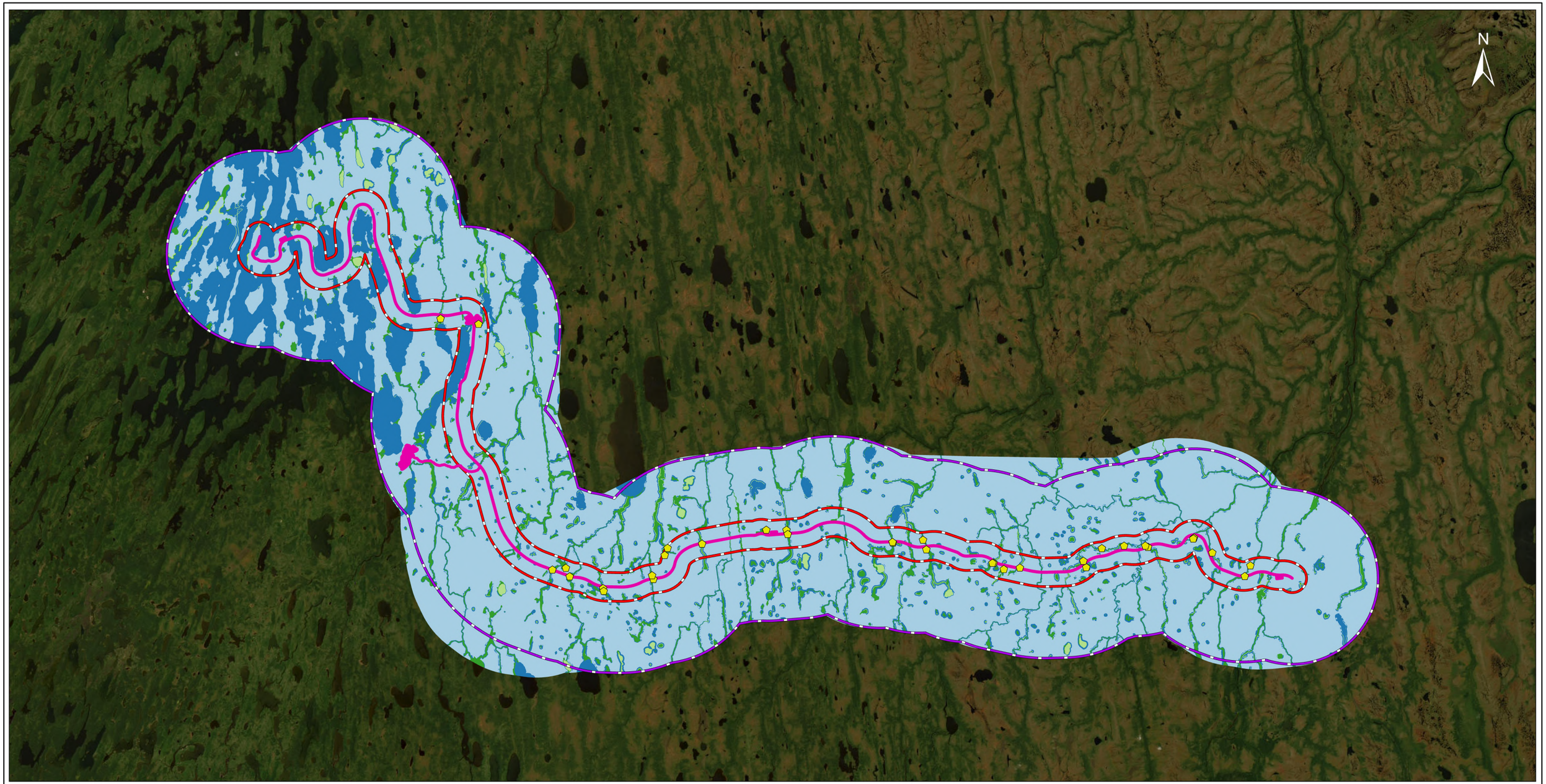
Clearing Activities

Removal of vegetation during site preparation, clearing, quarrying and placement of roadbed materials would reduce the availability of suitable furbearer habitat in the Project Footprint, most areas in the Project Footprint will be permanently removed during the construction phase. Based on an understanding of beaver habitat preferences a habitat suitability model was developed.

For North American beaver there is a predicted net effect of habitat loss after implementation of mitigation measures. Construction activities would result in the direct loss of 7.81 ha of high suitability habitat, 1.67 ha of moderate suitability habitat and 20.4 ha of low suitability habitat in the LSA (See **Figure 12.7**). For the LSA this would represent a loss of 0.57% of high and moderate suitability habitat. Within the RSA a total of 9.78 ha of high and moderate suitability habitat is removed, this represents 0.12% of the high and moderate suitability habitat in the LSA. Overall high and moderate suitability habitat for beaver is avoided by the Project Footprint in the LSA, with only 2.1% of the habitat removed being high and moderate suitability compared to 6.0% in the LSA.

Table 12-15: North American beaver Changes in Habitat Suitability by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	7.81	1,386.22	0.56	8.11	6,796.57	0.12
Moderate	1.67	284.5	0.59	1.67	1,430.92	0.12
Low	20.41	4,036.72	0.51	20.42	22,733.03	0.09
Poor	414.36	21,945.65	1.89	521.09	103,048.23	0.51



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)
- Beaver Locations

Habitat Suitability

- High
- Moderate
- Low
- Poor

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

Habitat Suitability Modeling for North American Beaver under Existing Conditions

Figure Number:	12-7	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

Hydrological Changes

Construction activities have the potential to cause the destruction of North American beaver habitat through changes to groundwater and surface flows. As described in Section 11.2.2 (Results, Assessment of Effects on Vegetation and Wetlands) most of the Project RSA is wetlands, primarily peatlands susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by roads. Changes in surface water conditions can also occur with the installation of crossing structures. Beavers can affect both groundwater and surface water due to their bio-engineering abilities. In areas where drought is occurring, beavers can maintain areas of open water up to 9-fold compared to areas where they are absent (Hood and Bayley, 2007). Beavers can also raise water tables, stabilize water temperature and maintain baseflow in areas that are drying (Dittbrenner et al., 2022), as well as in peatland areas (Karran et al., 2017). The ability to stabilize and maintain hydrology will minimize any habitat loss.

Operations

Clearing Activities

Operation of the Project is unlikely to result in additional loss of habitat through vegetation removal. Most maintenance activities will be involve managing re-growth of vegetation along the ROW within the Project Footprint and losses are accounted for in the construction phase. The loss or destruction of North American beaver habitat will persist past the operations phase of the project as it will be generally difficult to reverse due to the permanent nature of the roadway. Expansion of the quarry and any borrow pits are already accounted for as part of the construction phase, additionally these areas may become additional beaver habitat as inundated borrow pits in the boreal forest can be used extensively by beavers as foraging and overwintering sites (Scrafford et al., 2020)

Hydrological Changes

Beaver habitat loss through changes to hydrology could also potentially occur during the operations phase due to culvert and crossing structure maintenance but is unlikely. Most changes in hydrology during the operations phase will be related to culvert maintenance which in many cases will originate from beaver activity and the attempt of beavers to ameliorate or create beaver habitat which can be described as a positive hydrological change from the viewpoint of the beaver.

12.3.5.2 Habitat Alteration or Degradation

There could be alterations to North American beaver habitat resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of beaver habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration and degradation of North American beaver habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration and degradation of North American beaver habitat.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of North American beaver habitat.

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect → Alteration and degradation of North American beaver habitat.

Construction and maintenance activities → Introduction of invasive species → Alteration and degradation of North American beaver habitat.

Construction

Accidental Spills

Accidental spills and releases that occur during construction phase may result in North American beaver habitat degradation. Direct toxic exposure can lead to lethal consequences for wildlife in aquatic ecosystems (Peterson and Schulte, 2016). As ecosystem engineers influencing water flow and nutrient cycling, beavers can both diminish or exasperate the flow of pollutants in the aquatic environment (Peterson and Schulte, 2016). Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds throughout which pollutants can spread. Depending on concentrations and material spilled, an accidental spill could cause death of vegetation or directly affect beaver health (Hutchinson and Freedman, 2011; Zalewski et al., 2012).

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020). Changes in wetland drainage patterns, resulting in lower or higher water levels, can alter the plant community (Miller et al. 2015) which could locally affect browse availability for North American beavers. As mentioned in the previous section, beavers have the ability to modify their hydrological environment including both groundwater and surface water due to their bio-engineering abilities (Hood and Bayley, 2007; Dittbrenner et al., 2022). While roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020), beavers have the ability to accomplish the same in effects peatland areas (Karran et al., 2017).

Sensory Disturbance

Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for North American beavers adjacent to the Project Footprint. Sensory disturbance may be especially high during construction when activities such as blasting, quarrying, hauling and clearing may occur during all hours causing beaver to avoid the ROW and supportive infrastructure. Beavers show little response to sensory impacts from anthropogenic sources and easily adapt to industrial and urban environments where noise and light are present (Bailey et al., 2019) including the most heavily urban centres (O'Connor, 2007). While beavers do show some avoidance of humans this is primarily done by being primarily active during the crepuscular period which may be affected by construction if activities are conducted at night.

Habitat Structural Change

Changes to vegetation structure during road construction activities may alter or degrade North American beaver habitat near the Project Footprint due to vegetation clearing activities and removals. These vegetation removals may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat after the implementation of mitigation measures. It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road

construction, but most areas will remain free of tall vegetation. Early seral vegetation associated with clearance activities can provide quality habitat for beavers (Landriault et al., 2009) due to the early dominance of deciduous shrubs and trees in many cleared riparian areas. Clear cut logging, which can be considered similar to the clearing activities for the ROW, can often results in higher densities of beaver colonies (Brunelle et al., 1989) due to preferred beaver forage.

Introduction of Invasive Species

Construction activities have the potential to introduce invasive plant species to the wetland habitats used by the North American beaver. One of the pathways of spread for invasive plants is through construction equipment. Improperly cleaned construction equipment has the potential to transport and spread invasive plants, with cleared areas, including roads sides being susceptible to invasion (Hanen and Clevenger, 2005). Beavers through their clearing activities can increase the spread of invasive plants by opening gaps that invasive plants can take advantage of (Velicer and Lesser, 2024). Beavers can make use of invasive plants such as phragmites for construction (Kiviat, 2013); however, while invasive plants are known to spread along transportation corridors, few invasive species have been found in naturally occurring boreal wetland habitats (Langor et al. 2014).

Operations

Accidental Spills

Similar to the effects during the construction phase, there could be effects on North American beaver habitat quality during the operations phase of the Project from accidental spills. Spills during operations would most likely originate from accidental releases from vehicles traveling to and from the community. The fate of any spill will be dependant on the volatility and viscosity of the spilled material and the soil conditions but the majority of expected spills during operations would be petrochemicals. Gasoline and diesel are lighter than water and in peatlands can be restricted in their mobility due to the properties of peatland soils (Gharedaghloo and Price, 2017) The road is forecasted to have low traffic volumes, and traffic along the roadway will be primarily personal and commercial vehicles and transport trucks associated with the community.

Hydrological Changes

Beaver habitat loss through changes to hydrology could also potentially occur during the operations phase due to culvert and crossing structure maintenance but is unlikely. The area affected would be dependent on the amount of time the culvert remains blocked as well as the size of the impounded area. Most changes in hydrology during the operations phase will be related to culvert maintenance which in many cases will originate from beaver activity and the attempt of beavers to ameliorate or create beaver habitat which can be described as a positive hydrological change from the viewpoint of the beaver.

Sensory Disturbance

Road operations may affect North American beaver habitat. During operations, most sensory impacts will be related to traffic noise, as road lighting will not be used outside of the community; however, beavers show little avoidance of roads or noise associate with roads and are not expected to alter their use of an area to avoid roads, in fact the presence of the road or culvert has been found in some studies to have a positive relationship with beaver dam locations (Tremblay et al. 2017).

Habitat Structural Change

Habitat structural change during operations will have similar effects on North American beaver and their habitats. Maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW. The maintenance of early seral woody vegetation adjacent to the road will serve as food source for beavers.

Introduction of Invasive Species

The introduction and spread of noxious and invasive plant species could also occur during operations and will have similar potential effects on North American beaver habitat as during construction. While the spread of invasive plants along transportation corridors in the boreal forest has been found to be limited beyond the ROW (Langor et al. 2014), given the longer timeframe, operation of the road has the potential to have larger effects than construction in terms of habitat alteration/degradation from introduction of invasive species as repeated disturbance can maintain invasive plant populations in the boreal (Seitz et al., 2024).

12.3.5.3 Alteration in Movement

There may be alterations in North American beaver movement stemming from construction activities and operation of the road. The pathways or activities which may result in changes in wildlife movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of North American beaver.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of North American beaver.

Construction

Loss of Connectivity

During construction vegetation clearing, grading activities and the use of fencing to demarcate construction areas are likely to create short-term negative physical barriers to North American beaver movement. For beaver, temporary in water works such as cofferdams for water diversion during construction of bridges and culverts could act as barriers for beaver in watercourses. Open areas such as those cleared for construction can deter beaver movement and use due to the lack of food sources and increased predation risk, although the removed area must be relatively wide at 100 m to completely deter beaver use (Curtis and Jensen, 2004). Beavers may also not cross paths/areas used by humans due to odor (Loeb et al., 2014)

Sensory Disturbance

During construction activities such as blasting, clearing, hauling and grading will create disturbances that could cause North American beaver to move out and avoid the immediate area; However, beavers show little response to sensory impacts from anthropogenic sources and easily adapt to industrial and urban environments where noise and light are present (Bailey et al., 2019). The direct presence of humans may cause beavers to alter their movements (Loeb et al., 2014) but this alteration in movement is only short-term and will stop if humans leave the area.

Operations

Loss of Connectivity

The road ROW can act as a soft barrier during operations affecting connectivity. Beavers tend to forage close to water in order to reduce predation risk. At 35 m wide the ROW will likely have some impact on the number of road crossings, but beavers will still use areas over 50 m from water. Similar to wildlife crossing structures, beavers may also use culverts to cross under the road; however, North American beavers show little avoidance of roads and are not expected to alter their movements to avoid roads. Mumma et al. (2017) found that roads and seismic lines did not impact on the distribution of beavers.

Sensory Disturbance

Road operations may affect North American beaver movement due to sensory disturbance from traffic; however, beavers have not been found to be affected by sensory disturbances like noise and light from vehicle traffic, often establishing dams and lodges near the roadbed (Jensen et al., 2001). Additionally, as nocturnal animals' road traffic would be minimal while beavers are active.

12.3.5.4 Injury or Death

The creation of the road may lead to both direct and indirect North American beaver mortality. There could be increases in wildlife injury or death stemming from increased vehicle traffic during both construction and operation of the road, indirect mortalities arising from increased predator access and mortality due to increased human access. The pathways or activities which may result in beaver injury or death include the following:

Equipment and vehicles moving within Project Footprint → Collisions with North American beaver within Project Footprint → Injury or death of North American beaver.

Construction and operations activities clear vegetation → Incidental encounters with Individuals or dens → Injury or death of North American beaver.

Construction and operations activities clear vegetation → Increased access for American marten Predators → Injury or death of North American beaver.

Construction of Road → Increased access to American marten habitat by trappers → Injury or death of North American beaver.

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within the Project Footprint could result in increased death and injury of North American beaver. Roads and traffic affect a wide range of species and species groups, with mortality affecting populations, demographic structure and connectivity (Coffin et al., 2007; Moore et al., 2023). Vehicles will be travelling between camps and construction locations and encounters with beavers would not be unexpected. North American beaver may cross the road occasionally but will stay in aquatic environments if waterflow is maintained at crossings.

Incidental Take

For North American beaver, lodges and dams could be damaged during temporary in water activities associated with the construction of bridges and culvert at waterbody crossing such as dewatering or flow diversion. Dams and lodges may also need to be removed or damaged as part of clearance activities for construction of the roadbed. Unlike most other animal dwellings, beaver dams and lodges are conspicuous and are unlikely to be damaged accidentally. Beaver dwellings are covered under the Ontario *Fish and Wildlife Conservation Act* that prohibits damaging or destroying the den of a furbearing animal.

Changes to Predator-Prey Dynamics

Effects on North American beaver survival from improved predator access and movement rates is also possible within the Project Footprint during the construction phase. Linear features are known to facilitate predator movement in the boreal (Dickie et al., 2017; Benoit-Pepin et al., 2024). While predators like grey wolves often avoid areas of high human use, which will be true during construction, it is still probable that predators may use the linear features, especially more tolerant species such as bears (*Ursus sp.*), coyotes (*Canis latrans*) and lynx (*Lynx canadensis*), or in periods of low human use. Predators seem to have little impact on North American beaver populations, a study in the southern boreal region found wolves eliminated 40% of North American beavers from the area every year yet had little impact on North American beaver population (Gable, 2021). Similar results were found using data from Minnesota (Johnson-Bice, 2019) and Algonquin Park (Theberge and Therberge, 2004).

Increased Access

The development of the Project could result in a negative effect on the abundance of North American beaver through increased human access to habitats where beaver populations are present. Historically North American beaver have been the most trapped furbearer in North America and human activity continues to be the most important mortality factor for adults through trapping, hunting and nuisance North American beaver control (Wilson and Ruff 1999; Payne, 1984). Opening new areas to human development can often result in increased hunting and trapping (COSEWIC, 2022). Access to previously undisturbed areas introduces opportunity for increased harvesting for recreational purposes and by Indigenous communities and groups. Construction and other temporary workers may contribute to increased harvest during construction of the Project as these workers may exploit the local area to hunt or trap during their time-off or post-shift. During construction beaver-human conflict may occur if beavers attempt to build on or near the roadbed or near crossing locations. While non-lethal trapping and relocation does occur, lethal trapping of beavers still occurs.

Operations

Collisions with Vehicles

Vehicles traveling along the road during operations could collide with North American beaver causing injury or death. During operations, the predicted maximum vehicles travelling on the road is 500 per day, with most travel anticipated to take place during daylight hours. Lower levels of control along the road during the operations phase may lead to higher numbers of beaver collisions due to higher speeds; however, collisions with beavers are relatively rare. A 20-month study in Nova Scotia along two highways recorded one beaver death (Fudge et al., 2007), while a year long study in northern New York state recorded one beaver collision (Barthelmess and Brooks, 2010), this compares to 108 and 50 porcupine collisions (*Erethizon dorsatum*) recorded in the same studies.

Incidental Take

Vegetation clearing in North American beaver during road operations, and/or temporary in water activities are less likely to impact on beaver and cause injury or death. While beavers may use areas adjacent to the ROW, and the ROW and water crossings may be incorporated into beaver related structures removal and damage to these structures is not considered incidental but incorporated into the section describing injury or death due to increased access.

Changes to Predator-Prey Dynamics

Effects on North American beaver from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Maintenance clearing during operations will maintain openness along the ROW which will allow predators increased access to beaver habitat exposing beaver to increased predation. While predation may increase due to improved access, predation has not been shown to influence North American beaver populations, with populations quickly responding to predation.

Increased Access

Access to North American beaver habitat will continue during operations, potentially leading to increased harvest of beaver along the corridor. Linear structures like roads are inherently risky environments to beaver as they provide opportunity for trappers to operate easily (Viau et al. 2024). The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase. The issue of problem beavers is also more likely during the operations phase. Damming may flood roads and interfere with water flow through culverts and stream crossings (Curtis and Jensen, 2004). Damage to anthropogenic structures leads to the need for beaver removal which often involve lethal removal of the beavers (Taylor et al., 2017).

12.3.5.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP (International Union for the Conservation of Nature-Conservation Measures Partnership) unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (Natureserve, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. North American beaver can have large home ranges in ranging from 10-20 ha in size, or 0.5 to 1.0 km of stream length (Touihri et al., 2018). Based on the potentially large size of the home range beaver was evaluated at the RSA level.

Scope is small for all threats to beaver as the percent of the population affected is less than 10% of the available habitat and population within the RSA.

Beaver has threat severity ratings ranging from slight to serious. The threat related to clearance activities is serious for beaver within the scope based on the high degree of habitat loss. Beaver has a severity rating of serious for accidental spills based on its semi-aquatic lifestyle and spills which can spread more easily within aquatic environments. All other severity ratings are slight. Magnitude is rated as low for all threats.

Irreversibility is high for hydrological changes and very high for vegetation removal as the roadbed will likely never be removed and such changes are challenging to reverse in short time, if ever. Irreversibility is also high for spills, loss of connectivity, invasive species, increased access and predation because while the effects can technically be reversed it would take time and considerable effort. The rest of the threats were deemed low and can be easily reversed. The degree of effect was low for all except habitat loss due to clearance activities, which was moderate.

A summary of the threat assessment for beaver habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-16**.

Table 12-16: Summary of Threat Assessment for Potential Effects on North American beaver

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Moderate
Habitat Loss – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Accidental Spills	Small	Serious	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Sensory Disturbance	Small	Slight	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	High	Low
Alteration in Movement – Sensory Disturbance	Small	Slight	Low	Low	Low
Injury or Death – Collisions with Vehicles	Small	Slight	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Small	Slight	Low	High	Low
Injury or Death – Increased Access	Small	Moderate	Low	High	Low

12.3.6 Bats

For the purpose of the effects assessment, bats are treated as one species group as they share many similarities between roosting and foraging habitats and other life history traits, and both background data collection, scientific literature, and field data were not always sufficient to provide individual species accounts. In Northern Ontario, the bat active season, which includes the maternity roosting (breeding) period, is generally understood to occur between May 1 and August 31, after which species will either migrate or move to hibernation sites (hibernacula) (MECP, 2023).

Big Brown Bats are the most commonly encountered bat species in Ontario. Natural roosts for this species include tree cavities, such as woodpecker holes, rot holes, and knot holes, as well as caves, but also take advantage of anthropogenic structures like attics and outbuildings. This species typically migrates short distances from their summer range to overwinter (hibernate) (Thorne, 2017).

Hoary Bats exclusively roost in trees by hanging among the foliage and roosting on the surface of the bark. They migrate south to warmer climates for the winter, departing around October and returning in April (Thorne, 2017).

Silver-haired Bats roost in small colonies in cracks or hollows in tree bark. They move roosts frequently and typically require mature habitats with a high availability of roosts (Thorne, 2017). This species migrates south to warmer climates for the winter, departing by November and returning in April (Thorne, 2017).

12.3.6.1 Bat Habitat Loss

Bat habitat loss, including maternity roosting habitat and foraging habitat, may result from vegetation clearing and disturbance during construction and throughout operations. The pathway or activity which may result in loss or destruction of bat habitat during the construction and operations phases are described below.

Site preparation, vegetation clearing and roadbed construction → Permanent removal of vegetation → Loss of bat maternity roosting habitat and foraging habitat

Construction

Site preparation and construction activities would reduce the availability of suitable bat maternity roosting and foraging habitat in the LSA and Project Footprint, and most areas in the Project Footprint will be permanently removed for the duration of road operations. Quarry creation may result in destruction of bat habitat when roosting and foraging habitat is removed. The results of habitat modelling via Ecological Land Classification (refer to Section 11: Assessment of Effects on Vegetation and Wetlands), and an understanding of the Project Footprint, estimate construction activities will result in the removal of 9.22 ha of high use bat habitat in the LSA, comprised of Mixedwood Swamps (2.45 ha), Open Shore Fen/Thicket Swamp (0.02 ha), Open Shore Shrub Fen (0.83 ha) and River/Open Water (0.92 ha). Mixedwood Swamp is rare in the RSA, typically occurring in very small pockets within a Conifer Swamp mosaic.

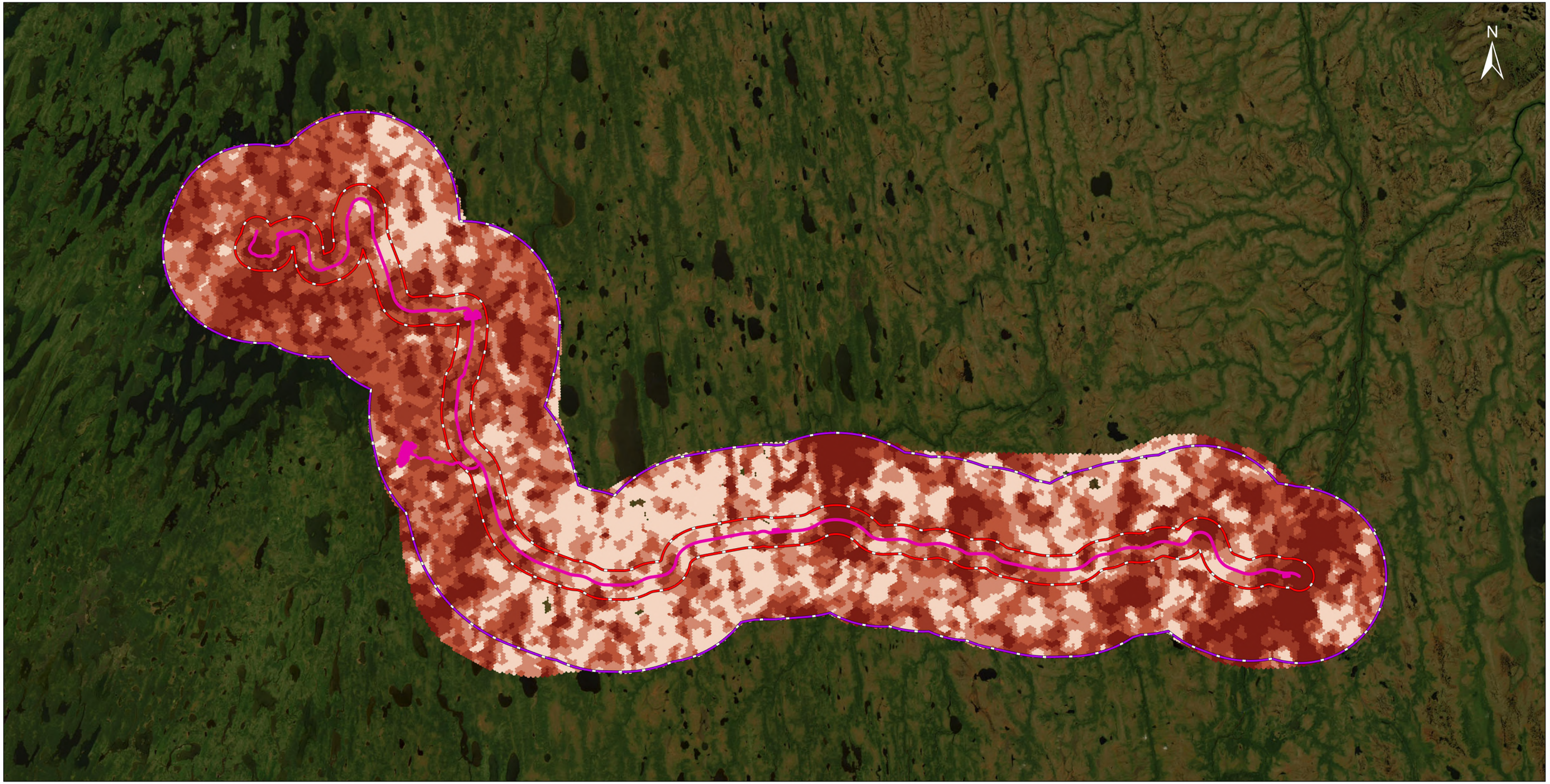
RSF modelling was done for bats as a species group. **Figure 12.8** shows the predicted use of the RSA under existing conditions for bats. The Project Footprint was overlayed, and the underlying habitat removed. For bats, this represents a loss of approximately 1.58% of high-use habitat in the LSA and a loss of 0.34% of high-use habitat in the RSA due to road construction and operations (**Table 12-17**).

Table 12-17: Bat Species High-Use Habitat by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	90.34	5730.77	1.58	90.61	26794.11	0.34
Moderate	225.22	11507.21	1.96	307.72	53592.33	0.57
Low	128.68	10415.33	1.24	152.96	53592.33	0.29

Operations

Road operations are unlikely to result in additional loss of Bat maternity roosting habitat and foraging habitat, as regular maintenance will involve managing re-growth of vegetation along the ROW within the Project Footprint. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations. While the quarries are expected to remain operational following construction, the footprints will not be expanded and as such no additional habitat loss or destruction is anticipated to occur during operations.



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Bat Detection Counts

- 7.983889 - 34.877137
- 34.877138 - 70.419640
- 70.419641 - 126.376754
- 126.376755 - 326.402650
- 326.402651 - 355131.080388

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

RSF Modeling for All Bat Species Based on Counts Under Existing Conditions

Figure Number:	12-8	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/16/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

12.3.6.2 Bat Habitat Alteration or Degradation

Alteration or degradation of bat maternity roosting habitat and foraging habitat may result from vegetation clearing and disturbances during construction and throughout operations. Bat activity, which reflects habitat utilization, was modelled with a Poisson regression, rather than a presence/absence RSF, using the daily average number of detections (i.e., bat activity). Details of the modelling methods are provided in the Existing conditions report. Poisson regression based on anticipated future disturbance effects predicts bat utilization to decrease 30.4% in the Project Footprint, decrease 11.8% in the LSA, and decrease 0.5% in the RSA (**Table 12-18**). **Figure 12.8** shows the predicted use of the RSA under existing conditions for all bats. **Figure 12.9** shows the predicted of use under future conditions. Overall, the change in habitat utilization can be attributed to habitat loss (discussed in the Habitat Loss and Destruction subsection above) and resulting habitat alteration and degradation. The pathways or activities which may result in alteration or degradation of bat habitat are described below.

Construction and operations require vegetation removal, clearing, and maintenance → Changes in moisture levels, sunlight exposure, temperature, and other abiotic and biotic habitat elements in adjacent habitats affecting vegetation height, density, and community composition → Habitat structural changes alter or degrade bat habitat

Construction activities and road operations generate noise, light, and other sensory disturbances → noise and light impair echolocation and changes prey availability → Sensory disturbances alter or degrade bat habitat

Construction of road and vegetation removals change drainage and alter soil moisture regimes → Hydrological changes to ground or surface water → Alteration and degradation of bat wetland and riparian foraging habitat

Table 12-18: Bat Species Group Habitat Use Percent Change by Study Area

Species	% Change by Study Area		
	Project Footprint	LSA	RSA
Bat Species Group	-30.4%	-11.8%	-0.5%

Construction

Habitat Structural Change

Vegetation removals, creation of the ROW and construction of the paved and gravel road surfaces may alter or degrade bat habitat near the Project Footprint, extending into the LSA by generating edge effects that change vegetation height, density, and community composition. The ROW will be 35 m wide with a road surface spanning 12 m composed of gravel (eastern half) and asphalt or chip seal treatment (western half) (refer to Section 4.3.1**:** Project Description, Roadway). Edge effects from construction of the road include abiotic, direct biotic, and indirect biotic effects on the habitat. Silver-haired Bat and Big Brown Bat have been found to have decreased activity near roads, with the effect dependent on temperature, suggesting that the construction of roads can degrade habitat for these species (Kitzes and Merenlender, 2014). In Boreal upland mixed forests, road edge effects on forest plant communities and environmental variables can be measured at the immediate edge, and changes to species composition are also evident (Buss et al., 2024).

Sensory Disturbance

During construction, activities such as blasting at quarries/pits, earth hauling and vegetation clearing, and the use of construction lighting, may reduce the ability of bats to use habitat along the ROW and supportive infrastructure due to sensory disturbances. Noise generated by construction equipment (e.g., generators, pumps, and other motors), if occurring between dusk and dawn during the bat active season, may mask the lower frequency components of echolocation calls (Altringham and Kerth, 2016). Construction lighting may draw insects out of woodland resulting in less prey availability for woodland-adapted bats near habitat edges (Altringham and Kerth, 2016).

Habitat Alteration/Degradation Due to Hydrological Changes

Hydrological changes during road construction from activities such as grading, installation of drainage features, and construction of the roadbed could alter soil moisture regime, and shift or alter bat wetland and riparian foraging habitat. Changes may occur to both surface and groundwater, causing flooding or drying of vegetation communities. As described in Section 11.3.3.3 (Loss or Alteration of Wetland Function), 91.82% of the project RSA is wetlands, primarily peatlands susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by roads. The effects of roads on hydrology and bat habitat can occur up to 250 m from the ROW; the habitat alteration assessment uses the same values as those shown in Section 11.3.3.3, with high effects expected within 20 m, moderate effects within 60 m and minimal effects experienced at 250 m.

Operations

Habitat Structural Change

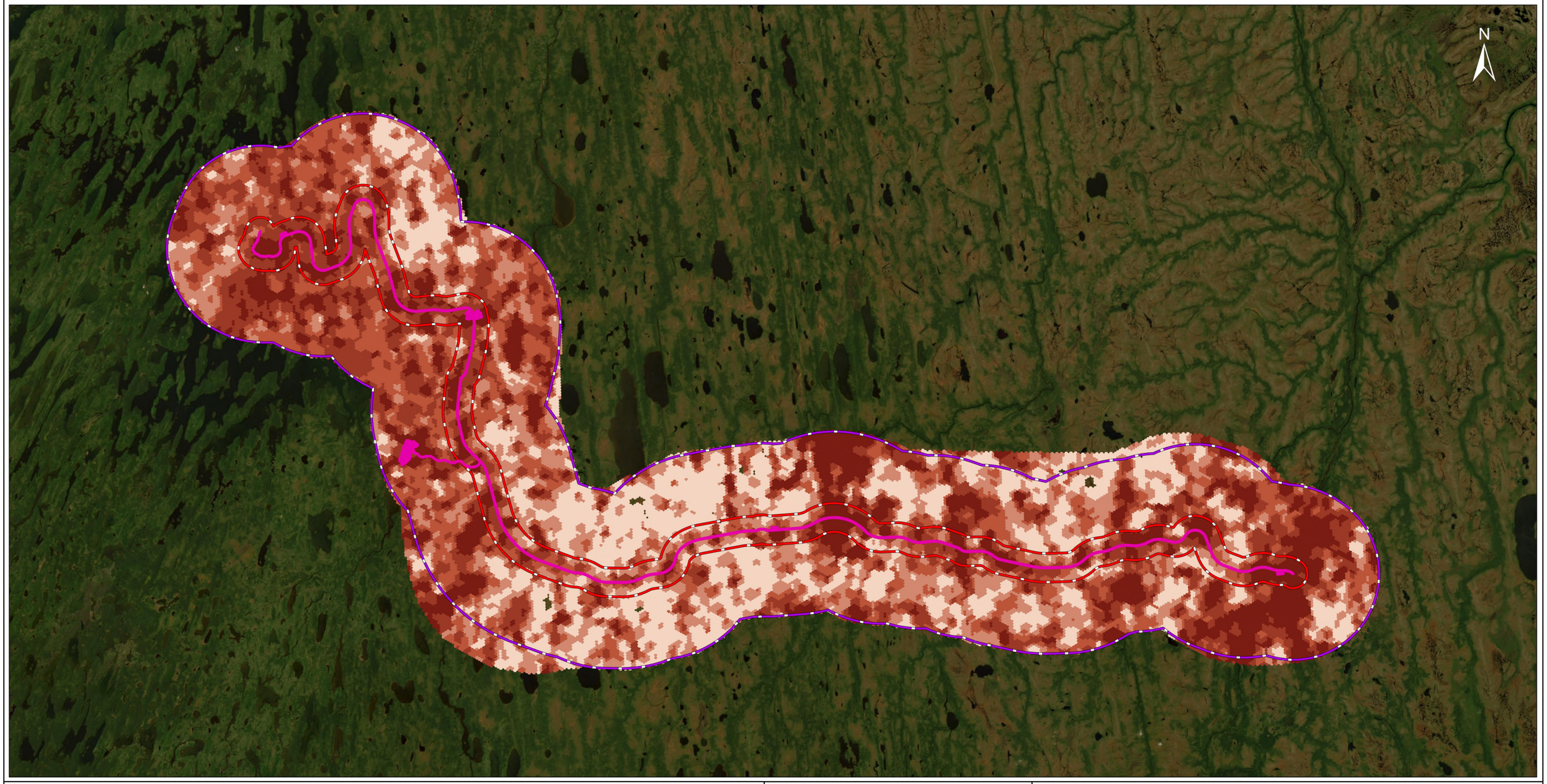
The edge effects on Bat habitat alteration and degradation initiated during the construction phase from vegetation clearing and changes to vegetation community structure is expected to continue during the operations phase. These vegetation changes will be maintained during road operations, but no new edge effects are expected to be generated as a result.

Sensory Disturbance

Noise and light from vehicles travelling on the road during operations may affect habitat along the ROW and supportive infrastructure. Siemers and Schaub (2011) found that traffic noise can decrease the foraging efficiency of bats by approximately 50%, decreasing proportionally with increasing proximity to highway noise.

Hydrological Changes

Operation of the road is not anticipated to result in further changes to hydrology than those initiated during the construction phase. It is possible that changes to hydrology may occur during the operations, such as accumulation of debris affecting culverts and drainage that results in localized flooding and drying of areas.



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Bat Detection Counts

- 7.983889 - 36.815815
- 36.815816 - 75.281131
- 75.281132 - 139.438619
- 139.438620 - 353.200127
- 353.200128 - 355131.080388

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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0 5 10 km

Webequie Supply Road

RSF Modeling for All Bat Species Based on Counts Under Future Conditions

Figure Number: 12-9		REV: PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/16/2025

DSC	DRN	CHK	APP
	TE	GS	GS

12.3.6.3 Alteration in Bat Movement

Alteration in bat movement may result from vegetation clearing and disturbance during construction and throughout operations. The pathways or activities which may result in alteration in bat movement include those described below.

Vegetation removal and clearing during construction fragments vegetated habitats → Bats avoid crossing large gaps during construction and operations → Loss of habitat connectivity alters bat movement

Construction activities and road operations generate noise, light, and other sensory disturbances → Sensory disturbances result in avoidance of area → Sensory disturbances alter bat movement

Construction

Loss of Connectivity

Bat movement is likely to be altered by construction of the road due to the fragmentation of forest habitat. It is acknowledged that forest fragmentation has been found to positively affect the abundance of Eastern Red Bat (*L. borealis*) potentially due to increased access to both foraging and roosting sites (Ethier and Fahrig, 2011); however, this has not been studied in the context of Boreal Forest or roads, nor for all species such as those present in the RSA.

Sensory Disturbance

Bat movement is also likely to be altered by sensory disturbances. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of bats as they avoid the ROW and supportive infrastructure areas. Construction lighting used during the bat active season may result in woodland-adapted bats avoiding these areas, as they have been found to avoid both high-pressure sodium and white LED lights (Stone et al. 2009, 2012; Altringham and Kerth, 2016).

Operations

Loss of Connectivity

Changes in bat movement will occur in the Project Footprint due to vegetation clearing initiated during road construction that results in habitat fragmentation and reduced connectivity. These vegetation changes will be maintained during road operations, but no new habitat fragmentation is expected to be generated as a result.

Sensory Disturbance

Bat movement will be affected by road operations due to sensory disturbances generated from road use. Bats, including Big Brown Bat and Eastern Red Bat, are less likely to fly across a road as traffic noise increases and display anti-predator behaviour in response to vehicles (Bennett and Zurcher, 2013; Zurcher et al., 2010).

12.3.6.4 Bat Injury or Death

The creation of the road may lead to both direct and indirect bat mortality. There could be increases in bat injury or death stemming from increased vehicle traffic during both construction and operation of the road, with indirect mortalities arising from increased energy expenditures and habitat change. The pathways or activities which may result in bat injury or death are described below.

Equipment and vehicles move within Project Footprint → Collisions with bats within Project Footprint → Injury/Death of bats

Construction and operations activities clear vegetation → Incidental encounters with roosting bats → Injury/Death of bats

Construction and operations activities clear vegetation → Increased access for bat predators → Injury/Death of bats

Construction and operations of road changes habitat structure and availability and alters movement of bats → Bats increase energy expenditures to move to and from roosting and foraging habitats → Injury/Death of bats

Construction

Collisions with Vehicles

Bat injury and death may occur during construction due to collisions with construction vehicles and equipment that operate between dusk and dawn during the bat active season.

Incidental Take

Vegetation clearing in bat habitat and nearby quarry activities during road construction may result in injury or death to bats if conducted during the active season. Bats have very small body sizes, ranging from just a few centimeters to 15 cm, and can roost individually in leaf clusters, knot holes, loose bark, and cracks and crevices of trees, making them difficult to detect in their habitats. Bats roost during daylight hours, when work activities such as vegetation clearing and blasting are typically conducted. Vegetation clearing of roosting habitat has the potential to directly harm roosting bats. Explosives will be used at aggregate source areas (i.e., ARA-2 and ARA-4) as part of the extraction/mining of bedrock rock material needed for the construction and operation phases of the Project (refer to Section 4: Project Description). Based on the relatively low volumes of rock needed for the Project (5,500 m^3) the blasting of rock using explosives during construction and operation activities is expected to occur on an infrequent basis. Blasting has the potential to cause injury or death to bats from uncontrolled projectiles if conducted in or adjacent to bat roosting habitat.

Changes to Predator-Prey Dynamics

Effects on bat survival from improved predator access and movement rates created during construction is possible. Owls are recognized as predators of bats, including Great Horned Owl (*Bubo virginianus*) and Barred Owl (*Strix varia*); however, geographic variation of prey species in diet exists; therefore, it is unknown to what extent owls may prey on bats in the RSA. According to a meta-analysis conducted by Bishop & Brogan (2013), owls comprise the second-largest number of road-killed birds after passerines in North America, which may serve as an indication that they are not deterred from roads and may be attracted to them.

Increased Energy Expenditures

The cumulative effects of habitat loss, alteration and degradation, and alteration of movements on bats during construction will likely lead to increased efforts to travel between roosting and foraging habitats and also to successfully forage for food in habitats near the Project Footprint. Bats are known to experience oxidative damage while migrating (Constantini et al., 2019), which may be experienced to a lesser degree during the active season if nightly travel distances between habitats increases.

Operations

Collisions with Vehicles

During operations, the predicted maximum vehicles travelling on the road is 500 per day, with the majority of travel anticipated to take place during daylight hours. Mortality during the operational phase is expected to occur throughout the bat active season where flyways cross the road, such as near watercourses and upland forest habitat, in the event that vehicles travel between dusk and dawn. In one study along a 4 km stretch of highway that bisected bat travel routes between roosts and foraging areas, it was estimated that annual highway mortality could approach 5% of the roost colony (Russel et al. 2009).

Incidental Take

Vegetation trimming in bat habitat during road operation may result in injury or death to bats if conducted during the active season. Bats have very small body sizes, ranging from just a few centimeters to 15 cm, and can roost individually in leaf clusters, knot holes, loose bark, and cracks and crevices of trees, making them difficult to detect during vegetation management.

Changes to Predator-Prey Dynamics

Operation of the road may provide resources that attract predators (Hill et al., 2020), such as increased rodent populations attracting raptors. Use of the ROW during road operations by raptors can alter encounter rates with bats and lead to increased predation, directly affecting bat injury and mortality.

Increased Energy Expenditures

Bats may experience increased energy expenditures during road operations as a result of other effects such as alteration in movement due to road avoidance, improved predator access, and sensory disturbances generated by road operations.

12.3.6.5 Summary of Bats Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (NatureServe, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. Big Brown Bat has been found to travel between 0.3 and 4.4 km between day roosts and foraging areas (Brigham, 1991), which is similar to Silver-haired Bat which may switch roosts between 0.1 and 3.4 km apart (Campbell et al., 1996). Hoary Bat, on the other hand, may have very restricted home ranges of 0.5 ha or less, sometimes using the same roost for several weeks at a time (Veilleux et al., 2009; Klug et al. 2012; Willis and Brigham, 2005). Due to the relatively small ranges maintained during the

roosting period, these species were evaluated at the LSA level. These species were evaluated together as they also share many similarities in life processes and habitat requirements.

Scope is small for all threats to bats as the percent of the population effected is less than 10% of the available habitat and population within the LSA. Threat severity ratings for these species range from slight to serious. One threat related to hydrological change resulting in habitat alteration or degradation is serious because bats rely on aquatic habitats to produce much of their aerial insect prey. Clearance activities, habitat structural change, and sensory disturbances are rated as moderate, while loss of connectivity, collisions with vehicles, incidental take, changes to predator-prey dynamics, and increased energy expenditure are assessed has having slight severity. Magnitude is rated as low for all threats. Irreversibility is very high for clearance activities and high for hydrological changes as the roadbed will likely never be removed and such changes are challenging to reverse in short time, if ever. Irreversibility is also high for habitat structural change, loss of connectivity, and changes to predator-prey dynamics, as the effects can technically be reversed but would take time and considerable effort. The rest of the threats are deemed medium or low and can be more easily reversed. The degree of effect is low for all except habitat loss and destruction due to vegetation removal, which is moderate.

A summary of the threat assessment for bat habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-19**.

Table 12-19: Summary of Threat Assessment for Potential Effects on Bats

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss/Destruction – Clearance Activities	Small	Moderate	Low	Very High	Medium
Habitat Alteration/Degradation – Habitat Structural Change	Small	Moderate	Low	High	Low
Habitat Alteration/Degradation – Sensory Disturbances	Small	Moderate	Low	Low	Low
Habitat Alteration/Degradation – Hydrological Changes	Small	Serious	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	High	Low
Alteration in Movement – Sensory Disturbances	Small	Moderate	Low	Low	Low
Injury/Death – Collisions with Vehicles	Small	Slight	Low	Medium	Low
Injury/Death – Incidental Take	Small	Slight	Low	Medium	Low
Injury/Death – Changes to Predator-Prey Dynamics	Small	Slight	Low	High	Low
Injury/Death – Increased Energy Expenditure	Small	Slight	Low	Medium	Low

12.3.7 Forest Songbirds (Orange-crowned Warbler, Tennessee Warbler)

While each forest songbird species occupies its own ecological niche within the LSA and RSA, potential effect pathways will be similar in the context of proposed project activities for Orange-crowned Warbler and Tennessee Warbler, which are both part of the forest bird guild (i.e., “Forest Songbirds”).

12.3.7.1 Habitat Loss

Migratory Forest Songbird habitat loss, including breeding habitat and foraging habitat, may result from vegetation clearing and disturbance during construction and throughout operations. The pathway or activity which may result in loss or destruction of bird habitat during the construction and operations phases are described below.

Site preparation, vegetation clearing and roadbed construction → Permanent removal of vegetation → Loss/destruction of Migratory Forest Songbird breeding habitat and foraging habitat

Construction

Clearing Activities

Site preparation and construction activities would reduce the availability of suitable Migratory Forest Songbird breeding and foraging habitat in the LSA and Project Footprint, and most areas in the Project Footprint will be permanently removed for the duration of road operations. Quarry creation may result in destruction of Migratory Forest Songbird breeding habitat. The results of habitat modelling via Ecological Land Classification (refer to Section 11: Assessment of Effects on Vegetation and Wetlands), and an understanding of the Project Footprint, estimate construction activities will result in the removal of 81.15 ha (4.3%) of Conifer Forest, 4.21 ha (3.32%) of Mixed Forest and 1.60 ha (3.13%) of hardwood Forest in the LSA, representing approximately 4.21% of available forest songbird habitat in the LSA. Overall, suitable forest songbird habitat is uncommon throughout the study areas with 7.58% of the LSA and 7.66% of the RSA consisting of these vegetation communities.

RSF modelling was done for probability of use by both the Tennessee Warbler and Orange-crowned Warbler using ARU data. **Figure 12.10** and **Figure 12.11** show the predicted use in the RSA under existing conditions for Tennessee Warbler and Orange-crowned Warbler, respectively. To calculate habitat loss the Project Footprint was overlayed to the underlying habitat removed.

For Tennessee Warbler, it shows a loss of approximately 2.32% of highest-use habitat in the LSA and a loss of 0.82% of high-use habitat in the RSA due to road construction (**Table 12-20**). Modeled probability of use ranged from 0.0 to 0.781 with the highest quantile (highest 20%) starting at 0.101.

Table 12-20: Changes to Available Habitat for Tennessee Warbler by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	130.03	5,614.7	2.32	233.56	28,506.62	0.82
Moderate	150.2	9,543.94	1.57	153.25	51,263.79	0.30
Low	164.01	12,494.66	1.31	164.47	54,190.7	0.30

For Orange-crowned Warbler, it shows a loss of approximately 2.47% of highest-use habitat in the LSA and a loss of 0.63% of high-use habitat in the RSA due to road construction (**Table 12-21**). Modeled probability of use ranged from 0.0 to 0.811 with the highest quantile (highest 20%) starting at 0.149.

Table 12-21: Changes to Available Habitat for Orange Crowned Warbler by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	154.52	6,244	2.47	157.35	25,009.67	0.63
Moderate	179.99	11,457.95	1.57	284.31	65,030.29	0.44
Low	109.63	9,951.36	1.10	109.63	43,921.15	0.25

Operations

Clearing Activities

Road operations are unlikely to result in additional loss of Migratory Forest Songbird breeding habitat and foraging habitat, as regular maintenance will involve managing re-growth of vegetation along the ROW within the Project Footprint. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations. While the quarries are expected to remain operational following construction, the footprints will not be expanded and as such no additional habitat loss or destruction is anticipated to occur during operations.

N

Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.029
- 0.029 - 0.036
- 0.036 - 0.048
- 0.048 - 0.081
- 0.081 - 0.760

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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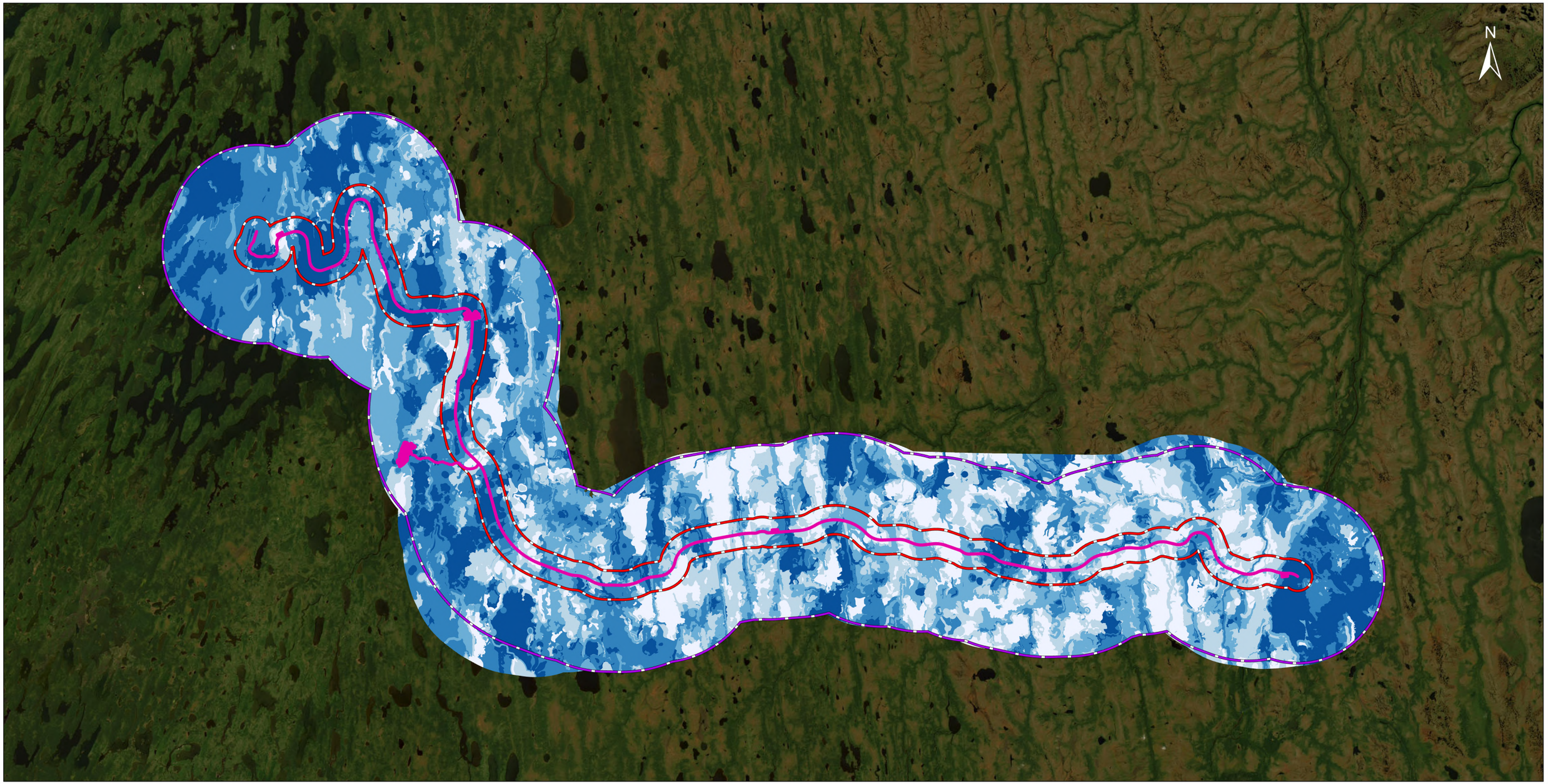
0 5 10 km

Webequie Supply Road

RSF Modeling Based on Probability of Use for Tennessee Warbler Under Existing Conditions

Figure Number:	12-10	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025	

DSC	DRN	CHK	APP
	TE	GS	GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.041
- 0.041 - 0.062
- 0.062 - 0.091
- 0.091 - 0.153
- 0.153 - 0.794

WSR WEBEQUIE SUPPLY ROAD

NOTES

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0 5 10 km

Webequie Supply Road

RSF Modeling for Orange-crowned Warbler based on Probability of Use Under Existing Conditions

Figure Number:	12-11	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

12.3.7.2 Habitat Alteration or Degradation

Migratory Forest Songbird habitat alteration or degradation may result from vegetation clearing and sensory disturbance during construction and throughout operations.

The pathways or activities which may result in alteration or degradation of Migratory Forest Songbird Habitat are described below:

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect and increased early seral vegetation → Alteration and degradation of Forest Songbird habitat

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of Forest Songbird habitat

Construction activities and road operations generate barrier effects and collisions with insects increase → Insect abundance and diversity declines → Alteration and degradation of Forest Songbird foraging habitat

Construction

Habitat Structural Change

Vegetation removals, creation of the ROW and construction of the paved and gravel road surfaces may alter or degrade Migratory Forest Songbird habitat near the Project Footprint, extending into the LSA by generating edge effects that change vegetation height, density, and community composition. The ROW will be 35 m wide with a road surface spanning 12 m composed of gravel (eastern half) and asphalt or chip seal treatment (western half) (refer to Section 4.3.1 (Project Description – Roadway). Edge effects from construction of the road include abiotic, direct biotic, and indirect biotic effects on the habitat. Forest interior neotropical migrant birds have been found to decrease in relative abundance in the presence of a 16-m wide paved road corridor (Rich et al., 1994), and even unpaved road corridors 8-10 m in width affect the distribution of forest songbirds, resulting in reduced relative abundance (Ortega and Capen, 2002), which may be attributed to alteration or degradation of habitat.

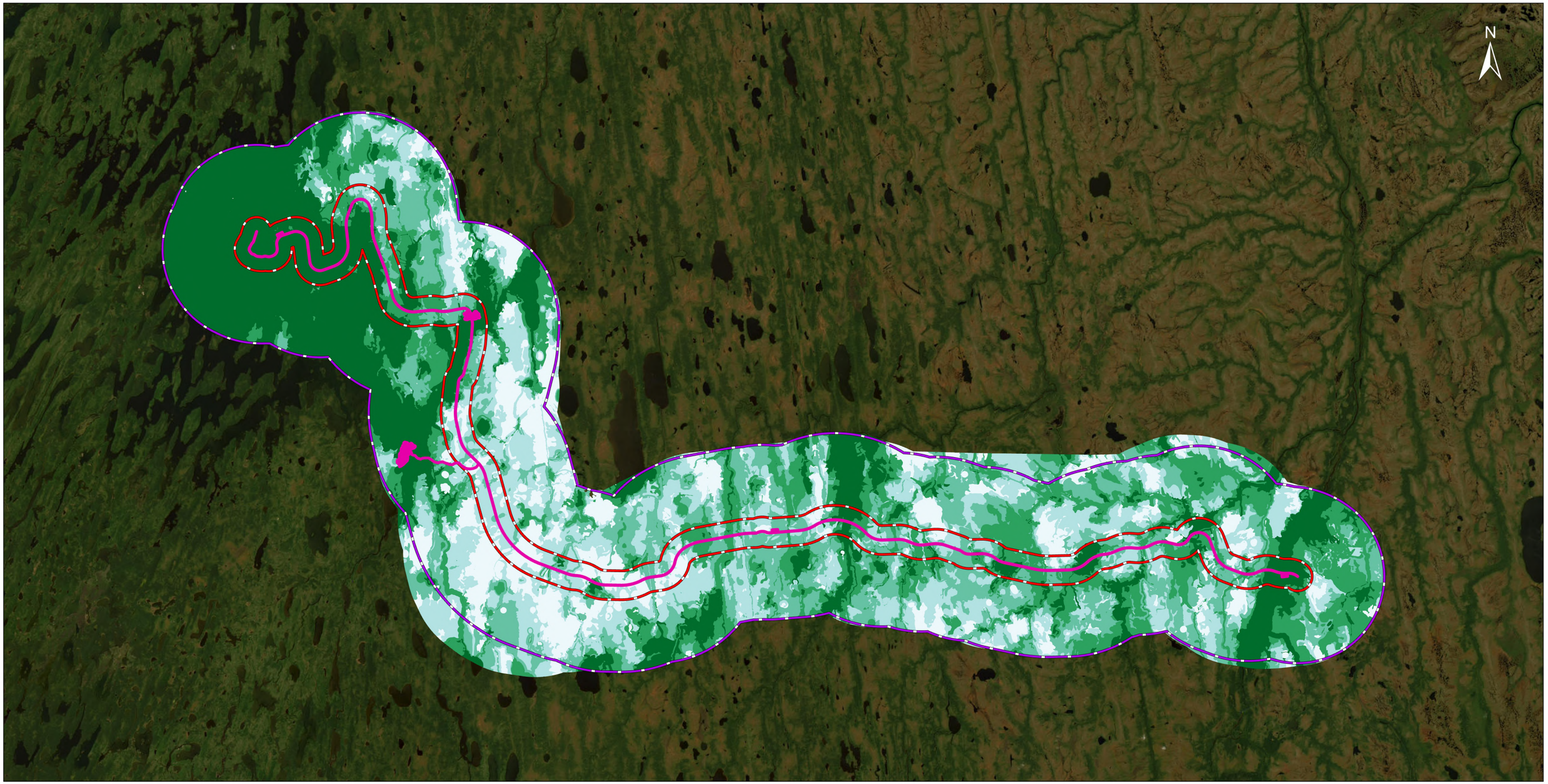
The alteration of certain areas into early successional habitat, such as construction of temporary camps, access roads and laydown areas undergoing restoration, and within the ROW during the operations phase, may create high quality habitat for some migratory forest songbird species. Hagan et al. (1997) found that early successional species will increase in managed forest landscapes; similarly, Drapeau et al. (2000) found that the abundance of bird species that occupy early successional habitats found in current and historic industrial forest landscapes is higher than in intact forest dominated by natural disturbances. Successional habitats resulting from natural regeneration or restoration of disturbed areas in conjunction with larger, natural landscapes have also been recognized as important for post-fledgling birds (Saracco et al., 2022).

RSF modeling based on future disturbance was used to predict change in use from clearing the ROW and changing existing habitat features into early seral communities (see **Section 12.2.1.1** for details). For Tennessee Warbler, the project is predicted to result in a 7.8% increase of use within the Project Footprint (**Table 12-22**). The use of the LSA is predicted to increase while use of the RSA is expected to decrease, both small non-significant amounts. **Figure 12.12** shows the probability of use for Tennessee Warbler within the RSA under future disturbance conditions.

For Orange-crowned Warbler, the Project is predicted to result in a 24.7% decrease of use within the Project Footprint. The use of the LSA is predicted to decrease 11.4% while use of the RSA is also expected to have a small non-significant decrease in use. **Figure 12.13** shows the probability of use for Orange-crowned Warbler within the RSA under future disturbance conditions

Table 12-22: Migratory Forest Songbird Species Probability of Habitat Use Percent Change by Study Area

Species	% Change		
	Project Footprint	LSA	RSA
Tennessee Warbler	7.8%	0.4%	-0.2%
Orange-crowned Warbler	-24.7%	-11.4%	-2.6%



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.029
- 0.029 - 0.036
- 0.036 - 0.048
- 0.048 - 0.080
- 0.080 - 0.760

WSR WEBEQUIE SUPPLY ROAD

NOTES

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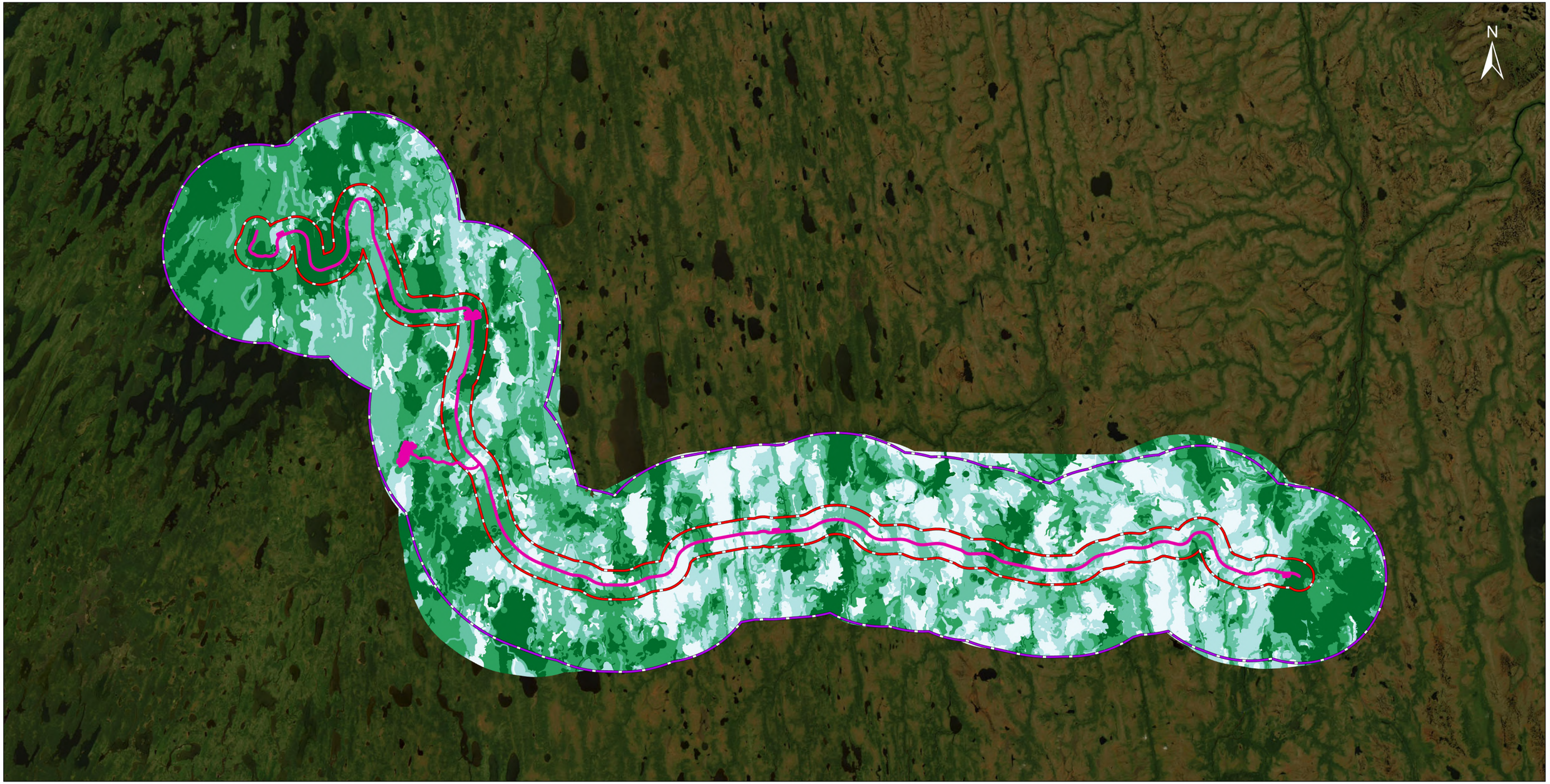
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Webequie Supply Road

RSF Modeling Based on Probability of Use for Tennessee Warbler Under Future Conditions

Figure Number:	12-12	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	

DSC	DRN	CHK	APP
	TE	GS	GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.039
- 0.039 - 0.060
- 0.060 - 0.087
- 0.087 - 0.144
- 0.144 - 0.708

WSR WEBEQUIE SUPPLY ROAD

NOTES

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0 5 10 km

Webequie Supply Road

RSF Modeling for Orange-crowned Warbler based on Probability of Use Under Future Conditions

Figure Number:	12-13	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Sensory Disturbance

During construction, activities such as blasting at quarries/pits, earth hauling and vegetation clearing, and the use of construction lighting, may reduce the ability of Migratory Forest Songbirds to use habitat along the ROW and supportive infrastructure due to sensory disturbances. Noise generated by construction equipment (e.g., generators, pumps, and other motors), if occurring during the migratory forest songbird active season (April 1 through September 30), may degrade foraging habitat via reduced foraging efficiency (Ware et al. 2015).

Decreased Insect Availability

Construction of the road may degrade foraging habitat for migratory forest songbirds via reduced insect availability as roads are known to negatively affect the abundance and diversity of insects due to collision mortalities and barrier effects (Muñoz et al. 2015).

Operations

Habitat Structural Change

The edge effects on Migratory Forest Songbird habitat alteration and degradation initiated during the construction phase from vegetation clearing and changes to vegetation community structure is expected to continue during the operations phase. These vegetation changes will be maintained during road operations, but no new edge effects are expected to be generated as a result.

The early successional habitat created during the construction phase from vegetation clearing and regeneration is also expected to continue during the operations phase. These vegetation changes will be maintained during road operations, but no new effects are expected to be generated as a result.

Sensory Disturbance

Noisy vehicles travelling on the road during operations may affect habitat along the ROW and supportive infrastructure, if occurring during the migratory forest songbird active season (April 1 through September 30), may degrade foraging habitat via reduced foraging efficiency (Ware et al. 2015). Acoustic modeling places the 50db zone of influence at approximately 125 m beyond the Project Footprint (See Appendix J), and 50 dB is the noise level Environment and Climate Change Canada uses in their guidelines to avoid harm to migratory birds (EEEC, 2023).

Decreased Insect Availability

Operation of the road may degrade foraging habitat for migratory forest songbirds via reduced insect availability as roads are known to negatively affect the abundance and diversity of insects due to road mortality and barrier effects (Muñoz et al. 2015).

12.3.7.3 Alterations in Movement

Alteration in Migratory Forest Songbird movement may result from vegetation clearing and disturbance during construction and throughout operations. The pathways or activities which may result in alteration in Migratory Forest Songbird movement include those described below.

Vegetation removal and clearing during construction fragments vegetated habitats → Forest Songbirds avoid crossing large gaps during construction and operations → Loss of habitat connectivity alters Forest Songbird movement

Construction activities and road operations generate noise, light, and other sensory disturbances → Sensory disturbances result in avoidance of area → Sensory disturbances alter Forest Songbird movement

Construction

Loss of Connectivity

Migratory Forest Songbird movement is likely to be altered by construction of the road due to the fragmentation of forest habitat. Forest songbird species considered to be habitat generalists, such as White-throated Sparrow and Dark-eyed Junco may be less affected, but forest gaps 25-40 m wide have been demonstrated to reduce the probability of forest bird species of crossing in response to territorial intruders including Swainson's Thrush, Golden-crowned Kinglet and Black-throated Green Warbler (Rail et al., 1997). Gaps in the Boreal Forest affect forest songbirds variably, impeding movement of some species, such as Yellow-rumped Warbler, while facilitating the movement of others, such as Red-breasted Nuthatch, which may be more disturbance tolerant (Bélisle and St. Clair, 2001).

Sensory Disturbance

Migratory Forest Songbird movement is also likely to be altered by sensory disturbances. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading may create disturbances that could alter movement of Migratory Forest Songbirds as they avoid the ROW and supportive infrastructure areas. For example, traffic noise playback has been found to reduce abundance of forest songbirds (McClure et al., 2013) which may indicate they avoid areas with anthropogenic disturbances.

Operations

Loss of Connectivity

Changes in Migratory Forest Songbird movement may occur in the Project Footprint due to vegetation clearing initiated during road construction that results in habitat fragmentation and reduced connectivity. These vegetation changes will be maintained during road operations, but no new habitat fragmentation is expected to be generated as a result.

Sensory Disturbance

Migratory Forest Songbird movement may be affected by road operations due to sensory disturbances generated from road use. Some migratory boreal forest songbird species have been found to be attracted to traffic noise playback (7 to 40 vehicles per minute) during the breeding season over spatial scales of 20 to 40 m (Hennigar et al. 2019), while traffic noise playback (12 vehicles per minute) during the migratory period has been found to significantly reduce abundance of forest songbirds (McClure et al. 2013).

12.3.7.4 Injury or Death

The creation of the road may lead to both direct and indirect Migratory Forest Songbird mortality. There could be increases in injury or death stemming from increased vehicle traffic during both construction and operation of the road, with indirect mortalities arising from increased energy expenditures and habitat change. The pathways or activities which may result in Migratory Forest Songbird injury or death are described below.

Equipment and vehicles move within Project Footprint → Collisions with Migratory Forest Songbirds within Project Footprint → Injury/Death of Migratory Forest Songbirds

Construction and operations activities clear vegetation → Incidental encounters with Migratory Forest Songbird nests → Injury/Death of Migratory Forest Songbirds

Construction and operations activities clear vegetation → Increased access for Migratory Forest Songbird predators → Injury/Death of Migratory Forest Songbirds

Construction

Collisions with Vehicles

Migratory Forest Songbird injury and death may occur during construction due to collisions with construction vehicles and equipment that operate during the bird active season. Collisions between birds and vehicles are common in Canada, with passerines accounting for 65.1% of mortalities (Bishop and Brogan, 2013).

Incidental Take

Vegetation clearing in Migratory Forest Songbird habitat and nearby quarry activities during road construction may result in injury or death to birds, hatchlings, and/or eggs, if conducted during the active season. Vegetation clearing of breeding habitat has the potential to directly harm nests with eggs or hatchlings. Tennessee Warblers typically build small (8 cm diameter) nests on the ground in *Sphagnum* moss hummocks or at the base of small trees (Rimmer and McFarland, 2020), while Orange-crowned Warblers build similarly sized nests on or near the ground in small crevices or depressions on shady slopes, sheltered by overhanging vegetation, or in shrubby bushes, ferns, or trees (Gilbert et al. 2020). The characteristics of migratory forest songbird nests can make them difficult to detect. Additionally, explosives will be used at aggregate source areas (i.e., ARA-2 and ARA-4) as part of the extraction/mining of bedrock rock material needed for the construction and operation phases of the Project (refer to Section 4: Project Description). Based on the relatively low volumes of rock needed for the Project (5,500 m^3) the blasting of rock using explosives during construction and operation activities is expected to occur on an infrequent basis. Blasting has the potential to cause injury or death to Migratory Forest Songbirds from uncontrolled projectiles if conducted in or adjacent to breeding habitat.

Changes to Predator-Prey Dynamics

Effects on Migratory Forest Songbird survival from improved predator access and movement rates created during construction is possible. Possible nest predators of Tennessee Warblers include Canada Jay, Red Squirrel (*Tamiasciurus hudsonicus*), American Marten, weasels (*Mustela* sp.), Striped Skunk (*Mephitis mephitis*) and Garter Snake (*Thamnophis sirtalis*) (Rimmer and McFarland, 2020). Canada Jay (*Perisoreus canadensis*) is well documented as a major nest predator in boreal forest, commonly taking eggs and nestlings from both ground and tree nesting songbirds (Strickland and Oullet, 2020). Ibarzabal and Desrochers (2004) found that during the egg and nestling period of most songbirds, Canada Jays

were closely associated with forest edges, and they spent more time searching along forest edges than the interior. Sharp-shinned Hawks, known to prey on Orange-crowned Warblers (Gilbert et al. 2020), will hunt from forest edges (Bildstein et al., 2020).

Operations

Collisions with Vehicles

During operations, the predicted maximum vehicles travelling on the road is 500 per day, with the majority of travel anticipated to take place during daylight hours. Mortality during the operational phase is expected to occur throughout the bird active season, particularly near breeding and foraging habitat. Collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). In coniferous-dominated Canadian landscapes with low-volume roads, it has been estimated that more than 14,000 birds are killed annually due to collisions with vehicles, or approximately one bird every 3 km per year (Bishop and Brogan, 2013). Passerines by far comprise the largest order of avian casualties attributed to collisions with vehicles in Canada, at 65.1% of mortalities (Bishop and Brogan, 2013). Woodland birds that forage on the bark and in foliage of trees and shrubs have been found to be most vulnerable to road mortality (Santos et al., 2016).

Incidental Take

Vegetation trimming in Migratory Forest Songbird habitat during road operation may result in injury or death to birds, hatchlings, and/or eggs if conducted during the active season. The characteristics of migratory forest songbird nests can make them difficult to detect during vegetation management.

Changes to Predator-Prey Dynamics

Operation of the road may provide resources that attract predators (Hill et al., 2020), such as increased rodent populations attracting raptors. Use of the ROW during road operations by raptors can alter encounter rates with Migratory Forest Songbirds and lead to increased predation, directly affecting injury and mortality.

12.3.7.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP (International Union for the Conservation of Nature-Conservation Measures Partnership) unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (Natureserve, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. No quantitative data exists on territory size for Tennessee Warbler but territories may be closely packed. For Orange-Crowned Warbler territory size is small, around 2 ha. Based on this, the LSA was deemed the most appropriate scale for the assessment.

Scope is small for all threats except sensory disturbance as the percent of the population effected is less than 10% of the available habitat and population within the LSA. For sensory disturbances, the disturbance can affect a considerable proportion of the LSA.

Severity of the threats ranges from slight to serious: threats related to loss by vegetation removals are serious as within the scope based on the high degree of habitat loss; sensory disturbances are rated as moderate due to the avoidance of roads by forest songbirds as are changes to habitat structure and

incidental take; all other threats are rated slight. Magnitude is rated as low for all threats except sensory disturbance.

Irreversibility is high for structural changes and very high for vegetation remove as the roadbed will likely never be removed but structural changes could be restored but it would take time and considerable effort. Incidental take, collisions and changes to predator prey dynamics could be restored with a reasonable commitment of resources so are rated medium. The rest of the threats were deemed low and can be easily reversed. The degree of effect was low for all except habitat loss through clearing activities which was moderate.

A summary of the threat assessment for forest songbird habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-23**.

Table 12-23: Summary of Threat Assessment for Potential Effects on Forest Songbirds

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Medium
Habitat Alteration or Degradation – Habitat Structural Change	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Sensory Disturbances	Restricted	Moderate	Medium	Low	Low
Habitat Alteration or Degradation – Decreased Insect Availability	Small	Slight	Low	Low	Low
Alteration in Movement – Habitat Fragmentation	Small	Slight	Low	Low	Low
Alteration in Movement – Sensory Disturbances	Restricted	Moderate	Medium	Low	Low
Injury or Death – Collisions with Vehicles	Small	Slight	Low	Medium	Low
Injury or Death – Incidental Take	Small	Moderate	Low	Medium	Low
Injury or Death – Changes to Predator-Prey Dynamics	Small	Slight	Low	Medium	Low

12.3.8 Wetland Songbirds (Palm Warbler, Alder Flycatcher)

While each species occupies its own ecological niche within the LSA and RSA, potential effect pathways will be similar in the context of proposed project activities for Alder Flycatcher and Palm Warbler, which are both part of the Bog, Fen and Other Wetland Birds guild (i.e., “Wetland Songbirds”).

12.3.8.1 Habitat Loss

Wetland songbird habitat loss may result from vegetation clearing vegetation clearing, hydrological changes and disturbance during construction and throughout operations. These losses could be to both foraging and breeding habitats. The pathways or activities which may result in loss or destruction of wetland songbird habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Loss of wetland songbird habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Loss of wetland songbird habitat.

Construction

Habitat Loss due to Clearance Activities

The construction of the road has the potential for direct and indirect effects that could cause the loss of wetland songbird habitat through physical alteration and removal of suitable habitat.

In the eastern and northern boreal, Palm Warbler is heavily associated with black spruce habitats, including sparse treed bogs and fens along with shrubby semi-open environments (BSI, 2024). Based on an understanding of Palm Warbler habitat preferences, the results of habitat modelling for Ecological Land Classification (refer to Section 11: Assessment of effects on Vegetation and Wetlands), were used to estimate removals of preferred habitat during construction. Predicted construction activities will result in the removal of 60.68 ha (1.13%) of Low Treed Bog, 29.62 ha (1.04%) of Sparse Treed Bog, 43.47 ha (1.55%) of Sparse Treed Fen, and 1.38 ha (0.25%) of Organic Poor Fen in the LSA, representing approximately 1.16% of the most suitable Palm Warbler habitat in the LSA. Overall, suitable Palm Warbler habitat is common throughout the study areas with 42.02% of the LSA and 48.50% of the RSA consisting of these vegetation communities.

Resource Selection Functions (RSFs) modelling was also done for probability of use for Palm Warbler using ARU data. **Figure 12.14** show the probability of use for Palm Warbler within the RSA under existing conditions. When the Project Footprint is overlayed it shows a loss of approximately 0.94% of highest-use habitat in the LSA and a loss of 0.16% of high-use habitat in the RSA due to road construction (**Table 12-24**). Modeled probability of use ranged from 0.0 to 0.834 % with the highest quantile (highest 20%) starting at 0.596.

Table 12-24: Changes to Available Habitat for Palm Warbler by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	45.5	4,833.55	0.94	45.5	27,672.64	0.16
Moderate	202.53	12,028.51	1.68	203.7	57,145.12	0.36
Low	196.21	10,791.24	1.82	302.077	491,44.277	0.61

In the northern boreal, Alder Flycatcher is associated with riparian habitats, including the edges of swamps bogs and ponds and creeks in alder and birch thickets (BSI, 2024). Based on an understanding of Alder Flycatcher habitat preferences, the results of habitat modelling for Ecological Land Classification

(refer to Section 11), were used to estimate removals of preferred habitat during construction. Predicted construction activities will result in the removal of, 6.88 ha (0.84%) of Riparian/Shore Communities, and 1.98 ha (4.14%) of Thicket Swamp in the LSA, representing approximately 1.01% of the most suitable Alder Flycatcher habitat in the LSA. Overall, the most suitable Alder Flycatcher habitat is somewhat rare throughout the study areas with 3.14% of the LSA and 3.78% of the RSA consisting of these vegetation communities.

Resource Selection Functions (RSFs) modelling was also done for probability of use for the Alder Flycatcher using ARU data. **Figure 12.15** show the probability of use for Alder Flycatcher within the RSA under existing conditions. When the Project Footprint is overlayed it shows a loss of approximately 1.41% of highest-use habitat in the LSA and a loss of 0.26% of high-use habitat in the RSA due to road construction (**Table 12-25**). Modeled probability of use ranged from 0.0 to 0.922 with the highest quantile (highest 20%) starting at 0.478.

Table 12-25: Changes to Available Habitat for Alder Flycatcher by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	26.68	1,920.47	1.39	26.68	10,132.25	0.26
Moderate	139.39	11,599.3	1.20	142.33	59,533.36	0.24
Low	278.17	14,133.53	1.97	382.27	64,296.43	0.59

Hydrological Changes

Construction activities have the potential to cause the destruction of wetland songbird habitat through changes to groundwater and surface flows. In terms of groundwater, project construction may lead to changes in the local hydrogeological environment by increasing, decreasing or redirecting groundwater flows. Road construction in particular can alter subsurface flows in peatlands changing the hydrology long-term (Waddington et al. 2014). Changes in surface water conditions can also occur with the installation of crossing structures. Such changes are generally concentrated downstream of the effect but can also take place on the upstream side if channel restriction causes water impoundment which can cause death of vegetation (Bocking et al., 2017). Both Alder Flycatcher and Palm Warbler could be affected by hydrological changes. Given Alder Flycatcher's preference for habitats near water, death of riparian vegetation could lead to loss of nesting habitat. For Palm Warbler, as a ground nester changes in water table levels could lead to the loss of nesting habitat.

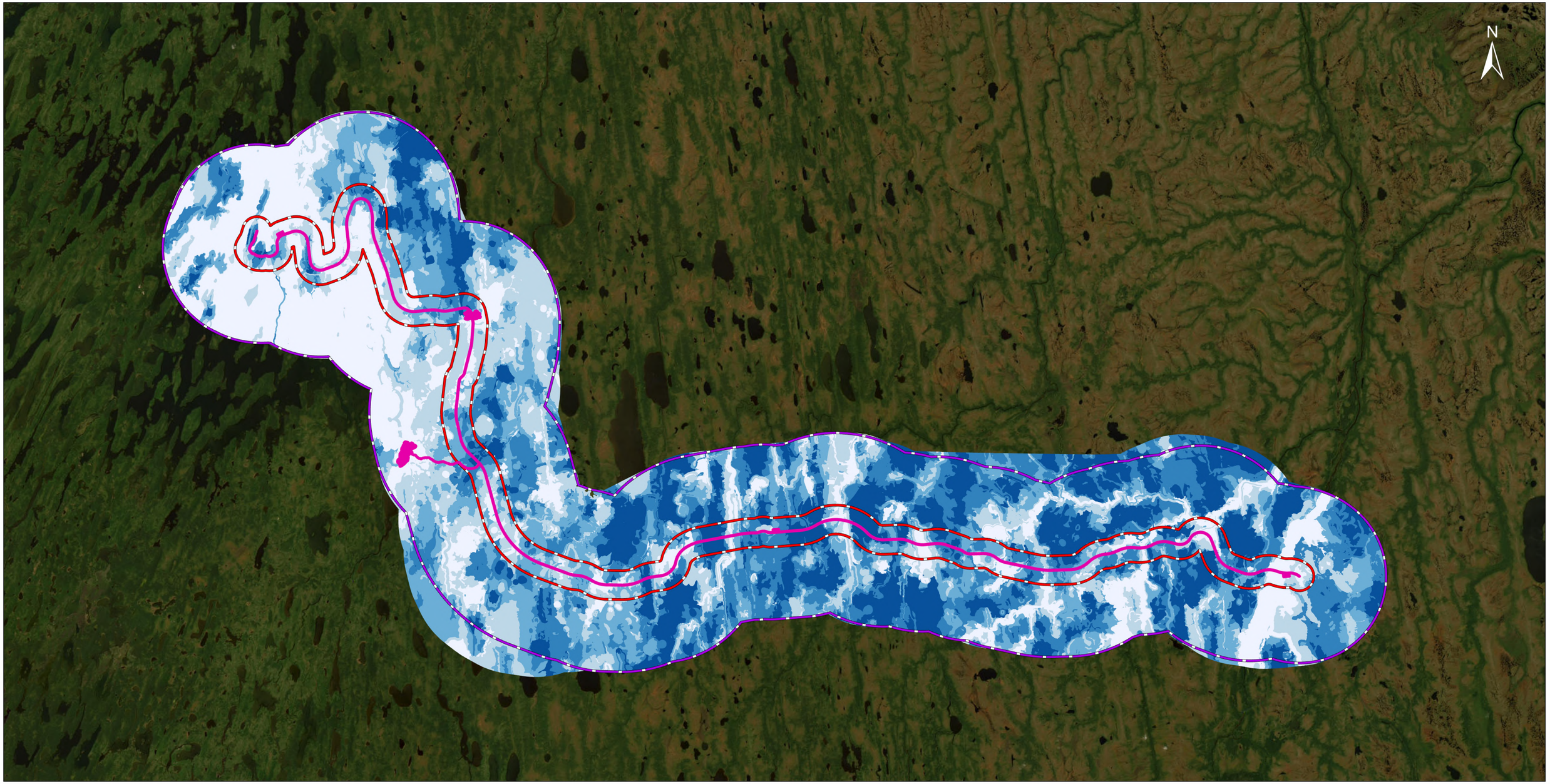
Operations

Clearing Activities

Operation of the roadway is unlikely to result in additional loss of Alder Flycatcher and Palm Warbler habitat through vegetation removal. Most maintenance activities will be involve managing re-growth of vegetation along the ROW within the Project Footprint and are accounted for in the construction phase. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations, but it is predicted that these effects would be short-term and of limited size. Quarries will remain operational following construction as additional material may be needed for maintenance activities; however, no additional habitat loss or destruction is anticipated to occur as the footprints will not be expanded during operations.

Hydrological Changes

Alder Flycatcher and/or Palm Warbler habitat loss through changes to hydrology could also potentially occur during the operations phase due to culvert and crossing structure maintenance. Culverts and other crossings could become partially or fully blocked from sediment or beaver activity. If culvert maintenance is ignored, given sufficient time, death of vegetation and loss of habitat could occur near the roadway (Bocking et al., 2017). Alder Flycatcher are known to nest near roads (OBBA, 2005) and have a roadside bias (Matsuoka et al. 2011) which may make them more susceptible to habitat loss than Palm Warblers, which are more likely encountered away from roads (Matsuoka et al. 2011).



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.295
- 0.295 - 0.379
- 0.379 - 0.490
- 0.490 - 0.620
- 0.620 - 0.830

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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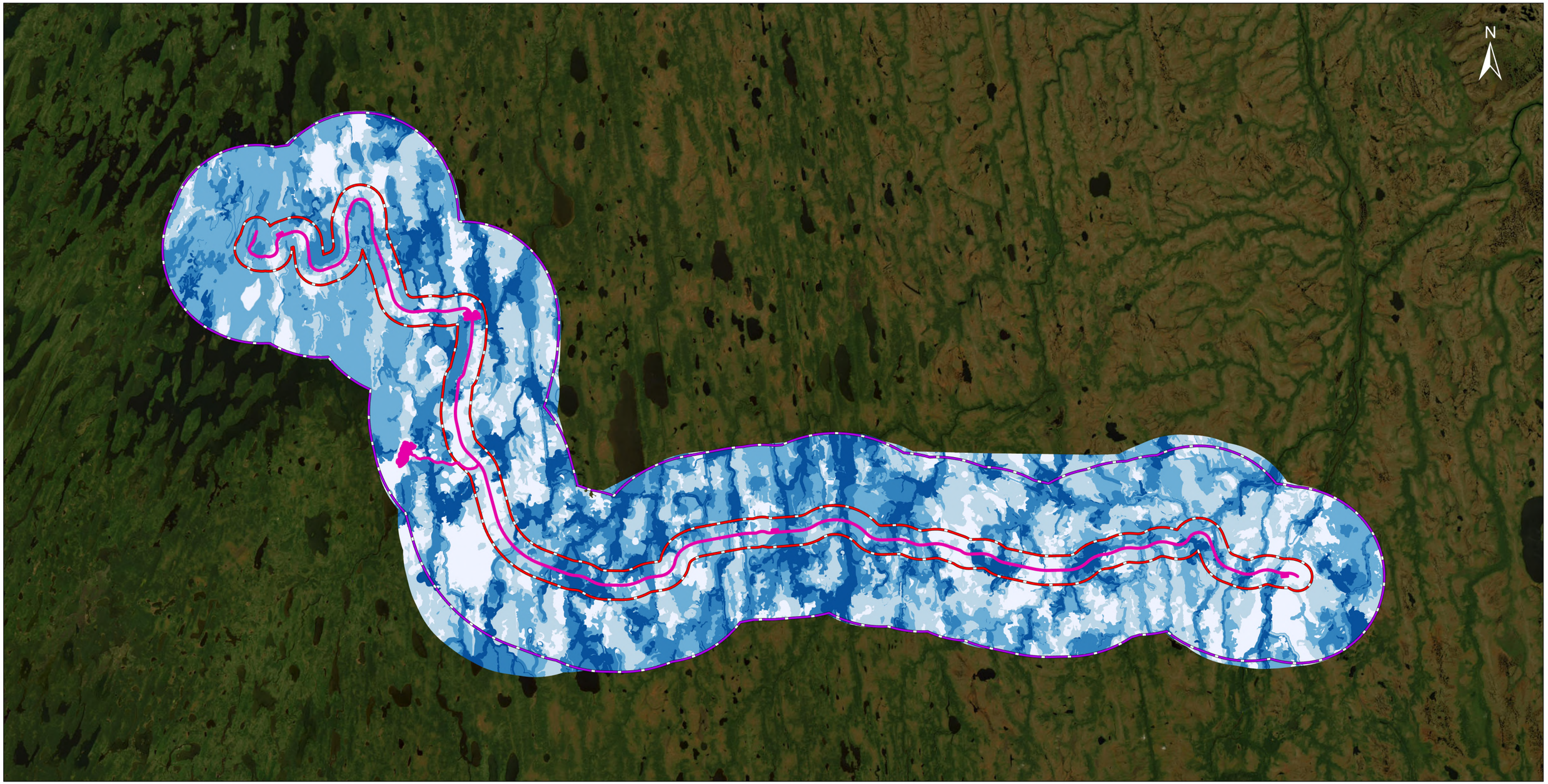
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0 5 10 km

Webequie Supply Road

RSF Modeling for Palm Warbler based on Probability of Use Under Existing Conditions

Figure Number: 12-14		**REV:** PA	
Client: Webequie First Nation	**Project Number:** 661910	**Date:** 5/14/2025	
DSC		**DRN** TE	**CHK** GS	**APP** GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.145
- 0.145 - 0.198
- 0.198 - 0.277
- 0.277 - 0.435
- 0.435 - 0.922

WSR WEBEQUIE SUPPLY ROAD

NOTES

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3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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0 5 10 km

Webequie Supply Road

RSF Modeling for Alder Flycatcher based on Probability of Use Under Existing Conditions

Figure Number:	12-15			**REV:**	PA
Client:	Webequie First Nation	**Project Number:**	661910	**Date:**	5/14/2025
DSC				**DRN**	TE
				CHK	GS
				APP	GS

12.3.8.2 Habitat Alteration or Degradation

There may be alterations to wetland bird habitat resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of wetland bird habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration and degradation of Alder Flycatcher and/or Palm Warbler habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration and degradation of Alder Flycatcher and/or Palm Warbler habitat.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of Alder Flycatcher and/or Palm Warbler habitat.

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect and increased early seral vegetation → Alteration and degradation of Alder Flycatcher and/or Palm Warbler habitat.

Construction and maintenance activities → Introduction of invasive species → Alteration and degradation of Alder Flycatcher and/or Palm Warbler habitat.

Construction

Accidental Spills

Accidental spills and releases that occur during construction phase may result in Alder Flycatcher or Palm Warbler habitat degradation. Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds throughout which pollutants can spread. Depending on concentrations and material spilled, an accidental spill could cause death of vegetation, lower productivity and alter the vegetation community (Hutchinson and Freedman, 2011; Lednev et al., 2023).

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020). Potential changes in surface water drainage patterns and increases or decreases in flows and surface water levels in waterbodies, as well as changes to groundwater, are described in detail in Sections 7 and 8. Peatlands, which make up the majority of vegetative communities in the Project Area are susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by roads. These changes can be extensive: a study within boreal fens in Alberta found pronounced differences in canopy cover up to 250 m from road edges in both rich and poor treed fens (Willier et al., 2022). Changes in wetland drainage patterns, resulting in lower or higher water levels, can alter the plant community (Miller et al. 2015). Drying areas can have increases in tree and shrub biomass while flooded areas may have corresponding losses (Miller et al. 2015). In areas where ground water levels rise, the availability of nesting locations for ground nesters, like Palm Warbler, may decrease.

Sensory Disturbance

Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for Alder Flycatcher or Palm Warbler adjacent to the Project Footprint, reducing utilization of the area or masking vocalizations related to courtship or alarm calling (Zhou et al. 2024). Construction noise is less continuous and more impulsive than traffic noise so habituation to the noise would not be likely in most cases. While direct research on wetland bird response to impulsive noise is lacking, research on shorebird response to impulsive noise showed area abandonment by birds at high decibel levels (Wright et al. 2010). While human disturbance effects on Alder Flycatcher have not specifically been measured, noise disturbance has been shown to reduce abundance in some species of flycatcher (Francis et al., 2021), and reproductive success in others (Mulholland et al., 2018). Light pollution can alter songbird singing occurrence (Da Silva et al., 2015) and egg laying (Senszaki et al., 2020), which may alter reproductive success; this is species and habitat dependant with species in open habitats more effected than those in forested habitats. Insectivorous species with good lowlight eyesight could be using artificial light to hunt more effectively (Senszaki et al., 2020) and while Alder Flycatcher has not been specifically studied, other flycatcher species have been found to use artificial light for foraging (Frey, 1993).

Habitat Structural Change

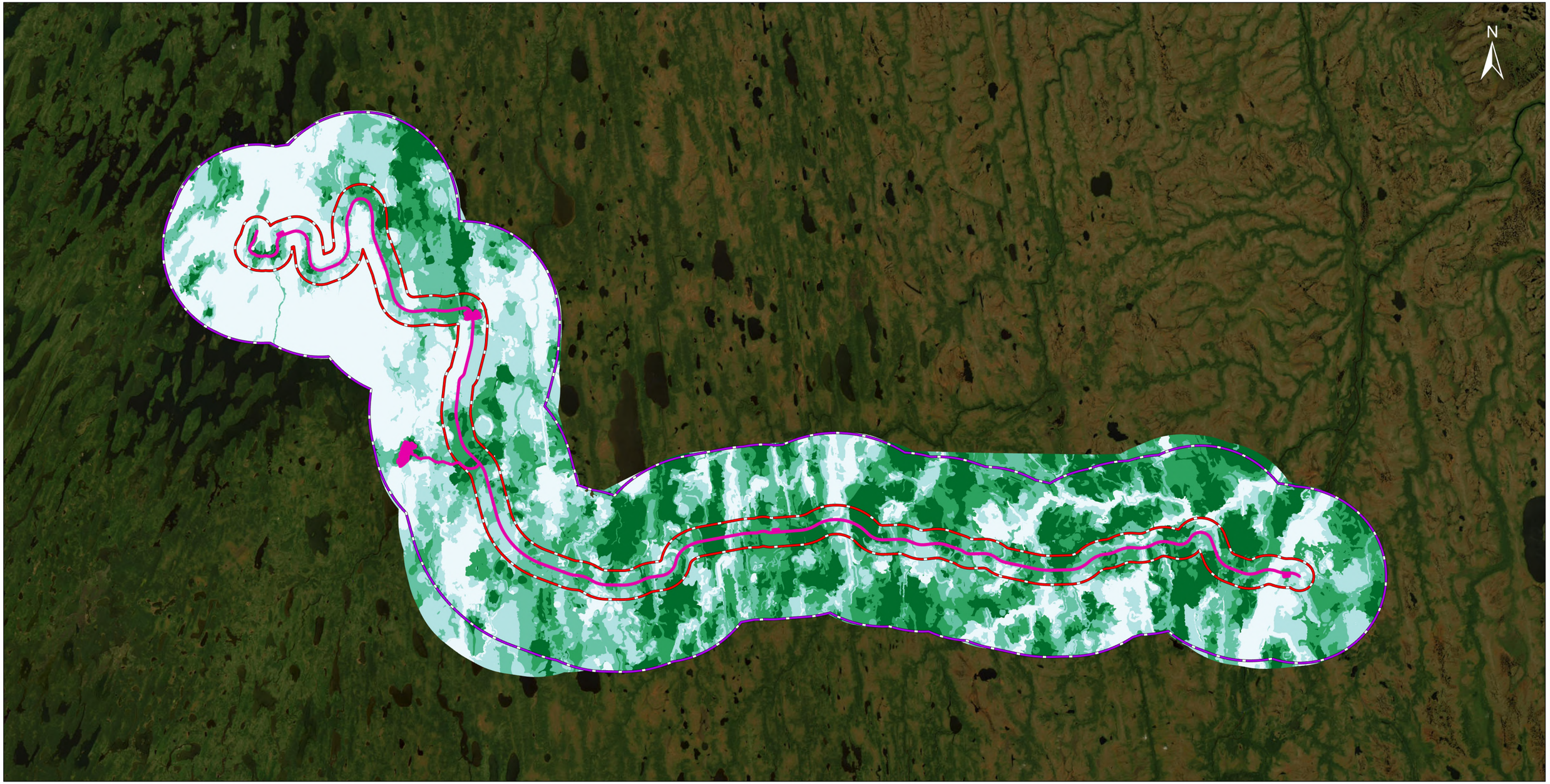
Changes to vegetation structure during road construction activities may alter or degrade wetland songbird habitat near the Project Footprint due to vegetation clearing activities and removals. These vegetation removals may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat after the implementation of mitigation measures. It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation.

The edge effect on Alder Flycatcher and Palm Warbler is likely relatively low due vegetation structure of their preferred wetland communities. Alder Flycatchers use habitat edges where riparian communities meet swamps, bogs and waterbodies (BSI, 2024) and can be found using shrub communities adjacent to roads (OBBA, 2005). Alder Flycatchers can often benefit from increased disturbance, with higher densities in more disturbed areas (Mahon et al. 2019). Palm Warbler have been found to use shrubby and early seral vegetation found along wider linear features (Kalukapuge et al. 2024) but this may not hold for roadsides as Palm Warbler have been shown to have some avoidance (Matsuoka et al., 2011).

RSF modeling based on future disturbance was used to predict change in use from clearing the ROW and changing existing habitat features into early seral communities (see **Section 12.2.1.1** for details). For Palm Warbler, the Project is predicted to result in a 29.62% increase of use within the Project Footprint. The use of the LSA is predicted to increase 10.49% while use of the RSA is expected to increase a small amount. **Figure 12.16** shows the probability of use for Palm Warbler within the RSA under future disturbance conditions. For Alder Flycatcher, the Project is predicted to result in a 18.49% increase of use within the Project Footprint. The use of the LSA is predicted to increase 4.66% while use of the RSA is also expected to have a small increase in use. **Figure 12.17** shows the probability of use for Alder Flycatcher within the RSA under future disturbance conditions.

Table 12-26: Wetland Songbird Probability of Habitat Use Percent Change by Study Area

Species	% Change		
	Project Footprint	LSA	RSA
Palm Warbler	29.62	10.49	2.42
Alder Flycatcher	18.4	4.66	1.07



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.322
- 0.322 - 0.416
- 0.416 - 0.530
- 0.530 - 0.633
- 0.633 - 0.830

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
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4. Service Layer Credits: Earthstar Geographics

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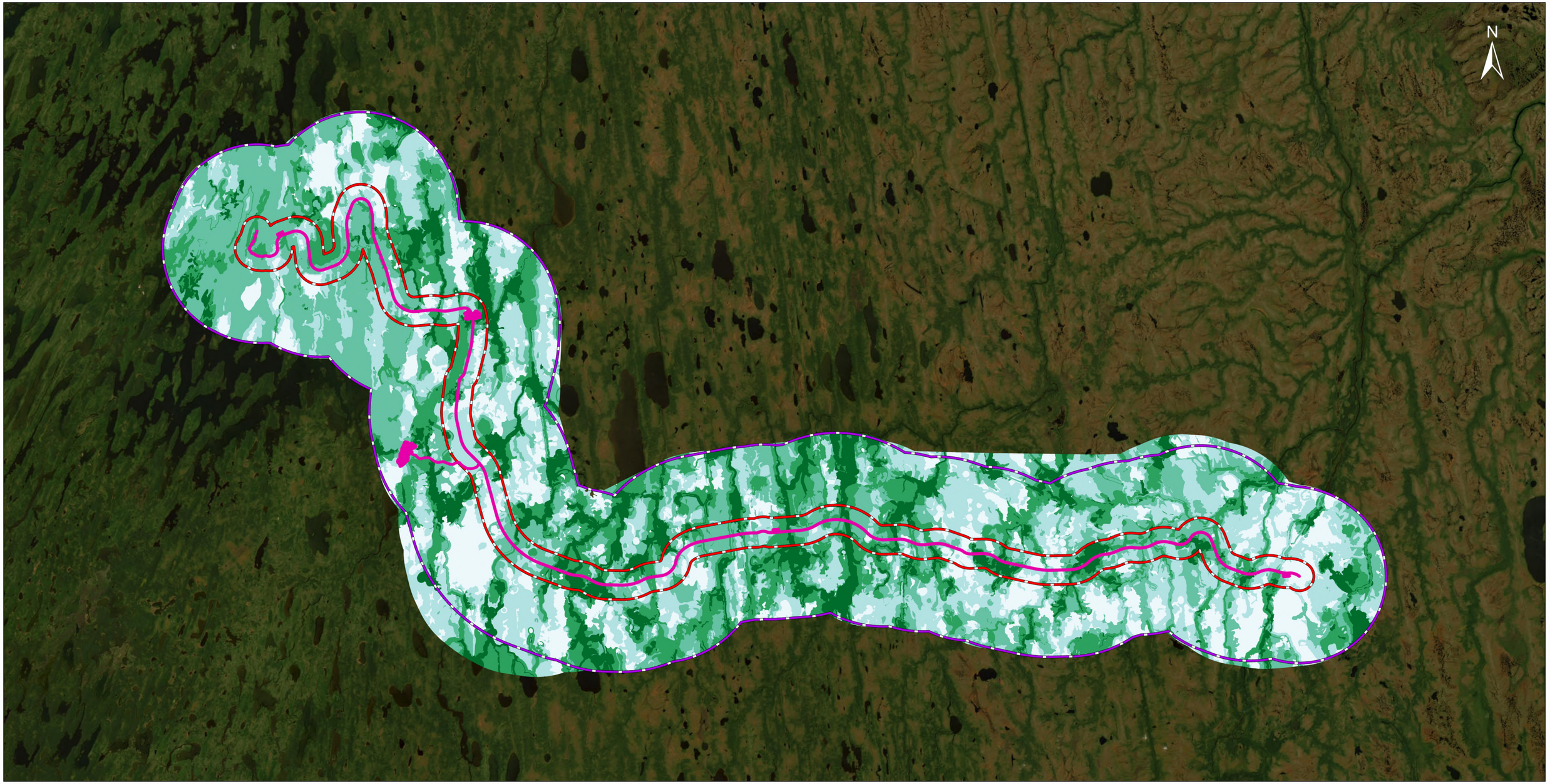
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0 5 10 km

Webequie Supply Road

RSF Modeling for Palm Warbler based on Probability of Use Under Future Conditions

Figure Number:	12-16			**REV:**	PA
Client:	Webequie First Nation	**Project Number:** 661910	**Date:** 5/15/2025		
DSC				**DRN**	TE
				CHK	GS
				APP	GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.151
- 0.151 - 0.201
- 0.201 - 0.280
- 0.280 - 0.435
- 0.435 - 0.922

WSR
WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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0 5 10 km

Webequie Supply Road

RSF Modeling for Alder Flycatcher based on Probability of Use Under Future Conditions

Figure Number: 12-17		REV: PA	
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	
DSC		DRN: TE	CHK: GS	APP: GS

Introduction of Invasive Species

Construction activities have the potential to introduce invasive plant species to the wetland habitats used by Alder Flycatcher or Palm Warbler. One of the pathways of spread for invasive plants is through construction equipment. Improperly cleaned construction equipment has the potential to transport and spread invasive plants, with cleared areas, including roads sides being susceptible to invasion (Hanen and Clevenger, 2005). The use of contaminated seed mixes in restoration efforts is also a pathway for invasive plants to establish in an area (Houghen et al. 2012). Once established in a new habitat, most invasive species are nearly impossible to eradicate (Pimentel et al. 2005).

Once established, invasive plant species can affect multiple ecosystem aspects including structure, diversity and function (CFIA, 2008); however, while invasive plants are known to spread along transportation corridors, few invasive species have been found in naturally occurring boreal wetland habitats used by Alder Flycatcher and Palm Warbler (Langor et al. 2014) with most invasive wetland species found well to the south of the project area (EDDMAps, 2024).

Operations

Accidental Spills

Similar to the effects during the construction phase, there could be effects to wetland songbird habitat quality during the operations phase of the Project from accidental spills, which may result in Alder Flycatcher and Palm Warbler habitat degradation. Spills during operations would most likely originate from accidental releases from vehicles traveling to and from the community. The road is forecasted to have low traffic volumes, and traffic along the roadway will be primarily personal and commercial vehicles and transport trucks associated with the community. While estimate frequency of spills is low (0.00000019 spills per mile, or 0.00000012 spills per kilometer [Harwood and Russell, 1990]), its predicted that minor spills and release are possible.

Hydrological Changes

Changes to hydrology could also occur during the operations phase due to culvert and crossing structure maintenance. Localized changes to hydrology could occur if culvert maintenance along the road is ignored, either in terms of repairs to the structure or removal of accumulated debris. The area affected would be dependent on the amount of time the culvert remains blocked as well as the size of the impounded area. Given sufficient time, Alder Flycatcher and Palm warbler habitat could be altered or degraded.

Sensory Disturbance

Road operations may affect Olive-sided Flycatcher and Rusty Blackbird habitat. During operations, most sensory effects will be related to traffic noise, which has been found to degrade bird habitat either through complete avoidance of areas near roads or decreased habitat value (Ware et al. 2015; Summers et al. 2011). Declines in densities of some songbird species have been shown to occur at a threshold around 45-48 dB (Sadlowski, 2011). Acoustic modeling places the 50db zone of influence at approximately 125 m beyond the Project Footprint (See Appendix J), and 50 dB is the noise level Environment and Climate Change Canada uses in their guidelines to avoid harm to migratory birds (EEEC, 2023). Noise from vehicles has been found to reduce bird vocalization, which could affect behaviour related to foraging, mating and predator avoidance (Cretois et al., 2023). While Palm Warbler has been found at lower densities near roads compared to areas away from roads (Matsuoka et al., 2011), Alder Flycatcher is

known to use areas near roads (OBBA, 2005). While lighting along roads is a major sensory disturbance for birds, the WSR road will not have lighting except near the community limiting its effects.

Habitat Structural Change

Habitat structural change during operations will have similar effects on Alder Flycatcher, Palm Warbler and their habitats. While it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW. For Alder Flycatcher especially this could have positive effects as they are known to have positive habitat relationships with transportation corridors (ABMI, 2023)

Introduction of Invasive Species

The introduction and spread of noxious and invasive plant species could also occur during operations and will have similar potential effects on Alder Flycatcher and Palm habitat. Transportation corridors are avenues of dispersal for invasive plants (Langor et al. 2014), and given the longer timeframe, operation of the road has the potential to spread aquatic as well as terrestrial invasive plants into the project area. The introduction of riparian species such as *Phragmites australis australis* (European Common Reed) could potentially alter Alder Flycatcher habitat but given the current northern range limits of most invasive plants in Ontario, the potential for establishment could be limited.

12.3.8.3 Alterations in Wetland Bird Movement

There may be alterations in wetland songbird movement stemming from construction activities and operation of the road. The pathways or activities which may result in changes in wildlife movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of wetland Alder Flycatcher and/or Palm Warbler.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of Alder Flycatcher and/or Palm Warbler.

Construction

Loss of Connectivity

Gaps in cover created by anthropogenic activities are known to impede movement of birds but is species- and habitat-dependant (Desrochers and Hannon, 1997; Grubb and Doherty, 1999). Bird species that have shown reluctance to cross gaps like those created by roads are generally forest species where the road creates a distinctive edge between the road and preferred habitats, with larger gaps acting as a greater barrier (Grubb and Doherty, 1999). While wetland songbirds have not been studied to the same degree, birds in treed swamps and bogs are likely to respond similarly. Lack of gap crossing is especially true for small birds which are more likely to be impeded by the changes in vegetation structure (Johnson et al. 2017). While Palm Warbler uses shrubby semi-open areas like road verges, there is the potential for fragmented areas by roads to act as a barrier to movement as some avoidance of roads has

been detected. For Alder Flycatcher fragmentation likely has a low effect as the species commonly uses habitat edges and gaps including roadsides (OBBA, 2005).

Sensory Disturbance

Alder Flycatcher and Palm Warbler movement is likely to be altered by sensory disturbances associated with Project construction and operations activities. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of Alder Flycatcher and Palm Warbler as they avoid the project ROW and supportive infrastructure. Unlike sensory disturbances in the operations phase, many of these disturbances will be abrupt, and occur randomly and at different locations. While no studies specifically examining wetland songbirds were found, multiple bird species have been found to respond behaviourally to sudden, loud noises by abandoning the area near the disturbance and varied in their rate of return (Wright et al. 2010; Delaney et al. 2011). Anthropogenic light may also affect bird movement as evidence shows it can be both a deterrent (Read, 1999) and an attractant (Gauthreux et al., 2006), especially for insectivores that may forage for insects around the artificial lights (Lebbin et al., 2007).

Operations

Loss of Connectivity

As was the case during the construction phase, alteration in movement due to loss of connectivity may occur during road operation. Maintenance activities will maintain vegetation in an early seral state; however, like during the construction phase, avoidance of these areas may be minimal for Alder Flycatcher as they prefer more open habitats including anthropogenically disturbed sites while Palm Warbler may show some crossing avoidance.

Sensory Disturbance

Vehicle noise is anticipated be the primary sensory effect on Olive-sided Flycatcher and/or Rusty Blackbird during operations. Traffic noise has been found to lower abundance and promote avoidance in many in many bird species (McClure et al. 2013). High-traffic roads have been shown to affect bird distribution when noise exceeded 56 dB (Hirvonen, 2001). While lighting along roads is a major sensory disturbance for birds, the Project will not have lighting except near the community, limiting its effect.

12.3.8.4 Wildlife Injury or Death

The construction of the road may lead to both direct and indirect wetland bird mortality. There may be increases in wetland bird injury or death stemming from increased vehicle traffic during both construction and operation of the Project, with indirect mortalities arising from increased energy expenditures and habitat change. The pathways or activities that may result in wetland songbird injury or death include the following:

Equipment and vehicles moving within Project Footprint → Collisions with wetland songbirds within Project Footprint → Injury or Death of Alder Flycatcher and/or Palm Warbler.

Construction and operations activities clear vegetation → Incidental encounters with Individuals or nests → Injury or Death of Alder Flycatcher and/or Palm Warbler.

Construction and operations activities clear vegetation → Increased access for wetland songbirds predators → Injury or Death of Alder Flycatcher and/or Palm Warbler.

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within Project Footprint could result in increased death and injury of Alder Flycatcher and Palm Warbler. Collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). Vehicles will travel between camps and construction locations; these trips could occur at all hours and encounters with birds would not be unexpected. Bird mortality from vehicle collisions is often related to travel speed of the vehicle as birds use distance as a threat estimate and can misjudge the closing distance between themselves and the vehicle, resulting in collision (DeVault et al. 2016). Wetland songbirds that forage and fly low from shrub to shrub have been found to be highly vulnerable to road mortality (Santos et al., 2016). Both Alder Flycatcher and Palm Warbler catch insects on the flight. Palm Warbler may be more susceptible to collisions as it spends more time foraging on the ground compared to the Alder Flycatcher.

Incidental Take

Vegetation clearing in Alder Flycatcher and Palm Warbler habitat during road construction, and/or movement of equipment/vehicles though vegetated areas, may result in injury or death to birds, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season, even after mitigation measures have been applied. The characteristics of wetland songbird nests can make them difficult to detect. Alder Flycatcher typically place their nest low in thick shrubs, typically around 60cm off the ground (OBBA, 2005; Lowther, 2020). Palm Warbler are ground nesting with their nest concealed under small conifers or shrubs (Peck and James 1987). Given the cryptic nature of their nests, incidental take is possible.

Changes to Predator-Prey Dynamics

Effects on Rusty blackbird and Olive-sided Flycatcher survival from improved predator access and movement rates is possible during the construction phase. Linear features are known to facilitate predator movement in the boreal (Dickie et al., 2017; Benoit-Pepin et al., 2024) and creation of new roads connected to human activity is known to spread predators into previously unoccupied areas (Lantham et al. 2011). Little information exists on predators for Alder flycatcher, although Red Squirrel is documented and predation by hawks and corvids is likely, many of which use edge habitats (Ibarzabal and Desrochers, 2004; Robertson and Hutto, 2007; Bildstein et al., 2020). For Palm Warblers, Gray Jays and Short-tailed Weasels have been reported as predators (Wilson 2013) although little is known. Both Palm Warblers and Alder flycatchers are sometimes parasitized by Brown-headed Cowbirds (Stoleson, 2010; Wilson 2020); however, no Brown-headed Cowbirds (Molothrus ater) were recorded during the existing conditions studies.

Operations

Collisions with Vehicles

Vehicle travel during operations will likely cause injury or death to Alder Flycatcher and Palm Warbler as collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). Along low-volume forest roads in Canada, it has been estimated that more than 14,000 birds are killed

annually due to collisions with vehicles, or approximately one bird every 3 km per year (Bishop and Brogan, 2013), this number is likely vastly underreported for small birds due to their size and scavenging. As in the construction phase, if present near the road, Palm Warbler are more likely to suffer a collision than Alder Flycatcher because of their foraging behaviours; however, they have shown some road avoidance which may make their presence less likely near the road.

Incidental Take

Vegetation clearing in Alder Flycatcher and Palm Warbler habitat is also scheduled to occur during operations as both species use habitat openings and edges. Though smaller in scale, periodic clearing of the ROW may occur during operations as part of line-of-sight maintenance or infrastructure repairs. If maintenance occurs during the breeding season, nests, eggs and individuals could be injured, destroyed, or killed. Rusty Blackbird nests are usually well concealed in small trees which would make them vulnerable to maintenance activities. Both Alder Flycatcher and Palm Warbler nest in early seral habitat which would make them vulnerable to maintenance activities.

Changes to Predator-Prey Dynamics

Effects on from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Maintenance clearing during operations will maintain openness along the ROW which will allow predators increased access to wetland areas near the road exposing Alder Flycatcher and Palm Warbler to increased predation. While some studies have found a positive effect on bird survival due to roads and resulting predator avoidance of roads, it is often attributed to higher levels of human presence (Singer et al. 2020), which given the low traffic levels is unlikely for this Project.

12.3.8.5 Threats Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP (International Union for the Conservation of Nature-Conservation Measures Partnership) unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (Natureserve, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. Alder Flycatcher have small territories 0.2-3 ha in size and Palm Warbler have breeding territories that are approximately 4 ha in size, based on this the LSA was deemed the most appropriate scale for the assessment.

Scope is small for all threats to both Alder Flycatcher and Palm Warbler except for hydrological and sensory effects where the scope is restricted.

Both species have threat severity ratings ranging from slight to serious. The two threats related to vegetation removals are serious for both species as well, as within the scope based on the high degree of habitat loss and alteration, hydrologic loss is rated as severe for Palm Warbler because of its ground nesting behavior while Alder Flycatcher rates as moderate.

Hydrologic alteration, predation and spills are rated as moderate for both Olive-sided Flycatcher and Rusty Blackbird. Palm Warbler has a severity rating of moderate for sensory disturbances and connectivity while Alder Flycatcher has a rating of slight. The difference is based on the evidence of road

avoidance for Rusty Blackbird. All other severity ratings are slight. Magnitude is rated as low for all threats except for hydrological loss and alteration.

For both Alder Flycatcher and Palm Warbler the irreversibility ratings are the same. Irreversibility is high for hydrological changes and very high for vegetation removal as the roadbed will likely never be removed and such changes are challenging to reverse in short time, if ever. Irreversibility is also high for spills, edge effects, invasive species, and predation because while the effects can technically be reversed it would take time and considerable effort. The rest of the threats were deemed low and can be easily reversed. The degree of effect was low for all except habitat loss due to clearance activities and hydrological changes, both of which were moderate.

A summary of the threat assessment for Alder Flycatcher habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-27**, and the summary for Palm Warbler is presented in **Table 12-28**.

Table 12-27: Summary of Threat Assessment for Potential Effects on Alder Flycatcher

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Medium
Habitat Loss – Hydrological Changes	Restricted	Moderate	Medium	High	Medium
Habitat Alteration or Degradation – Accidental Spills	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Restricted	Moderate	Medium	High	Medium
Habitat Alteration or Degradation – Sensory Disturbance	Restricted	Slight	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	Low	Low
Alteration in Movement – Sensory Disturbance	Restricted	Slight	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Restricted	Moderate	Low	High	Low
Injury or Death – Collisions with Vehicles	Small	Slight	Low	Low	Low

Table 12-28: Summary of Threat Assessment for Potential Effects on Palm Warbler

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Medium
Habitat Loss – Hydrological Changes	Restricted	Serious	Medium	High	Medium
Habitat Alteration or Degradation – Accidental Spills	Small	Moderate	Low	High	Low

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Alteration or Degradation – Hydrological Changes	Restricted	Moderate	Medium	High	Medium
Habitat Alteration or Degradation – Sensory Disturbance	Restricted	Moderate	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Moderate	Low	Low	Low
Alteration in Movement – Sensory Disturbance	Restricted	Moderate	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Restricted	Moderate	Low	High	Low
Injury or Death – Collisions with Vehicles	Small	Slight	Low	Low	Low

12.3.9 Waterfowl (Canada Goose, Mallard)

12.3.9.1 Habitat Loss

There may be waterfowl habitat loss resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathways or activities which may result in loss or destruction of waterfowl habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Loss/destruction of waterfowl habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → loss/destruction of waterfowl habitat.

Construction

Clearance Activities

The construction of the Project has the potential to cause a loss of habitat used by waterfowl in the area. In particular, site preparation and construction activities would reduce the availability of suitable habitat (such as wetlands and watercourses) in the LSA and Project Footprint. Within the Project Footprint, most areas of natural habitat will be permanently replaced by the road and associated infrastructure. These features would be replaced by surfaces generally unsuitable for waterfowl breeding (although they still may utilize the areas for other life stages). Waterfowl generally select nesting habitats near marshes and graminoid fens, and peatlands (Dyson et al 2022; Johnston 2021) which will be reduced where road infrastructure is placed. For Mallard and Canada Goose specifically, most nest within 100 m of water (Hickie, J., 1985).

Outside of the direct footprint of the road, vegetation clearing and ground disturbance to establish work areas, temporary storage areas, and access roads may cause loss/destruction of habitat, including nesting and foraging locations. Previous studies have shown that roads may increase the likelihood of waterfowl nesting nearby, albeit not directly on the road surface (Dyson et al 2024 and Dyson et al 2024).

Using the results of habitat modelling via Ecological Land Classification (refer to Section 11: Assessment of Effects on Vegetation and Wetlands), and based on an understanding waterfowl habitat preferences and the Project Footprint, estimate construction activities will result in the removal of 155.58 ha (0.65%) of Conifer Swamp, 80.04 ha (2.01%) of Poor Conifer Swamp, 29.62 ha (1.04%) of Sparse Treed Bog, 43.47 ha (1.55%) of Sparse Treed Fen, 1.98 ha (3.68%) of Thicket Swamp, 6.87 ha (0.83%) of shore communities and 3.38 ha (33.69%) of Rock Barren in the LSA, representing approximately 1.73% of the most suitable waterfowl breeding habitat in the LSA. Overall, suitable waterfowl habitat is common throughout the study areas with 59.7% of the LSA and 55.1% of the RSA consisting of these vegetation communities.

The Project will also remove 1.86 ha of open water within the LSA which represents only 0.07% of the open water available in the LSA. Overall, open water habitat is common throughout the study areas with 10.1% of the LSA and 26.29% of the RSA consisting of these aquatic communities.

RSF modelling was done for both Canada Goose and mallard. **Figure 12.18** and **Figure 12.19** show the predicted use of the RSA under existing conditions for Canada Goose and mallard, respectively. The Project Footprint was overlayed, and the underlying habitat removed. For Canada Goose, this represents a loss of approximately 2.34% of high-use habitat in the LSA and a loss of 1.19% of high-use habitat in the RSA (**Table 12-29**). Modeled probability of use ranged from 0.0 to 0.714 with the High Use quantile (highest 20%) starting at 0.079.

For mallard, approximately 0.86% of high-use habitat will be removed from the LSA, and 0.16% of high-use habitat will be removed from the RSA due to road construction and operations (**Table 12-30**). Modeled probability of use ranged from 0.04 to 0.879 birds/ha with the High Use quantile (highest 20%) starting at 0.219.

Table 12-29: Changes to Available Habitat for Canada Goose by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	138.11	5,890.4	2.34	219.52	18,489.57	1.19
Moderate	147.52	11,452.19	1.29	172.69	64,837.32	0.27
Low	158.62	10,310.71	1.54	159.08	50,634.22	0.31

Table 12-30: Changes to Available Habitat for Mallard by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	12.47	1,447.42	0.86	14.53	9,152.63	0.16
Moderate	138.26	8,172.24	1.69	160.54	41,802.72	0.38
Low	293.51	18,033.64	1.63	376.22	83,005.76	0.45

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020). Changes in wetland drainage patterns, resulting in lower or higher water levels, can alter the plant community (Miller et al. 2015). Hydrological changes during road construction could result in the destruction of aquatic foraging habitat and other suitable habitat of waterfowl. Specifically, roads can impound or drain water, thus reducing the available habitat for waterfowl (Hagy et al. 2014). The stability of the water table will influence the amount, structure and diversify of aquatic vegetation which can dictates waterfowl habitat quality and productivity (Markham, 1982). Higher water levels may destroy ground-nesting sites or nesting trees (Poiani, 2006). Lower water levels can reduce nesting sites for overwater nesters (Markham, 1982)

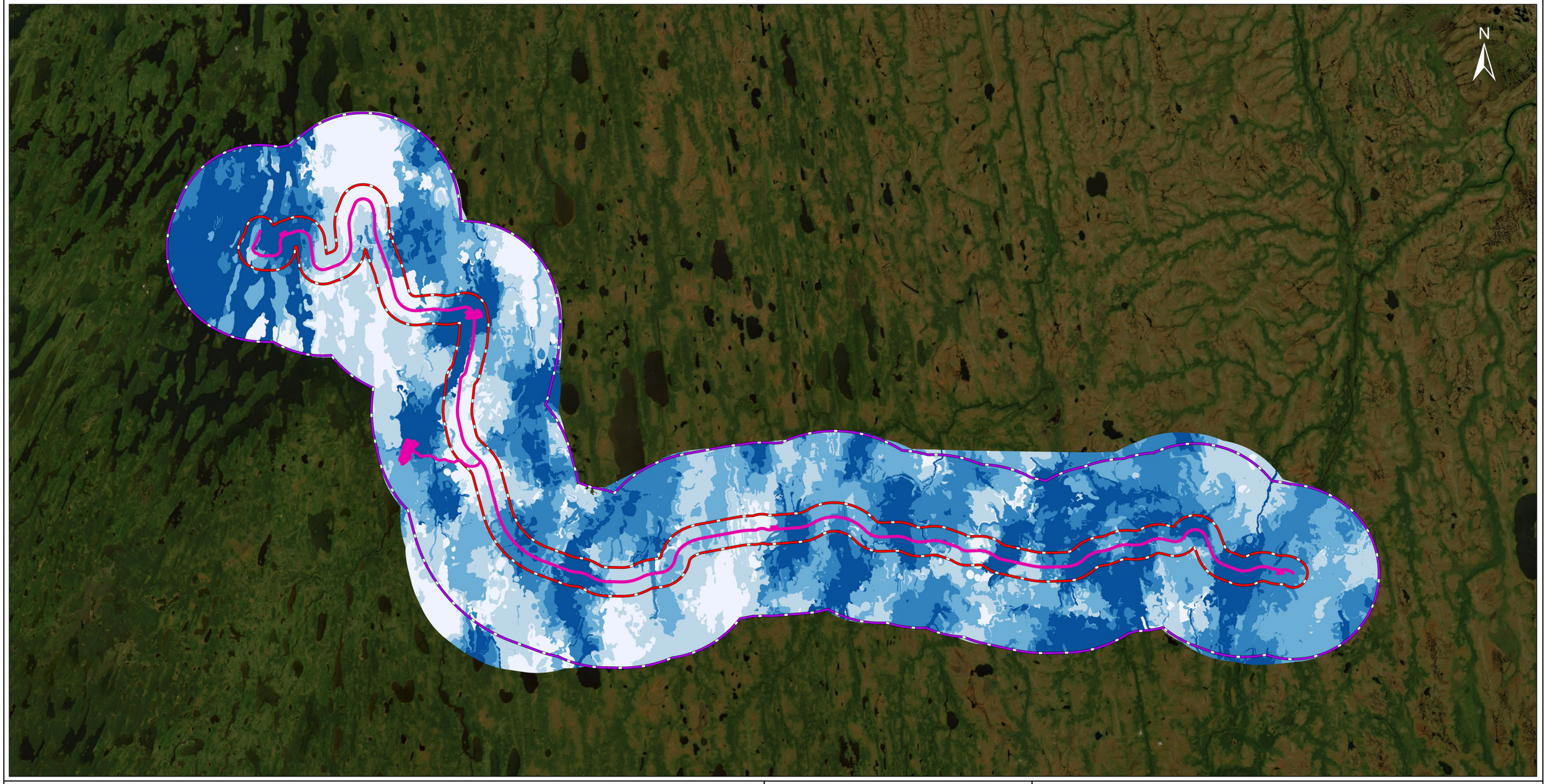
Operations

Clearing Activities

Operation of the roadway is unlikely to result in additional loss of waterfowl habitat as maintenance activities will involve managing re-growth of vegetation along the ROW within the Project Footprint. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations, but it is predicted that these effects would be short-term and of limited size. While the quarries are expected to remain operational following construction, the footprints will not be expanded and as such no additional habitat loss or destruction is anticipated to occur during operations. Additionally, these areas may become waterfowl habitat as inundated borrow pits in the boreal forest can mimic natural wetlands (Johnstone et al., 2023)

Hydrological Changes

Hydrological changes may continue during the operations stage of the project. Improper culvert maintenance or blockages may lead to additional changes in habitat due to flooding or improper drainage. Given sufficient time, death of vegetation and small losses of habitat for waterfowl could occur (Bocking et al., 2017); however, creation of flooded habitat could be a positive as ponds created by plugged culverts are similar to beaver ponds which are often high-quality habitat for waterfowl.



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.019
- 0.019 - 0.026
- 0.026 - 0.041
- 0.041 - 0.070
- 0.070 - 0.714

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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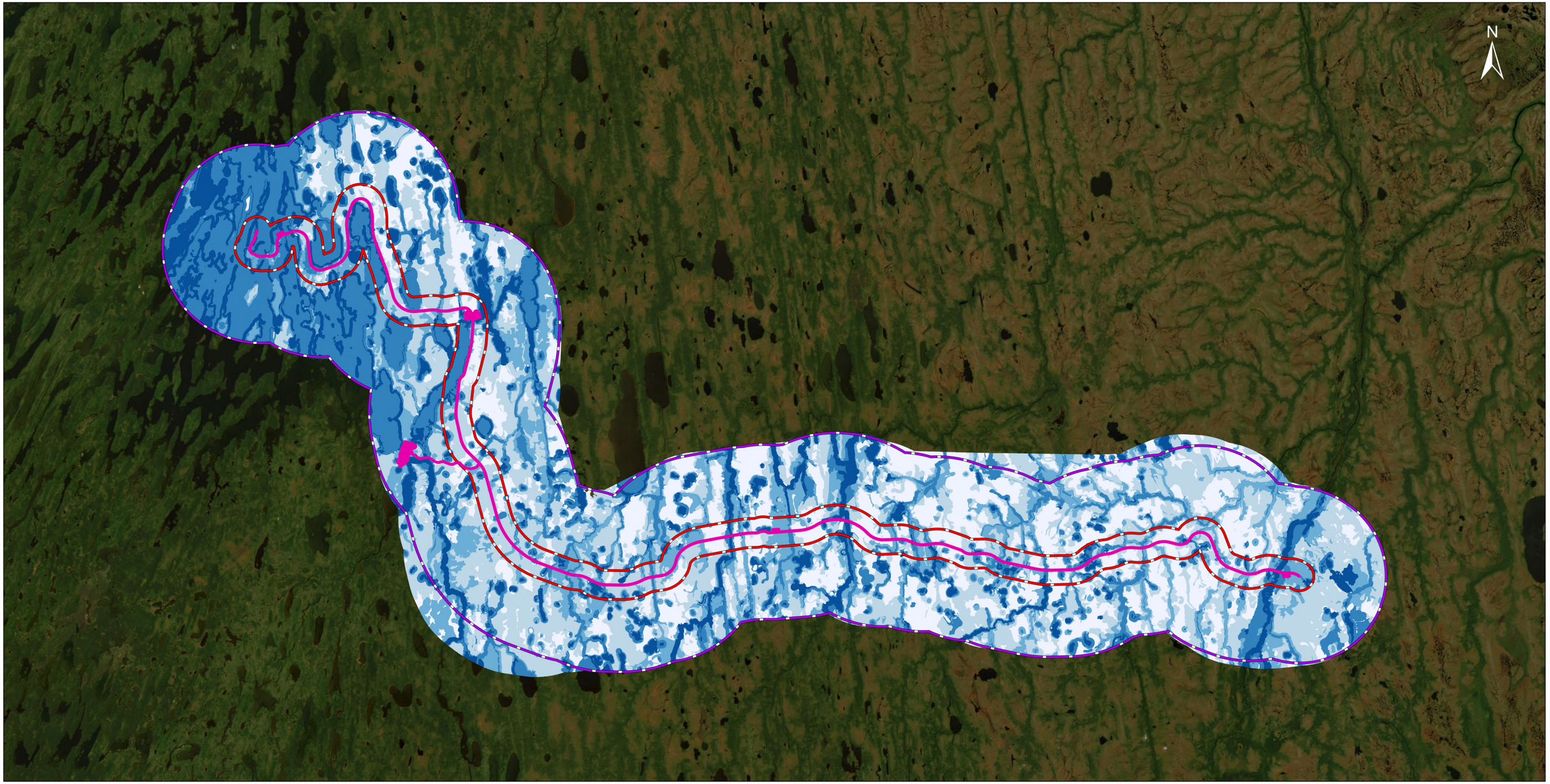
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Webequie Supply Road

RSF Modeling for Canada Goose based on Probability of Use Under Existing Conditions

Figure Number: 12-18		**REV:** PA	
Client: Webequie First Nation	**Project Number:** 661910	**Date:** 5/20/2025	
DSC		**DRN** TE	**CHK** GS	**APP** GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.060
- 0.060 - 0.080
- 0.080 - 0.113
- 0.113 - 0.190
- 0.190 - 0.880

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
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0 5 10 km

Webequie Supply Road

RSF Modeling for Mallard based on Probability of Use
Under Existing Conditions

Figure Number:	12-19	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/14/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

12.3.9.2 Habitat Alteration or Degradation

There could be alterations to waterfowl habitat resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of waterfowl habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration and degradation of Waterfowl habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration and degradation of Waterfowl habitat.

Construction and operations maintenance activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of Waterfowl habitat.

Construction and operations maintenance activities → Clearing of vegetation → Structural differences between cleared and remaining vegetation create edge effect → Alteration and degradation of Waterfowl habitat.

Construction and operations maintenance activities → Introduction of invasive species → Alteration and degradation of Waterfowl habitat.

Construction

Accidental Spills

Fuel or other spills could affect water quality, wetlands and other waterbodies, as well as upland areas which in turn may affecting waterfowl habitat. Evidence from previous major spills show that some waterfowl avoid habitats affected by releases, although only in a temporary nature. The range of this avoidance differs from species to species but generally has a negative impact on habitat availability (Day et al. 1997). Spills may cause temporary avoidance by waterfowl in the case of a large release, but generally waterfowl do not avoid waterbodies that may be hazardous to their health or survival (Read 1999). This in turn may lead to wildlife injury or death, discussed in **Section 12.3.10.4**.

Hydrological Changes

Hydrological changes may occur as a result of impoundment or drainage, in turn causing alterations in wetlands or waterbodies/watercourses. Impoundments may occur both from changes caused by the road, but also those caused by beavers which may create small-to-moderate impoundments where they build dams. These effects will begin during the construction phase but will persist into the operations stage so long as the road and culvert structures exist. These drainages and impoundments may degrade available nesting and foraging habitats, while simultaneously they also may increase open-water habitat that waterfowl may use. Waterfowl generally are dependent on an abundance of small wetlands and watercourses, so hydrologically changes may reduce their abundance where hydrological changes occur. Studies have shown that anthropogenic modification of habitats reduces available habitat and can result in a reduction of waterfowl production (Johnsgard 1956). Waterfowl will use large man-made lakes as well as smaller impoundments as resting, foraging, and predator-avoidance areas so may benefit from hydrological changes (Reitan and Thingstad 1999).

Sensory Disturbances

Construction, loud noises, dust, and other human activity may reduce the habitat suitability for waterfowl around the Project Footprint as they may avoid areas due to sensory disturbance. Roads can have a negative impact that cause habitats to be less appealing and may will be greater during the construction phase during the more intensive habitat disturbance. Both human and vehicle presence can cause habitat avoidance, with humans outside of vehicles creating additional avoidance behaviours (Pease et al. 2010). As such, it is expected that this effect will be greater during construction than during roadway operations. Since many birds (waterfowl included) rely heavily on acoustic communication, noise is suspected to have a widespread impact on many species (Kociolek et al., 2015). For waterfowl, loud noises from blasting, clearing and grading during construction could disrupt communication and cause stress; however, the severity of the impact depends on the frequency and amplitude of road noise compared to their vocalizations.

Habitat Structural Change

During construction, vegetation clearing and ground disturbance may alter waterfowl habitat composition, including increased edge effects. Vegetation may need to be cut or mowed, and natural habitats may be modified which may cause waterfowl to alter locations for nest selection, foraging, or staging. Dyson et. al., (2022) found that upland waterfowl tend to avoid seismic lines and pipelines but may be attracted to borrow pits and roads. Kemink et al (2019) also found that waterfowl generally avoid areas of disturbance, although only to a minor extent and the preservation of appropriate wetland habitat is likely most important. Singer et. al., (2022) modelled anthropogenic disturbance and found that seismic lines and pipelines (and likely roads) reduce breeding pair abundance, indicating habitat avoidance or increased mortality. Bashuk (2007) found that waterfowl did not appear to be deterred from roads, despite roads reducing the overall available nesting habitat and increasing the amount of edge habitat present. Conversely, timber harvesting effects tend to positively influence local populations of some waterfowl, such as Canada Geese and Green-winged teal (Lemelin et al. 2007). These attractions may also bring in additional predators, which is discussed in **Section 12.3.10.4** (Wildlife Injury and Death).

Deposition of dust and other airborne particles during construction degrade nearby aquatic and foraging habitats for waterfowl. Walker and Everett (1987) found that roadways produce dust that increases the rate of snow melt within 30 to 100 m of roadways. This concentrates waterfowl along roadways due to it often being one of the few ice-off locations. This is likely to begin during construction as earth is moved and construction vehicles produce dust.

RSF modeling based on future disturbance was used to predict change in use from clearing the ROW and changing existing habitat features into early seral communities (see **Section 12.4.2.1** for details). For Canada Goose, the Project is predicted to result in a 14.53% decrease of use within the Project Footprint. The use of the LSA is predicted to decrease 13.45% while use of the RSA is expected to decrease 4.54%. **Figure 12.16** shows the probability of use for Canada Goose within the RSA under future disturbance conditions. For Mallard, the Project is predicted to result in a 19.31% increase of use within the Project Footprint. The use of the LSA is predicted to increase 1.35% while use of the RSA is expected to increase 0.28%. **Figure 12.17** shows the probability of use for Mallard within the RSA under future disturbance conditions. Overall, waterfowl as a group are predicted to have a 7.33% decrease in habitat utilization in the Project Footprint; a 6.69% increase in the LSA; and a 6.46% increase in habitat utilization in the RSA (**Table 12-31**).

The predictions of higher use for Mallard in the Project Footprint area are counterintuitive and may be a result of the model using existing disturbances to predict future habitat use (refer to **Section 12.4.2.1.1**). As there are no existing permanent roads, existing disturbances in the RSA (winter road, cutlines, old camps, pads) are vegetated and may serve as waterfowl habitat for upland nesting species. Additionally, these areas are not used by humans most of the time and may be used by species that are known to otherwise avoid human activities.

Table 12-31: Waterfowl Species Probability of Habitat Use Percent Change by Study Area

Species	% Change		
	Project Footprint	LSA	RSA
Canada Goose	-14.53%	-13.45%	-4.54%
Mallard	19.31%	1.35%	0.28%
Waterfowl Group	-7.33%	6.96%	6.46%

Habitat Alteration or Degradation because of the Introduction of Invasive Species

During construction, invasive vegetation may be introduced that may modify the habitat for waterfowl; however, studies are mixed on the results. Thompson et al. (2012) found that encroaching woody vegetation did not have an effect on waterfowl nest success. Grosholz (2010) found that grazing geese avoid habitat with invasive hybrid cordgrasses. Some dabbling and diving ducks prefer open wetlands and an increase in robust hydrophytes (*Typha spp.*) may cause these birds to avoid areas where they are introduced (Kantrud et al. 1986). Conversely, areas where these are removed to do vegetation clearing may increase waterfowl abundance.

Operations

Accidental Spills

Similar to the construction phase, spills during the operational stages may cause temporary avoidance by waterfowl in the case of a large release, but generally waterfowl do not avoid waterbodies that may be hazardous to their health or survival (Read 1999). It is expected that spills during the operational stages will be generally of low volume and are unlikely to have a major effect on waterfowl.

Hydrological Changes

Changes to hydrology could also occur during the operations phase due to culvert and crossing structure maintenance. Localized changes to hydrology could occur if culvert maintenance along the road is ignored, either in terms of repairs to the structure or removal of accumulated debris. Small impoundments caused by culvert blockages may act as habitat for ducks and other waterfowl but also lead to drying of other areas. The area affected would be dependent on the amount of time the culvert remains blocked as well as the size of the impounded area. Inundation of borrow pits could lead to an increase of waterfowl habitat.

Sensory Disturbances

Both human and vehicle presence can cause habitat avoidance, with humans outside of vehicles creating additional avoidance behaviours (Pease et al. 2010). The avoidance may occur during operations although it is likely to be of a lesser magnitude compared to construction. A review of human disturbance on waterbirds found that some species are disturbed by driving, although walking and human powered

vehicles (kayaks, bicycles, etc.) generally cause more disturbance (Borgman et al 2011). Slowing or stopping vehicles increased this response compared to those that continued on. This often led to flushing or otherwise retreating from the location. Acoustic modeling places the 50db zone of influence at approximately 125 m beyond the Project Footprint (See Appendix J), and 50 dB is the noise level Environment and Climate Change Canada uses in their guidelines to avoid harm to migratory birds (EEEC, 2023). With multiple active vehicles expected per day, the roadway may cause sensory disturbances in mores sensitive species. This may be exacerbated by locations where humans may exit vehicles along the roadway.

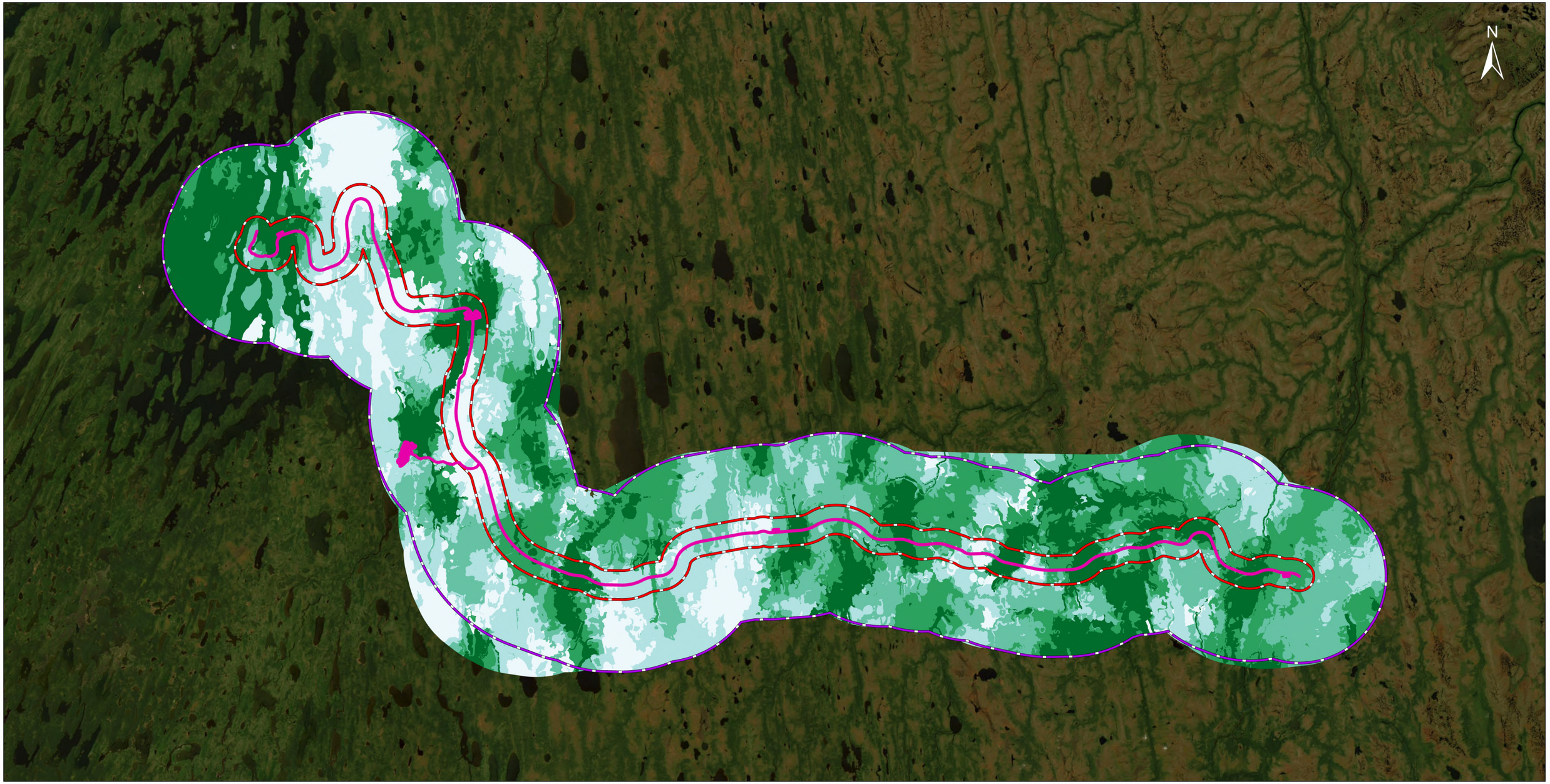
Habitat Structural Change

Maintenance related to clearing of adjacent riparian vegetation could alter waterfowl habitat composition including increased edge effects and altering nesting preferences. Voorhees and Cassel (1980) found that there was little difference in preference for un-mowed vegetation or mowed vegetation, but nesting success generally declined in un-mowed areas. Oetting and Cassel (1971) found the opposite in a different study, indicating that un-mowed vegetation was a preferred nesting site, and also led to increased nest success. This may suggest that reducing mowing (especially during the early breeding season) may reduce effects to ground-nesting waterfowl, assuming it does not negatively affect the safety of the roadway.

The deposition of dust and other airborne particles caused by vehicles on the road can change soil and water quality and alter vegetation which can result in the degradation of waterfowl habitat. Cruezer et al (2016) found that dust deposition immediately adjacent to roadways in North Dakota had increased dust loading, with the degree of increase decreasing from distance to the roadway. They also found that this increased loading only had a minimal effect on wetlands. Deposition of dust and other airborne particles during construction degrade nearby aquatic and foraging habitats for waterfowl. The effects described by Walker and Everett (1987) on increased melting speed would continue during operations as vehicles utilize the roadway.

Introduction of Invasive Plant Species

During the operational phase of the Project, invasive vegetation may be introduced from passing vehicles, or from users entering watercourses or upland areas and accidentally introducing invasive plants. These in turn may modify the habitat for waterfowl. Much like the effects during construction the effects on waterfowl are expected to be minor and could be both positive and negative in nature, depending on the species affected.



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.019
- 0.019 - 0.026
- 0.026 - 0.041
- 0.041 - 0.070
- 0.070 - 0.714

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

DISCLAIMER

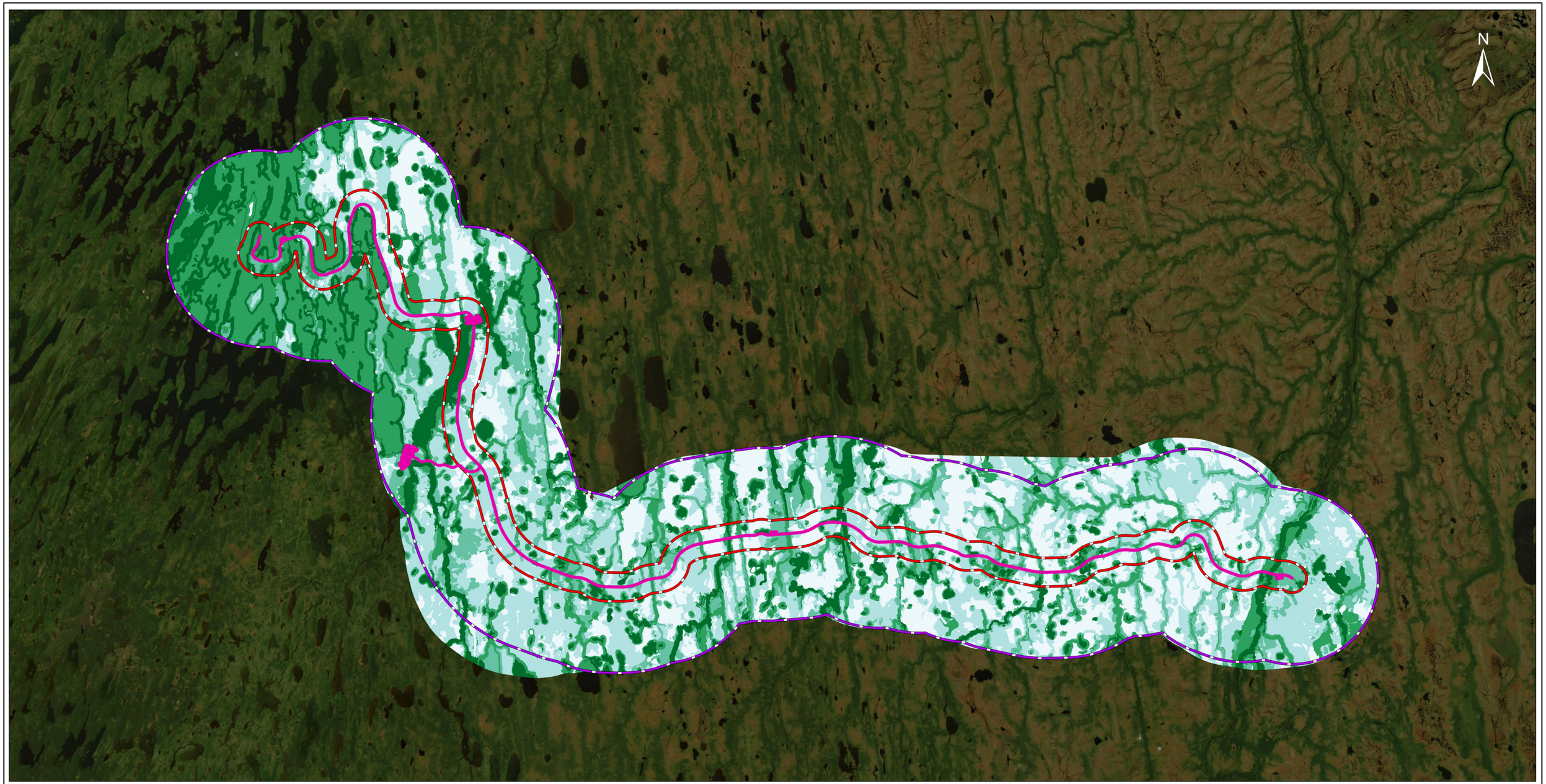
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0 5 10 km

Webequie Supply Road

RSF Modeling for Canada Goose based on Probability of Use Under Future Conditions

Figure Number: 12-20		**REV:** PA	
Client: Webequie First Nation	**Project Number:** 661910	**Date:** 5/20/2025	
DSC		**DRN** TE	**CHK** GS	**APP** GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.061
- 0.061 - 0.082
- 0.082 - 0.108
- 0.108 - 0.175
- 0.175 - 0.880

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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0 5 10 km

Webequie Supply Road

RSF Modeling for Mallard based on Probability of Use
Under Future Conditions

Figure Number:	12-21	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

12.3.9.3 Alterations in Movement

There could be alterations in waterfowl movement stemming from construction activities and operation of the road. The pathways or activities which may result in changes in waterfowl movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of Waterfowl.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of Waterfowl.

Construction

Loss of Connectivity

Roads can affect the movement of birds in different ways. They can result in habitat fragmentation, making it difficult for waterfowl to move freely between areas on either side of the road (Kociolek et al., 2011; Pell and Jones, 2015; Soanes et al., 2024). Ducks, for example, will avoid crossing open areas to reduce the risk of predation, instead preferring to remain in areas with more structurally complex and higher in available cover (Holopainen), such as wetlands containing tall grasses and shrubs.

Vegetation clearing for the WSR may decrease the availability of natural camouflage within the Project Footprint, thereby reducing the ability of waterfowl to travel safely between feeding, nesting and resting areas. Canada Geese prefer more open nesting locations and have shown some positive response to clear cuts (Lemielin et al. 2007); therefore, clearing for the WSR may act as a positive effect on the species. Barriers to movement can also impact seasonal migration and dispersal. The restriction of such movements can result in the functional isolation of populations and decreased their long-term persistence.

Sensory Disturbance

Waterfowl movement is likely to be altered by sensory disturbances associated with the construction phase. Noise, artificial light and other sensory disturbances can have substantial effects on birds relative to other effects and taxonomic groups (Kociolek et al., 2011). Auditory deterrents are used in the mining industry to keep waterfowl off of tailing ponds, the sudden random noises produced by these deterrents can be similar to some construction activities; however, habituation to these random noises has been shown (Ronconi and St. Clair, 2005).

Waterfowl such as Canada Goose and Mallard have adapted to urban environments throughout their respective ranges, but their boreal-nesting counterparts may not exhibit the same tolerance. Canada Goose are known to flush from their nest when approached by a human at a distance of 20-22 m (Miller et al., 2013) and flush from the water when approached by a kayak at a distance of 54 m (Avocet Research Associates, 2007); Mallards have been demonstrated to flush from the water when approached by a kayak at a distance of 18 m (Avocet Research Associates, 2007). Additionally, mallards have a higher nest desertion rate than other waterfowl due to human activity (Drilling et al., 2020). Since waterfowl in the RSA are not accustomed to the kinds of disturbance that would accompany road construction, the degree that they will avoid the WSR is uncertain.

Operations

Loss of Connectivity

During the operations phase, management activities will maintain roadside vegetation in an early seral state, with an anticipated 35 m width opening (clearing) being retained. Gaps in cover created by anthropogenic activities are known to impede movement of certain birds; however, the level of interference is species and habitat-dependent (Desrochers and Hannon, 1997; Grubb and Doherty, 1999). Few Studies directly have examined the effects of roads and water crossings on waterfowl in terms of locally limiting movement. For roads the lack of direct research may be due to the presumption that waterfowl are relatively large-bodied birds which are known to be less affected by the barrier effect of roads (Johnson et al. 2017) and due to waterfowl often seen on or near roads. For water crossings, they have been found to have no effect (Vance et al., 2012) or a small negative effect (Takeshige et al., 2023) on waterfowl movement along a river. Culverts may also provide an opportunity to cross under the roadway as waterfowl have been recorded using the structures to move between habitats.

Sensory Disturbance

Noise will be the primary sensory effect on waterfowl during operations. Traffic noise has been found to lower abundance and promote avoidance in many in many bird species (McClure et al. 2013). Traffic noise could interfere with their ability to communicate or could change their vigilance behavior. Waterfowl may move away from roads and use more distant areas more frequently due to traffic noise (Veon and McClung, 2023). Disturbance is species dependant with some species of geese changing spatial patterns of use in an area with traffic levels as low as 10 vehicles a day (Korschegen and Dahlgren, 1992). While Canada Goose and Mallards are generally tolerant of anthropogenic activity this tolerance is mainly know within urban dwelling individuals and local populations may not exhibit the same tolerance. Although artificial lighting from roads can interfere with natural behaviours, such as foraging and migration, the WSR will not be lit outside of the community, thereby reducing potential sensory impacts on waterfowl.

12.3.9.4 Wildlife Injury or Death

The construction of the road may lead to both direct and indirect waterfowl mortality. There may be increases in waterfowl injury or death due to collisions with vehicles and equipment during construction and operation of the WSR, with incidental take also occurring. Increased access into the LSA will provide opportunities for predation that did not exist prior to road construction, as well as increased chances of hunting, poaching and/or human-wildlife conflicts that lead to injury or death. The pathways or activities that may result in waterfowl injury or death include the following:

Equipment and vehicles moving within Project Footprint → Collisions with Waterfowl within Project Footprint → Injury or Death of Waterfowl.

Construction and operations activities clear vegetation → Incidental Encounters with Individuals or nests → Injury or Death of Waterfowl.

Construction and operations activities clear vegetation → Increased access for Waterfowl Predators → Injury or Death of Waterfowl.

Construction of Road → Increased access to Waterfowl habitat by poachers → Injury or Death of Waterfowl

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within Project Footprint may result in increased injury or death of waterfowl. Vehicles will be travelling between camps and construction locations, with human/vehicle-bird encounters not unexpected. Collisions with vehicles is one of the top three causes of bird mortality in Canada (Calvert et al., 2013). Although birds are typically perceived as being able avoid impacts by flying away from, or above vehicles and equipment, this is not always the case. According to Kociolek et al. (2015), birds bigger home ranges, larger body sizes, and lower flying heights are typically more susceptible to road impacts. Waterfowl are often seen crossing roads by walking as walking is less energetically costing than flying short distances (Bautista et al., 2001).

In coniferous-dominated Canadian landscapes with low-volume roads, it has been estimated that more than 14,000 birds are killed annually due to collisions with vehicles, or approximately one bird for every 3 km of road annually (Bishop and Brogan, 2013). Waterfowl comprise a relatively small number of avian casualties attributed to collisions with vehicles in Canada, at 1.06% of mortalities (Bishop and Brogan, 2013). Bird mortality related to vehicle collisions is often related to travel speed of the vehicle as birds use distance as a threat estimate and can misjudge the closing distance between themselves and the vehicle resulting in collision (DeVault et al. 2016). For ducks and geese, roads can be particularly challenging during certain times of the year. During moulting season, adult geese lose their flight feathers and are unable to fly, making them more likely to walk across roads. Additionally, goslings (young geese) cannot fly until they are older, so they must walk across roads to follow their parents. Collisions with helicopters are also possible when they are being used to ferry people and equipment. Canada Goose ranks second among birds in strike risk across the US for aircraft (DeVault et al., 2018).

Incidental Take

Vegetation clearing in waterfowl habitat during road construction may result in injury or death of birds, hatchlings, or eggs if the activity is conducted during the breeding season. Canada Goose typically nest on drier, slightly elevated sites near water such as on islands, muskrat lodges, or beaver lodges (Mowbray et al., 2020), while mallards usually nest on the ground in upland areas near water, with the nest placed under overhanging cover or in dense vegetation for concealment (Drilling et al., 2020). Mallards have a higher nest desertion rate than other waterfowl due to human activity (Drilling et al., 2020), which can result in the total abandonment and failure of the nest.

While some birds are known to move away from roads, others are attracted to early successional areas that form in ROWs. Waterfowl are generally not attracted to roads; however, if their natural habitats (e.g., ponds, wetlands) are in proximity, they may use the ROW to forage on grasses and young herbaceous plants, leading to increased opportunities for incidental take during construction.

Changes to Predator-Prey Dynamics

Effects on waterfowl survival from increased predator access and movement rates is probable. Predators of Canada Goose eggs and goslings include red fox and gulls (*Larus* sp.) (Mowbray et al., 2020). Red fox is also a predator of nesting female mallards and their eggs, while American mink (*Neovision vison*) will prey on adults and ducklings alike (Drilling et al., 2020). Corvids, including American crow (*Corvus brachyrhynchos*) and common raven (*Corvus corax*) will also depredate nests of both species (Mowbray et al., 2020; Drilling et al., 2020). Foxes, mink and corvids all may directly increase pressure on waterfowl populations because of new access routes created by the WSR. Adult Canada Goose predators include Bald Eagles, black bears and coyotes (CWF, 2024).

Waterfowl predators may also be attracted to construction camps, laydowns and worksites due to improper garbage storage and disposal. Unsecured garbage is particularly attractive because it provides an easy food source for many predators. Increased numbers of predators attracted to the Project Footprint would have probable direct effects on waterfowl inhabiting the area; however, nest success for ducks has often been found to be higher near roads with the hypothesis that roads may create refuges from nest predators because some duck predators avoid them (Pasitschniak-Arts et al. 1998; Dyson et al., 2024).

Increased Access

Project development could result in a negative effect on the abundance of waterfowl by permitting increased human access to habitats where populations are present. Mallards and Canada Geese are the most harvested duck and goose species in Canada (Canadian Wildlife Service Waterfowl Committee, 2023). By permitting humans to access to previously undisturbed areas, construction of the Project introduces novel opportunities for recreational hunting and increased harvesting by Indigenous communities and groups. Construction and other temporary workers may contribute to increased harvest during construction of the Project. These workers may exploit the local area to hunt during their time-off or post-shift.

Increased access to waterfowl habitat may also result in an increase in illegal harvest (poaching). Data and statistics on waterfowl poaching in Ontario and Canada are not readily available; however, enforcement actions are taken every year by the Wildlife Enforcement Directorate (WED) of ECCC's Enforcement Branch for violations under the Migratory Birds Convention Act, 1994 (ECCC, 2024). For example, in between 2018 and 2019, the WED confiscated 32 green-winged teal (Anas carolinensis) carcasses illegally harvested in Quebec (ECCC, 2019).

Operations

Collisions with Vehicles

During operations, the potential for vehicle-bird collisions will likely continue as cars, equipment and machinery move between residences and operational areas (e.g., Webequie First Nation and locations such as quarries, pits). Although traffic volume is anticipated to be low, collisions along the ROW will likely continue to have a negative effect on waterfowl fitness and survival, particularly for young birds, or moulting birds that are unable to react quickly to approaching vehicles.

Incidental Take

Vegetation management is proposed as part of the Operational Phase to maintain roadside vegetation in order to permit infrastructural repairs and/or promote driver safety (i.e., line of sight). Road maintenance may result in injury or death of birds, hatchlings, or eggs if vegetation clearing and/or management activities are conducted during the breeding season. Ground nesting waterfowl are the most likely affected group during the operations phase as large trees are unlikely to be removed which may contain cavity nesters and aquatic habitats which contain on water nesters are unlikely to be affected.

Changes to Predator-Prey Dynamics

Effects on from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Maintenance clearing during operations will maintain openness along the ROW which will allow predators increased access to wetland areas near the road exposing waterfowl to increased predation from species such as red fox and American mink,

corvids, and other species. Opportunistic species that are also waterfowl predators may also be attracted to operational areas if waste in improperly managed, leading to changes in predator-prey dynamics from pre-construction conditions.

Increased Access

During operations, human access along the WSR will be maintained, thereby potentially affecting the abundance of waterfowl by permitting increased opportunities to hunt, trap and poach wildlife in areas that were not easily accessible prior to road construction. Hunting pressure will be dependant on how local communities view hunting conditions and access. Local hunters often view short trips with easy access as the most preferred type of hunting trip (Sainsbury et al., 2024), this may put more pressure on areas close to the community.

12.3.9.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (NatureServe, 2012). Threats are assessed prior to any mitigative measures being applied. Assessments are generally done at the population level, and for Canada goose and Mallard, which can have territories that can range in size from 0.8 to 4 hectares, and 0.2 to 0.6 hectares, respectively, the evaluation was made at the LSA level.

Scope is small for most threats as the percent of the population affected is less than 10% of the available habitat and population within the LSA. Scope is moderate for increased access as areas immediately adjacent to the road and supportive infrastructure will be affected. Scope is also moderate for Hydrological alteration as effects may be felt up to 250 m from the road. Severity of the threats ranges from slight to serious: threats related to loss of habitat by vegetation removals and hydrological changes are serious as within the scope based on the degree of habitat loss; sensory disturbances are rated as moderate due to the avoidance of transportation corridors by waterfowl as are collisions with vehicles and increased access; all other threats are slight. Magnitude is medium for increased access, as once undisturbed areas are entered, it will take time for succession to occur and reestablish natural barriers. Magnitude is rated low for all other threats.

Irreversibility is high for hydrological changes and very high for vegetation removal as the roadbed will likely never be removed but hydrological mitigations could be done. Irreversibility is also high for spills, edge effects, invasive species, and predation because while the effects can technically be reversed it would take time and considerable effort. Hunting and loss of connectivity could be restored with a reasonable commitment of resources. The rest of the threats were deemed low and can be easily reversed.

A summary of the threat assessment for waterfowl habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-32**.

Table 12-32: Summary of Threat Assessment for Potential Effects on Waterfowl

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearing Activities	Small	Serious	Low	Very High	Moderate
Habitat Loss – Hydrological Changes	Small	Serious	Low	High	Low
Habitat Alteration or Degradation – Spills	Small	Serious	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Restricted	Moderate	Medium	High	Moderate
Habitat Alteration or Degradation – Sensory Disturbance	Small	Moderate	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	Medium	Low
Alteration in Movement – Sensory Disturbance	Small	Moderate	Low	Low	Low
Injury or Death – Collisions with Vehicles	Small	Moderate	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Small	Slight	Low	High	Low
Injury or Death – Increased Access	Restricted	Moderate	Medium	Medium	Moderate

12.3.10 Shorebirds (Greater Yellowlegs)

12.3.10.1 Habitat Loss

There may be shorebird habitat loss resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. These losses could be to both foraging and breeding habitats. The pathways or activities that may result in loss or destruction of wildlife habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Loss/destruction of Shorebird habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → loss/destruction of Shorebird habitat.

Construction

Clearing Activities

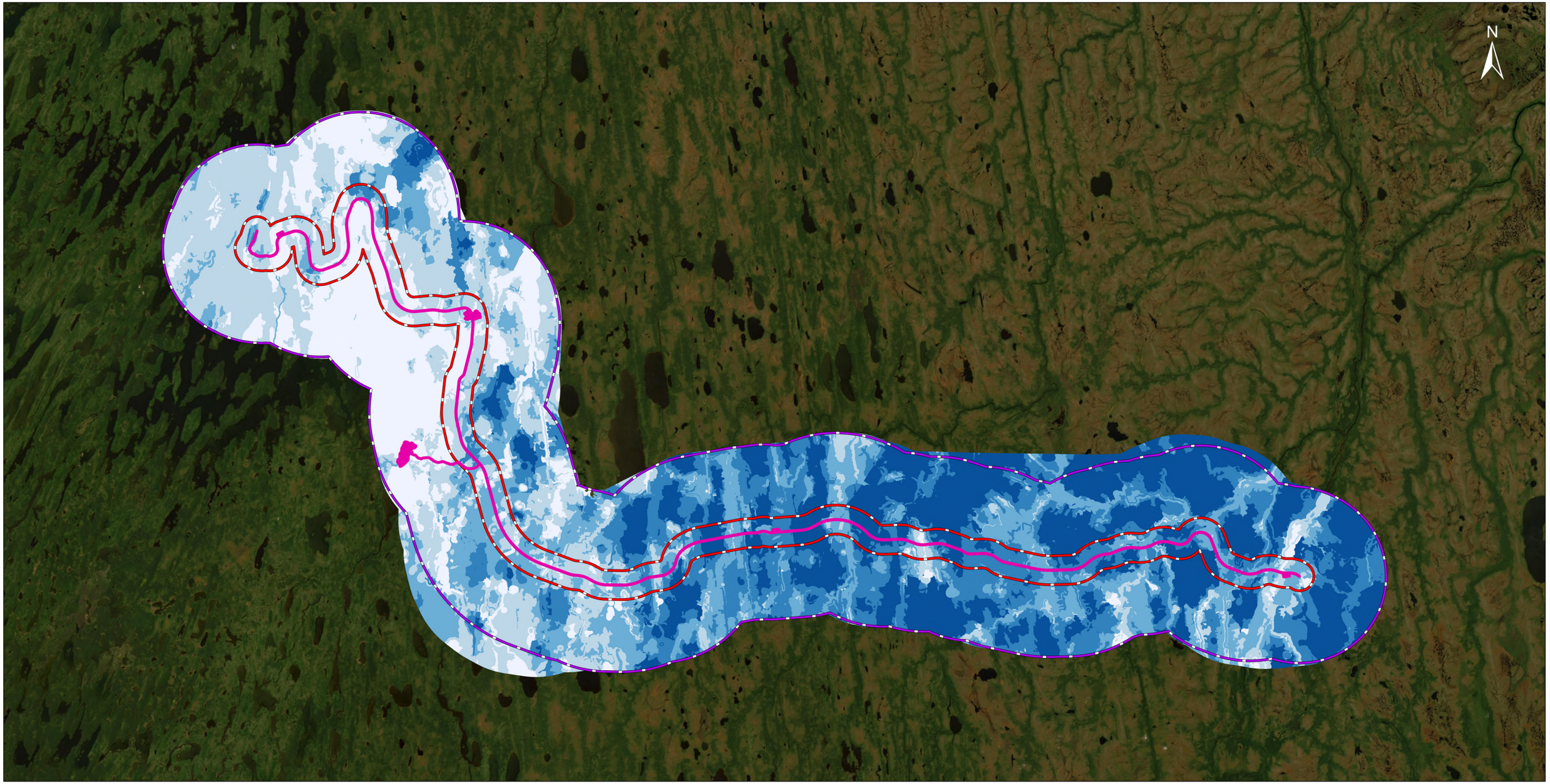
The construction of the Project has the potential for direct and indirect effects that could cause the loss of Shorebird habitat through physical alteration and removal of suitable habitat. Greater Yellowlegs in the eastern Canadian boreal nest primarily in open wetlands, specifically large open fens with open waterbodies (COSEWIC, 2020). They also nest in raised open areas like regenerating burns that retain their wetland features (Cadman et al. 2007).

Using the results of habitat modelling via Ecological Land Classification (refer to Section 11: Assessment of Effects on Vegetation and Wetlands), and based on an understanding Greater Yellowlegs habitat preferences and the Project Footprint, estimate construction activities will result in the removal of 29.62 ha (1.04%) of Sparse Treed Bog, 43.47 ha (1.55%) of Sparse Treed Fen, 0.33 ha (032%) of Open Shore Fen, 5.92 ha (1.11%) of River/Fen, 1.38 ha (0.25%) of Poor Fen, and 0.05 ha (0.03%) of Open Bog in the LSA, representing approximately 1.15% of the most suitable Greater Yellowlegs habitat in the LSA. Overall, suitable Greater Yellowlegs habitat is common throughout the study areas with 25.4% of the LSA and 26.29% of the RSA consisting of these vegetation communities.

RSF modelling was done for Greater Yellowlegs using Point Count and ARU data. **Figure 12.22** shows the predicted use of the RSA under existing conditions for Greater Yellowlegs. The Project Footprint was overlayed, and the underlying habitat removed. For Greater Yellowlegs, this represents a loss of approximately 0.63% of high-use habitat in the LSA and a loss of 0.14% of high-use habitat in the RSA due to road construction and operations (**Table 12-33**). Modeled probability of use ranged from 0.0 to 0.828 with the High Use quantile (highest 20%) starting at 0.337.

Table 12-33: Shorebird Species High-Use Habitat by Study Area

Habitat Use	LSA			RSA		
	Area Removed (ha)	Pre-Construction (ha)	% Removed	Area Removed (ha)	Pre-Construction (ha)	% Removed
High	8.1	1,291.43	0.63	8.1	5,684.85	0.14
Moderate	78.91	5,947.76	1.33	79.73	29,303.66	0.27
Low	357.23	19,977.96	1.79	463.3	98,430.34	0.47



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.113
- 0.113 - 0.150
- 0.150 - 0.218
- 0.218 - 0.379
- 0.379 - 0.828

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

RSF Modeling for Greater Yellowlegs based on Probability of Use Under Existing Conditions

Figure Number:	12-22			**REV:**	PA
Client:	Webequie First Nation	**Project Number:** 661910	**Date:** 5/20/2025		
DSC				**DRN**	TE
				CHK	GS
				APP	GS

Hydrological Changes

Potential changes in surface water drainage patterns and increases or decreases in flows and surface water levels in waterbodies, as well changes to groundwater, are described in detail in Section 7 (Assessment of Effects on Surface Water Resources) and Section 8 (Assessment of Effects on Groundwater Resources). Construction activities have the potential to locally influence the contribution of groundwater discharge to the baseflow of waterbodies. Specifically, Project construction may lead to changes in the local hydrogeological environment by increasing, decreasing or redirecting groundwater flows. Changes in surface water conditions can also occur with the installation of crossing structures. While changes are generally concentrated downstream of the effect, they can also take place on the upstream side if channel restriction causes changes to water impoundment. Extreme changes, such as those due to poor road design or large fluctuations in water levels, can lead to death of vegetation and loss of Greater Yellowlegs habitats, including nesting as they are converted to open water habitats (Bocking et al., 2017).

Operations

Clearing Activities

Operation of the roadway is unlikely to result in additional loss of Greater Yellowlegs habitat as maintenance activities will involve managing re-growth of vegetation along the ROW within the Project Footprint. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations, but it is predicted that these effects would be short-term and of limited size. While the quarries are expected to remain operational following construction, the footprints will not be expanded and as such no additional habitat loss or destruction is anticipated to occur during operations.

Hydrological Changes

Greater Yellowlegs habitat loss through changes to hydrology could also occur during the operations phase due to culvert and crossing structure maintenance. Habitat loss could occur if culvert maintenance is ignored, either in terms of repairs to the structure or removal of accumulated debris. Given sufficient time, death of vegetation and loss of habitat could occur (Bocking et al., 2017).

12.3.10.2 Habitat Alteration or Degradation

There may be alterations or degradation to Shorebird habitat resulting from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. Alteration of habitat is defined as a modification in the habitat type or quality of the habitat, this change could be either positive or negative (Fuller, 2017). Habitat degradation is defined similarly as decline in the quality of the habitat resulting in reduced capacity to support the target species. The pathways or activities which may result in alteration or degradation of shorebird habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration and degradation of Shorebird habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration and degradation of Shorebird habitat.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances effect on adjacent areas → Alteration and degradation of Shorebird habitat.

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect → Alteration and degradation of Shorebird habitat.

Construction and maintenance activities → Introduction of invasive species → Alteration and degradation of Shorebird habitat.

Construction

Habitat Structural Change

Changes to vegetation structure during road construction activities may alter or degrade shorebird habitat near the Project Footprint due to vegetation clearing activities and removals. These vegetation removals may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat after the implementation of mitigation measures. It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation.

RSF modeling based on future disturbance was used to predict change in use from clearing the ROW and changing existing habitat features into early seral communities (see **Section 12.4.2.1** for details). The Project is predicted to result in a 5.69% decrease of use by Greater Yellowlegs within the Project Footprint. Small positive changes are predicted within the LSA and RSA but are l within modeling margins of error and can be interpreted as no significant change. **Figure 12.23** shows the probability of habitat use for Alder Flycatcher within the RSA under future disturbance conditions.

Table 12-34: Greater Yellowlegs Probability of Habitat Use Percent Change by Study Area

Species	% Change		
	Project Footprint	LSA	RSA
Greater Yellowlegs	-5.69%	0.09%	0.04%

Shorebird species from multiple families have been found to rely on bare, wet ground for thermoregulation when experiencing high ambient temperatures (Ryeland et al. 2020), and such microhabitat features may experience edge effects if they occur adjacent to the ROW. The edge effect on Greater Yellowlegs is likely relatively low due to the more open and lower vegetation structure of its preferred wetland communities compared to forested habitats which undergo large changes in structure and composition due to edge effects (Frankin et al. 2020) in addition to its ability to use disturbed habitats like areas cleared for forestry (OBBA, 2005).

Accidental Spills

Accidental spills and releases that occur during construction phase may result in shorebird habitat degradation. Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds throughout which pollutants can spread. Depending on concentrations and material spilled, an accidental spill could cause death of vegetation, lower productivity and alter the vegetation community (Hutchinson and Freedman, 2011; Lednev et al., 2023). These changes in habitat could degrade Greater Yellowlegs foraging and nesting habitat.

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of the landscapes they traverse. While destruction of habitat can result in extreme cases, alteration and degradation of shorebird habitat can occur in many others (Bocking et al., 2017). Flooding events during construction may result in erosion of the ROW and deposition of granular materials into adjacent wetlands and waterways. Conversely, hydrological changes associated with construction may affect wetland drainage patterns, resulting in lower or higher water levels and altering the plant community (Miller et al. 2015). These changes can be extensive, a study within boreal fens in Alberta found pronounced differences in canopy cover up to 250 m from road edges in both rich and poor treed fens (Willier et al., 2022). Lowering of the water table could result in a decreased number of small ponds and wetlands near the roadbed used by Greater Yellowlegs. Potential changes in surface water drainage patterns and increases or decreases in flows and surface water levels in waterbodies, as well changes to groundwater, are described in detail in Section 7 (Assessment of Effects on Surface Water Resources) and Section 8 (Assessment of Effects on Groundwater resources), respectively.

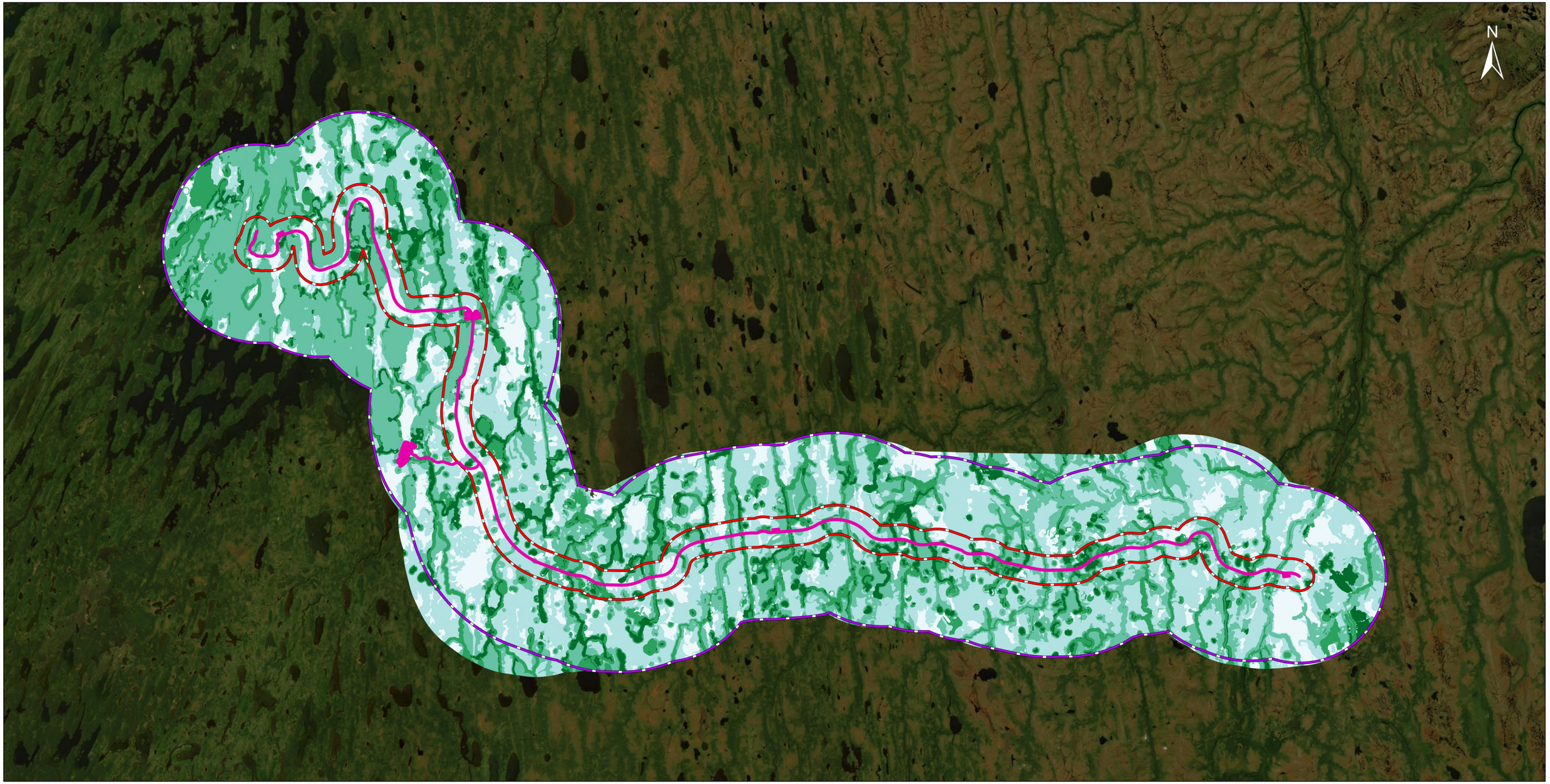
Sensory Disturbance

Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for Greater Yellowlegs adjacent to the Project Footprint, reducing utilization of the area or masking vocalizations related to courtship or alarm calling (Zhou et al. 2024). While sensory disturbance effects on Greater Yellowlegs have not specifically been measured, human disturbance has been shown to reduce shorebird abundance and site fidelity (Gibson et al., 2017; Placidos et al., 2021).

Sensory disturbance may be especially high during construction when activities such as blasting, quarrying, hauling and clearing may occur during all hours causing wetland birds to avoid the ROW and supportive infrastructure. Construction noise is less continuous and more impulsive than traffic noise so habituation to the noise would not be likely in most cases. Research on shorebird response to impulsive noise, such as occurs during construction, showed area abandonment by birds at high decibel levels (Wright et al. 2010). Light pollution can have a major effect on shorebirds. Shorebirds may avoid roosting at artificially lit roosts and a lack of unlit roost areas mat cause shorebirds to avoid using otherwise suitable feeding grounds (Gaston et al., 2013).

Introduction of Invasive Species

The introduction and spread of noxious and invasive plant species have the potential to affect aquatic and terrestrial habitats used by Greater Yellowlegs. Invasive plant species can affect multiple ecosystem aspects including structure, diversity and function (CFIA, 2008). One of the pathways of spread for invasive plants is through construction activities and associated equipment use. Construction equipment has the potential to transport and spread invasive plants, with cleared areas including roadsides being susceptible to invasion (Hanen and Clevenger, 2005). The use of contaminated seed mixes in restoration efforts is also a pathway for invasive plants to establish in an area (Houghen et al. 2012). Once established in a new habitat, most invasive species are nearly impossible to eradicate (Pimentel et al. 2005). While invasive plants are known to spread along transportation corridors, few invasive species have been found in naturally occurring open habitats such as the wetland habitats used by Greater Yellowlegs (Langor et al. 2014).



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.069
- 0.069 - 0.093
- 0.093 - 0.157
- 0.157 - 0.260
- 0.260 - 0.900

WSR WEBEQUIE SUPPLY ROAD

NOTES

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0 5 10 km

Webequie Supply Road

RSF Modeling for Greater Yellowlegs based on Probability of Use Under Future Conditions

Figure Number: 12-23			**REV:** PA		
Client: Webequie First Nation	**Project Number:** 661910	**Date:** 5/20/2025			
DSC			**DRN** TE	**CHK** GS	**APP** GS

Operations

Accidental Spills

Similar to the effects of construction, there could be effects to water quality during the operations phase of the Project from accidental spills which may result in Greater Yellowlegs habitat degradation. Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds throughout which pollutants can spread. Spills during operations would most likely originate from accidental releases from vehicles. The road is forecasted to have low traffic volumes, and traffic along the roadway will be primarily personal and commercial vehicles and transport trucks associated with the community. While estimated frequency of spills is low (0.00000019 spills per mile, or 0.00000012 spills per kilometer, (Harwood and Russell, 1990), its predicted that minor spills and release are possible.

Hydrological Changes

Changes to hydrology could also occur during the operations phase due to culvert and crossing structure maintenance. Localized changes to hydrology could occur if culvert maintenance along the road is ignored, either in terms of repairs to the structure or removal of accumulated debris. The area affected would be dependent on the amount of time the culvert remains blocked as well as the size of the impounded area.

Sensory Disturbance

Sensory disturbances resulting from road operations may degrade habitat for Greater Yellowlegs adjacent to the Project Footprint, reducing utilization of the area or masking vocalizations of individuals that remain. Most sensory effects during operations will be related to traffic noise which has been found to degrade bird habitat either through complete avoidance of areas near roads or decreased habitat value (Ware et al. 2015; Summers et al. 2011). Sensory disturbance has been found to lower abundance of birds near roads, especially at high traffic densities (Husby, 2017). Studies on Greater Yellowlegs have shown that abundance decreases in areas around transportation corridors (ABMI, 2023). Acoustic modeling places the 50db zone of influence at approximately 125 m beyond the Project footprint (See Appendix J), and 50 dB is the noise level Environment and Climate Change Canada uses in their guidelines to avoid harm to migratory birds (EEEC, 2023). While lighting along roads is a major sensory disturbance for shorebirds, the WSR will not have lighting except near the community limiting its effects.

Habitat Structural Change

Edge effects associated with structural changes to habitat during operations will have similar effects on Greater Yellowlegs and their habitat. While it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW.

Introduction of Invasive Species

The introduction and spread of noxious and invasive plant species could also occur during operations and will have similar potential effects on Greater Yellowlegs habitat. Road operations could have larger effects than construction in terms of introduction, particularly of invasive aquatic plants. Aquatic plants can be introduced to waterbodies when recreational boats are moved, and improper cleaning and

decontaminating procedures are used on the boat or equipment (Cole et al. 2019). While recreational boating has been found to be responsible for movement invasive species throughout the Great Lakes region (Cole et al. 2019), currently the spread of invasive aquatic plants into the boreal has only occurred in a few isolated pockets (iNaturalist, 2024). Given that transportation corridors are avenues of dispersal for invasive plants (Langor et al. 2014), operation of the road has the potential to spread aquatic as well as terrestrial invasive plants into the project area.

12.3.10.3 Alterations in Movement

There may be alterations in shorebird movement stemming from construction activities and operation of the road. The pathways or activities which may result in changes in wildlife movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of shorebirds.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of shorebirds.

Construction

Loss of Connectivity

Gaps in cover created by anthropogenic activities are known to impede movement of certain birds; however, the level of interference is species and habitat-dependent (Desrochers and Hannon, 1997; Grubb and Doherty, 1999). Bird species that have shown reluctance to cross gaps, like those created by roads, are generally forest species where the road creates a distinctive edge between the road and preferred habitats, with larger gaps acting as a greater barrier (Grubb and Doherty, 1999). The project ROW, at 35 m, is smaller than the gap size (50 m) found to limit crossings for some boreal birds (St Clair et al., 1998), although some laydown and temporary clearings will exceed this limit.
Greater Yellowlegs prefer more open habitats where the road ROW would present as less of a barrier as it is more structurally similar to wetland habitats; however, Greater Yellowlegs are known to use linear disturbances, including transportation corridors, at lower levels (ABMI, 2023). Additionally, no studies were found that indicated shorebirds respond to road gaps as a barrier.

Sensory Disturbance

Greater Yellowlegs may alter their movement in response to sensory disturbances that are associated with Project construction. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of Greater Yellowlegs as they avoid the project ROW and supportive infrastructure. Some shorebird species, when roosting, have been found to respond behaviourally to sudden, loud noises by flying away and abandoning their roost site (Wright et al. 2010). Human activity can increase the amount of time that shorebirds spend moving, increasing energy expenditure and decreasing the amount of time available for foraging (Murchison et al., 2016).

Operations

Loss of Connectivity

As was the case during the construction phase, alteration in movement due to loss of connectivity may occur during road operation. Maintenance activities will maintain vegetation in an early seral state; however, like during the construction phase, movement of Greater Yellowlegs within these areas may be minimally affected by the fragmentation as Greater Yellowlegs prefer more open habitats including some anthropogenically disturbed sites.

Sensory Disturbance

Noise will be the primary sensory effect on Greater Yellowlegs during operations. Traffic noise has been found to lower abundance and promote avoidance in many in many bird species (McClure et al. 2013). High traffic roads have been shown to affect shorebird distribution when noise exceeded 56 dB (Hirvonen, 2001). Greater Yellowlegs may also be affected by the visual presence and movement of vehicles. Shorebirds have been found to increase their time away from the nest, change their use patterns and spend increased time in flight when exposed to nearby off-highway vehicles (OHV) (Defeo et al. 2009; Schlacher et al., 2013). Cole et al. (2019) found that in a highly regulated OHV trail system, which is more similar to a road network, these responses did not occur, and overall, some habituation may be possible (Schlacher et al., 2013). Given Greater Yellowlegs avoidance of transportation corridors, some avoidance of the area may occur (ABMI, 2023).

12.3.10.4 Injury or Death

The construction of the Project may lead to both direct and indirect shorebird mortality. There may be increases in wildlife injury or death stemming from increased vehicle traffic or clearing activities during both construction and operation of the road, with indirect mortalities arising from increased predator encounters and human access. The pathways or activities that may result in shorebird injury or death include the following:

Equipment and vehicles moving within Project Footprint → Collisions with Shorebirds within Project Footprint → Injury or Death of Shorebirds.

Construction and operations activities clear vegetation → Incidental encounters with Individuals or nests → Injury or Death of Shorebirds.

Construction and operations activities clear vegetation → Increased access for Shorebird Predators → Injury or Death of Shorebirds.

Construction of Road → Increased access to Shorebird habitat by poachers → Injury or Death of Shorebirds.

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within Project Footprint could result in increased death and injury of shorebirds. Collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). Vehicles will be travelling between camps and construction locations; these trips could occur at all hours and encounters with birds would not be unexpected. Bird mortality from

vehicle collisions is often related to travel speed of the vehicle as birds use distance as a threat estimate and can misjudge the closing distance between themselves and the vehicle, resulting in collision (DeVault et al. 2016). Shorebirds comprise a relatively small number of avian casualties attributed to collisions with vehicles in Canada, at 0.9% of mortalities (Bishop and Brogan, 2013). Shorebird collisions with vehicles can occur when they move between feeding areas (Buchanan, 2011).

Incidental Take

Vegetation clearing in Greater Yellowlegs habitat during road construction, and/or movement of equipment/vehicles though vegetated areas, may result in injury or death to birds, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season. Greater Yellowlegs nest on the ground at the base of short (1-2 m) coniferous trees and placed in or next to a moss or shrub-covered hummock (Elphick and Tibbitts, 2020). The characteristics of shorebird nests can make them difficult to detect. Additionally, nesting adult Greater Yellowlegs can be reticent and stay on their nest when approached by humans (Elphick and Tibbitts, 2020).

Changes to Predator-Prey Dynamics

Effects on Greater Yellowlegs survival from improved predator access and movement rates is possible during the construction phase. Linear features are known to facilitate predator movement in the boreal (Dickie et al., 2017; Benoit-Pepin et al., 2024) and creation of new roads connected to human activity is known to spread predators into previously unoccupied areas (Lantham et al. 2011). Effects on shorebirds from predator encounters are predicted to be long term in duration as predators are known to use linear features well beyond their operational lifetime. Possible predators of Greater Yellowlegs include a variety of raptor species, such as Bald Eagle, Northern Harrier, Merlin, and Peregrine Falcon (Elphick and Tibbitts, 2020). Nest predators are not well documented for Greater Yellowlegs (Elphick and Tibbitts, 2020) but likely include mammals such as red fox which can incorporate roads into their home ranges to increase travel distance and penetration into wetlands (Frey and Conover, 2006).

Increased Access

The development of the Project could result in a negative effect on the abundance of shorebird species through increased human access to habitats where populations are present. Access to previously undisturbed areas introduces opportunity for recreational hunting and increased harvesting by Indigenous communities and groups. Construction and other temporary workers may contribute to increased harvest during construction of the Project. These workers may exploit the local area to hunt during their time-off or post-shift. While hunting of shorebirds was extensive in the 19th and early 20th century, Greater Yellowlegs has not been legally harvested in Canada, except by First Nation Peoples, since the introduction of the *Migratory Bird Act* in 1918. Data and statistics on shorebird poaching in Ontario and Canada are not readily available; however, enforcement actions are taken every year by the Wildlife Enforcement Directorate (WED) of ECCC's Enforcement Branch for violations under the Migratory Birds Convention Act, 1994 (ECCC, 2024). Currently hunting by Indigenous communities is thought to be negligible (COSEWIC, 2020).

Operations

Collisions with Vehicles

Vehicles traveling along the road during operations could collide with Greater Yellowlegs causing injury or death. Collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). In coniferous-dominated Canadian landscapes with low-volume roads, it has been estimated that more than 14,000 birds are killed annually due to collisions with vehicles, or approximately one bird every 3 km per year (Bishop and Brogan, 2013). Shorebirds comprise a relatively small number of avian casualties attributed to collisions with vehicles in Canada, at 0.9% of mortalities (Bishop and Brogan, 2013) but are likely under-reported due to their small size. For Greater Yellowlegs in particular, the effect of collisions on populations is unknown.

Incidental Take

Vegetation clearing in Greater Yellowlegs habitat is also scheduled to occur during operations as they use open habitats, including cleared areas. Though smaller in scale, periodic clearing of the ROW may occur during operations as part of line-of-sight maintenance or infrastructure repairs. If maintenance occurs during the breeding season, nests, eggs, and individuals could be injured or killed, as the cryptic behavior of Greater Yellowlegs during breeding will be unchanged, presenting the same potential for incidental take.

Changes to Predator-Prey Dynamics

Effects on Greater Yellowlegs from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Maintenance clearing during operations will maintain openness along the ROW which will allow predators increased access to wetland areas near the road exposing ground nesters, like Greater Yellowlegs, to increased predation. While some studies have found a positive effect on bird survival due to roads and resulting predator avoidance of roads, it is often attributed to higher levels of human presence and traffic (Pescador and Peris, 2007; Singer et al. 2020), which given the low traffic levels are unlikely for this Project.

Increased Access

Access to Greater Yellowlegs Habitat will continue during operations, potentially leading to harvest of Greater Yellowlegs. Creation of roads in previously inaccessible areas can often lead to increased use by hunters (Crichton et al., 2004; Boston 2016). The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase.

12.3.10.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (NatureServe, 2012). Threats are assessed prior to any mitigative measures being applied. Assessments are generally done at the population level, and for Greater Yellowlegs, which can range up to 13 km from the nest to forage during the incubation and brood-rearing periods (Elphick and Tibbitts, 2020). Based on this the RSA was deemed the most appropriate scale for the assessment.

Scope is small for all threats as the percent of the population affected is less than 10% of the available habitat and population within the RSA. Severity of the threats ranges from slight to serious: threats related to loss by vegetation removals and hydrological changes are serious as within the scope based on the high degree of habitat loss; sensory disturbances are rated as moderate due to the avoidance of transportation corridors by Greater yellowlegs as are changes to predator-prey dynamics and hydrological alteration of habitat; all other threats are slight. Magnitude is rated as low for all threats.

Irreversibility is high for hydrological changes and very high for vegetation remove as the roadbed will likely never be removed but hydrological mitigations could be done. Irreversibility is also high for spills, edge effects, invasive species, and predation because while the effects can technically be reversed it would take time and considerable effort. Hunting and loss of connectivity could be restored with a reasonable commitment of resources. The rest of the threats were deemed low and can be easily reversed. The degree of effect was low for all except vegetation loss which was moderate.

A summary of the threat assessment for Greater Yellowlegs habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-35**.

Table 12-35: Summary of Threat Assessment for Potential Effects on Greater Yellowlegs

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearing Activities	Small	Serious	Low	Very High	Moderate
Habitat Loss – Hydrological Changes	Small	Serious	Low	High	Low
Habitat Alteration or Degradation – Spills	Small	Serious	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Sensory Disturbance	Small	Moderate	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	Medium	Low
Alteration in Movement – Sensory Disturbance	Small	Moderate	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes to Predator-Prey Dynamics	Small	Moderate	Low	High	Low
Injury or Death – Collisions with Vehicles	Small	Slight	Low	Low	Low
Injury or Death – Increased Access	Small	Slight	Low	Medium	Low

12.3.11 Raptors (Red-tailed Hawk, Great Grey Owl)

12.3.11.1 Habitat Loss or Destruction

Raptor habitat loss may result from vegetation clearing and disturbance during construction and throughout operations. The pathways or activities which may result in loss or destruction of Raptor habitat include the following:

Site preparation and vegetation clearing and ground disturbance → Loss of Raptor habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Loss of Raptor habitat.

Construction

Clearing Activities

The construction of the road has the potential for direct and indirect effects that could cause the loss of Raptor habitat through physical alteration and removal of suitable habitat.

Red-tailed hawk occupies a wide range of habitats, only avoiding areas with dense forests and large treeless expanses (Preston and Beane 2009). For nesting tall trees are preferred. Deciduous and Mixedwood forest containing large aspen are frequently used but tall conifers are also potential nest sites. Red-tailed hawk will also use nest platforms and transmission towers.

Great Grey Owls hunt in bogs, treed swamps and edges of forests where suitable perching habitat exists. Great Grey Owls don't build their owl nests either using the broken top of snags or re-using stick nests from other species such as hawks, crows and ravens. While commonly associated with conifer forests Great Gray Owl will use all forest types where other large birds build stick nests. Great Gray Owl will also use nest platforms if available.

Based on an understanding of raptor habitat preferences, the results of habitat modelling for Ecological Land Classification (refer to Section 11: Assessment of Effects on Vegetation and Wetlands) were used to estimate removals of preferred breeding habitat during construction. Predicted construction activities will result in the removal of 81.15 ha (4.3%) of Conifer Forest, 1.60 ha (3.13%) of Hardwood Forest, and 4.21 ha (3.32%) of Mixed Forest, representing approximately 7.58% of available potential high quality raptor nesting habitat in the LSA. Some swamps with large trees may be used but are not considered as the highest quality sites. Overall, suitable raptor breeding habitat is somewhat uncommon throughout the study areas with 8.34% of the LSA and 7.66% of the RSA consisting of these vegetation communities.

Raptor Nests (i.e., stick nests) were recorded during aerial surveys near but not within the Project Footprint. A total of one Great Gray Owl ness was recorded and no red-tailed hawk nests although five nests of unknown origin were recorded; none were within 1 km of the WSR route alternatives. Nests are often reused year after year, therefore there is a low likelihood that any nests will be removed as a result of construction.

Both species use open areas but as perch hunters required trees or other structures nearby. In the boreal suitable foraging habitat for Great Gray Owls would include treed bogs, fens burns and roadside clearances (Kirk and Duncan, 1996). (insert) Red-tailed hawks may use similar sites but often in more open environments, knowledge of Red-tailed hawk habitat use in boreal wetlands is sparse. Creation of

openings may increase available foraging habitat, particularly for Red-tailed hawk which often use open areas adjacent to forested areas (Smith et al., 2003). Using the results of habitat modelling for Ecological Land Classification 213.79 ha of Great Gray Owl foraging habitat (sparse treed fens and bogs, poor fen, low treed bog and poor swamp) will be removed during construction and 74.87 ha of Red-tailed hawk foraging habitat (sparse treed fens and bogs, poor fen, open bog and shore fens). These represent approximately 1.37% and 1.15% of available potential high-quality habitat in the LSA, respectively. Not all construction activities are expected to be habitat losses, Both Red-tailed hawk and Great Grey Owl may use disturbed areas like clearings, laydowns and pipelines. Temporary clearings will provide additional Red-tailed hawk and Great Grey Owl foraging habitat, at least in the short-term. Overall, suitable forging habitat is common throughout the study areas with 24.22% and 57.33% of the RSA suitable foraging habitat for Red-tailed hawk and Great Gray Owl respectively.

Hydrological Changes

Raptor could be affected by hydrological changes causing habitat loss. Construction activities have the potential to cause the destruction of raptor habitat through changes to groundwater and surface flows. Road construction in particular can alter subsurface flows in peatlands changing the hydrology long-term (Waddington et al. 2014). Changes in surface water conditions can also occur with the installation of crossing structures. Such changes are generally concentrated downstream of the effect but can also take place on the upstream side if channel restriction causes water impoundment, which can cause death of vegetation (Bocking et al., 2017). While Red-tailed hawks generally nest in upland super-canopy trees, these are can be located near water. Great Gray Owl will reuse any large stick nest including nests in wetlands or near water. Extreme hydrological changes due to poor road design or water level fluctuations may lead to death of vegetation and loss of raptor nesting habitats as they are converted to open water habitats (Bocking et al., 2017).

Operations

Clearing Activities

Operation of the roadway is unlikely to result in additional loss of raptor habitat as maintenance activities will involve managing re-growth of vegetation along the ROW within the Project Footprint. A small chance exists that large trees adjacent to the roadway may be removed if they pose safety concerns these may contain raptor nest as snags can be used by both Red-tailed hawks (Preston and Beane, 2009) and Great Gray Owl (Kirk and Duncan, 1996). There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations; therefore, in the short- to medium-term, no trees used by Red-tailed hawks or Great Gray Owls for nesting are likely to be impacted. While the quarries are expected to remain operational following construction, the footprints will not be expanded and as such no additional habitat loss or destruction is anticipated to occur during operations.

Habitat Loss due to Hydrological Changes

Habitat loss for raptors through changes to hydrology is unlikely to occur during the operations phase. Changes to hydrology could potentially occur during the operations phase due to culvert and crossing structure maintenance. Culverts and other crossings could become partially or fully blocked from sediment or beaver activity. Hydrological changes during operations are likely to affect a much smaller area and are unlikely to affect large diameter canopy trees which would be more likely located in drier areas.

12.3.11.2 Habitat Alteration or Degradation

Raptor habitat alteration or degradation may result from vegetation clearing and disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of raptor habitat include the following:

Accidental spill during construction or operations activities → Transportation of material into wetland → Alteration or degradation of Raptor habitat.

Construction of roadbed and crossing structures → Hydrological changes to ground or surface water → Alteration or degradation of Raptor habitat.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Sensory disturbances impact on adjacent areas → Alteration or degradation of Raptor habitat.

Construction and operations activities clear vegetation → Structural differences between cleared and remaining vegetation create edge effect → Alteration or degradation of Raptor habitat.

Construction and maintenance activities → Introduction of invasive species → Alteration or degradation of Raptor habitat.

Construction

Accidental Spills

Accidental spills and releases that occur during construction phase may result in raptor habitat degradation. Depending on concentrations and material spilled, an accidental spill could cause death of vegetation, lower productivity and alter the vegetation community (Hutchinson and Freedman, 2011; Lednev et al., 2023). While spills in uplands may cause local soil contamination and vegetation degradation these upland areas and associated wildlife species are likely less affected than lowland areas that are often hydrologically connected through subsurface flows (Smerdon et al., 2005). If large caliber trees die due to contamination some nest site locations may be lost in the long-term. Snags may still be used as nest sites by some raptors including Great Grey Owl and Red-tailed hawk.

Hydrological Changes

It is widely accepted that roads can alter the hydrologic function and characteristics of peatland communities (Saraswati et al., 2020). Peatlands, which make up the majority of vegetative communities in the RSA, are susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by roads. Changes in wetland drainage patterns, resulting in lower or higher water levels, can alter the plant community (Miller et al. 2015) including the tree canopy. These changes can be extensive: a study within boreal fens in Alberta found pronounced differences in canopy cover up to 250 m from road edges in both rich and poor treed fens (Willier et al., 2022); however, tree loss, which would impact on raptor nesting sites, would be confined to the area closest to the road (Saraswati et al., 2020). Changes can take decades to appear, and if a road is constructed without consideration of drainage these effects can extend hundreds of meters (Juglum, 1975).

Habitat Structural Change

Changes to vegetation structure during road construction activities, such as vegetation clearing and removal, may alter or degrade raptor habitat near the Project Footprint. These vegetation removals may also lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat. For both Red-tailed hawk and Great Grey Owl, in terms of habitat degradation, a large component of the effect is associated with removal of mature forests that may serve as nest sites and replacement with early seral communities in temporary supportive infrastructure areas and within the road ROW. While temporary camps, laydowns, and access roads are scheduled for restoration, regrowth of forests in the boreal is slow.

In terms of foraging, Red-tailed hawks are unlikely to be affected by the edge creation as they often preferentially chose edges and forest fragmentation can be a gain in habitat (La Sorte et al., 2004). For Great Grey Owls, their preference for large tracts of forest for nesting may be affected by cutting the ROW but Great Grey Owls often use of open edges of forest for foraging (Johnsgard, 1988).

Sensory Disturbance

Sensory disturbances resulting from road construction and operations, including movement of equipment and vehicles, noise, vibration, and other human activities may degrade habitat for raptors adjacent to the Project Footprint, reducing utilization of the area. Noise and light may degrade raptor habitat by reducing utilization of the area, this may be especially true during construction when activities such as blasting at quarries and pits, hauling and clearing may occur causing raptors to avoid areas around the road ROW and supportive infrastructure areas. Construction noise is less continuous and more impulsive than traffic noise, raptors responding negatively to loud sporadic noise such as excavating, blasts or helicopter overflights using the areas less during noise events (Schuenk et al. 2001), this is especially true of raptors that have not previously been exposed to anthropogenic noise (Andersen and Rongstad, 1989). Some habituation may occur at least for Great Grey Owl as owls have been found to use sites industrial noise (Shonfield and Bayne, 2017) while Red-tailed hawks were found to nest farther from coal-bed natural gas development (Carlisle et al., 2018). Both raptor species are known to use urban environments (Poppleton, 2016).

Operations

Accidental Spills

Raptor habitat degradation from accidental spills could also occur during the operations phase. Spills during operations would most likely originate from accidental releases from vehicles traveling to and from the community. Accidental spills and releases during road operations may occur due to mechanical failure, human error, poor visibility or slippery road conditions. While estimate frequency of spills is low (0.00000019 spills per mile, or 0.00000012 spills per kilometer [Harwood and Russell, 1990]), its predicted that minor spills and release are possible and like during construction, the primary concern for raptors would be spills in or adjacent to nesting habitats where large canopy trees are impacted.

Hydrological Changes

Alterations to hydrology during the operations could also impact on raptor habitat. The primary pathway would be alterations due to culvert and crossing structure maintenance. Localized changes to hydrology could occur if culvert maintenance along the road is ignored, either in terms of repairs to the structure or removal of accumulated debris. The area affected would be dependent on the amount of time the culvert

remains blocked as well as the size of the impounded area. The area impacted would likely be limited compared to the construction phase as blockages would affect individual road crossings.

Sensory Disturbance

Sensory disturbances resulting from road operations may degrade habitat for raptors adjacent to the Project Footprint. During the operations phase, most sensory effects will be related to traffic noise as lighting will be limited along the road and human activity outside of driving will be limited and primarily related to maintenance activities. Traffic noise has been found to degrade bird habitat either through complete avoidance of areas near roads or decreased habitat value (Ware et al. 2015; Summers et al. 2011). Foraging efficiency in owls has been found to decline with increasing traffic noise levels, with the effects of acoustic masking (disrupting prey detection) extending more than 120 m away from a road, even at low levels of traffic noise (40 dB [Amplitude]) (Senzaki et al., 2016). Red-tailed hawks can often be found near higher traffic roads suggesting they are less sensitive to traffic levels which have the highest noise levels (Watson and Simpson, 2014) adapt well to noisy human environments (Poppleton, 2016; Stout et al., 2006).

Habitat Structural Change

Changes to vegetation structure during operations will have similar effects on raptors and their habitat as during the construction phase. While it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW. Both Red_tailed Hawks and Great Grey Owls would be expected to continue using trees along any created edge if suitable perching trees are available. Fragmentation can cause increased windthrow, which may cause the loss of super canopy trees near the ROW. Increased windthrow has generally been reported in forestry where openings between forested areas are much larger than the 35 m width of the WSR ROW (Scott and Mitchell, 2005).

12.3.11.3 Alteration in Movement

Alteration in raptor movement may result from vegetation clearing and disturbance during construction and throughout operations. The pathways or activities which may result in alteration in raptor movement include the following:

Construction and operations activities clear vegetation → Structural differences between cleared and natural vegetation act as a barrier → Alteration in movement of Raptor.

Construction and operations activities cause sensory disturbances (light, noises, dust) → Disturbances cause avoidance response → Alteration in movement of Raptor.

Construction

Loss of Connectivity

Alteration of raptor movement may occur due to changes in habitat connectivity due to construction activities. The construction of the road will fragment terrestrial and wetland habitats, including temporary access roads, laydown areas, and quarries. Raptor movement is unlikely to be altered by fragmentation of habitat due to clearing of the ROW. Great Grey Owl can be affected by larger clearcuts (>100 m wide) which have no hunting perches and are of little use but respond favourably to smaller openings

(Niemi and Hanowski, 1997). Avoidance due to predation concerns is unlikely for Red-tailed hawks as healthy adults are rarely at risk of predation. Great Grey Owls avoid hunting in large openings as they can be more vulnerable to predators like Northern Goshawks and Great Horned Owls (Duncan, 1997).

Sensory Disturbance

Raptor movement may be altered by sensory disturbances. Construction activities such as noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of raptors, including shifts in territories, as they avoid the project ROW and supportive infrastructure. Construction noise is less continuous and more impulsive than traffic noise, raptors responding negatively to loud sporadic noise such as excavating, blasts or helicopter overflights using the areas less during noise events (Schuenk et al., 2001). While Red-tailed hawk and Great Grey Owl may leave areas when exposed to anthropogenic noise, both have been shown to return to habitats once human activity stops (Anderson and Rongstad, 1989; van Ripper et al., 2013). For chronic noise, owls have been found to use sites with background industrial noise (Shonfield and Bayne, 2017) while Red-tailed hawks can use areas with high traffic levels and noise (Watson and Simpson, 2014). Owls may also be attracted to light sources used during construction activities as they could attract prey and lighting improves predation success (Canario et al., 2012; Rodreguez et al., 2020).

Operations

Loss of Connectivity

Similar to the construction phase, during operations alteration in movement due to changes in habitat connectivity is unlikely for Red-tailed hawk or Great Grey Owl. Maintenance activities will maintain vegetation in an early seral state along the road; however, while it has been demonstrated that small birds are affected by gaps and cross less frequently, larger birds such as raptors continue to fly over roads only at higher elevations (Johnson et al. 2017; Husby, 2017). Additionally, many raptors have been found to show little response to roads especially with low to moderate traffic (Planillo et al. 2015).

Sensory Disturbance

Vehicle noise is anticipated be the primary sensory impact on raptors during operations. Traffic noise has been found to lower abundance and promote avoidance in many bird species (McClure et al. 2013). High traffic roads have been shown to affect bird distribution when noise exceeded 56 dB (Hirvonen, 2001). Birds have also been shown to shift in their use seasonally around roads (Wiacek and Polak, 2015). However, Red-tailed hawks are often seen along noisy roadsides and show little alteration in behavior. For owls, while evidence suggest reduced foraging success in noisy environments (Senzaki et al., 2016), they still use areas with traffic noise (Shonfield and Bayne, 2017).

12.3.11.4 Injury or Death

The construction of the Project may lead to both direct and indirect raptor mortality. There could be increases in raptor injury or death stemming from increased vehicle traffic or clearing activities during both construction and operation of the road, with indirect mortalities arising from increased predator encounters. The pathways or activities which may result in raptor injury or death include the following:

Equipment and vehicles moving within Project footprint → Collisions with raptors within Project Footprint → Injury or Death of raptors.

Construction and operations activities clear vegetation → Incidental encounters with Individuals or nests → Injury or Death of raptors.

Construction and operations activities clear vegetation → Increased access for raptor predators → Injury or Death of raptors.

Construction

Collisions with Vehicles

Movement of construction equipment and vehicles within Project Footprint could result in increased death and injury of raptors. Collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). Vehicles will be travelling between camps and construction locations; these trips could occur at all hours and encounters with birds would not be unexpected. In Canada, Accipitriforme birds (hawks, vultures and eagles) are very rarely counted as casualties of vehicle collisions (Bishop and Brogan, 2013). Raptors can be susceptible to collisions due to their feeding behaviors, either through hunting near roads or feeding on roadkill (Croston, 2021). Red-tailed hawks, while they generally hunt small mammals and birds, will feed on carrion (Preston and Beane, 2024). Owls can be particularly susceptible due to their low flying hunting behavior (Grilo et al., 2012). Collisions with helicopters are also possible when they are being used to ferry people and equipment (Washburn et al., 2013).

Incidental Take

Vegetation clearing in raptor habitat during road construction and operations may result in injury or death to birds, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season, even after mitigation measures have been applied. Red-tailed hawks use large stick nests that are relatively conspicuous on the landscape, in the tallest trees (Moorman and Chapman, 1996) making accidental removal unlikely, while Great Grey Owls use stick nests built by other raptors or broken tops of large snags. Indirect raptor mortality could occur if construction activities take place close to the nest as the probability of nest abandonment increases with intensity and proximity to human activities (Richardson and Miller, 1997).

Changes to Predator-Prey Dynamics

Effects on raptor injury or death from improved predator access and movement rates is possible during the construction phase. Linear features are known to facilitate predator movement in the boreal (Dickie et al., 2017; Benoit-Pepin et al., 2024) and creation of new roads connected to human activity is known to spread predators into previously unoccupied areas (Lantham et al. 2011). Adult Red-tailed hawks have few predators while Great Grey Owls can be predated by Great Horned Owls and lynx (Hayward and Verner, 1994). Nestlings and eggs from both species can be predated by Great Horned Owls, Northern Goshawks, Ravens (Preston and Beane, 1983; Bull and Ducan, 1983) and predation by terrestrial predators like black bear and fisher may also occur (Morrison et al., 2006) but little information is known. A small increase is possible as great horned owls have been found to select for linear features due to these types of disturbances creating suitable hunting habitat (Shonfield and Bayne, 2023).

Operations

Collisions with Vehicles

Vehicles traveling along the road during operations could collide with raptors causing injury or death where the road intersects breeding, roosting and foraging habitats. Collisions with vehicles is among the top three causes of bird mortalities in Canada (Calvert et al., 2013). Raptors can be susceptible to collisions due to their feeding behaviors, either through hunting near roads or feeding on roadkill (Croston, 2021). Loos and Kerlinger (1993) estimated 25 raptors a year were killed on a 145 km route driven every weekday over a 10-year period with most being smaller owls. Traffic speed is of particular importance with higher speeds resulting in increased deaths for hawks and owls (Gagne et al., 2015; Dwyer et al. 2018).

Incidental Take

Vegetation clearing in raptor habitat is also scheduled to occur during operations. Though smaller in scale, periodic clearing of the ROW may occur during operations as part of line-of-sight maintenance or infrastructure repairs. Most clearing during operations will consist of removal of small vegetation and is unlikely to affect preferred raptor habitat but a small chance exists that large trees adjacent to the roadway may be removed due to safety concerns. Indirect death of eggs and nestlings may occur if nest abandonment occurs due to maintenance activities occur near occupied nests.

Changes to Predator-Prey Dynamics

Effects on Red-tailed hawks and Great Grey Owls from predators during operations are a continuation of the same impacts as described for the construction phase. Maintenance clearing during operations will maintain openness along the ROW which will maintain predator access to areas near the road and facilitate movement.

12.3.11.5 Threat Assessment

Each of the four potential effects categories were evaluated based on the threats assessment criteria outlined in the TISG and is based on IUCN-CMP (International Union for the Conservation of Nature-Conservation Measures Partnership) unified threat classification system, referenced from NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk (Natureserve, 2012). Threats are assessed prior to any mitigative measures being applied. The threat assessment process is generally done at the population level but can be done at a more regional level. Home range for Great Grey Owl is between 1.5-6 km^2, and males have been found hunting up to 3 km from their nest. For Red-tailed Hawk territory size is large, around 2-5 km^2. Based on this, the RSA was deemed the most appropriate scale for the assessment.

Scope is small for all threats as the percent of the population affected is less than 10% of the available habitat and population within the RSA.

Severity of threats ranges from slight to serious. Threats related to vegetation removals are serious within the scope based on the high degree of habitat loss and alteration, and spills are rated as moderate as they are less likely to occur but would be damaging if they happened. Collisions are also rated as moderate due to both Red-tailed Hawk and Great Gray Owl behavior around roads, and all other threats as slight. Magnitude is rated as low for all threats.

Irreversibility is high for hydrological changes and very high for vegetation removal as the roadbed will likely never be removed but hydrological mitigations could be done. Irreversibility is also high for spills, habitat structural change, invasive species, and predation because while the effects can technically be reversed it would take time and considerable effort. The rest of the threats were deemed low and can be easily reversed. The degree of effect was low for all except vegetation loss which was moderate.

A summary of the threat assessment for raptors habitat loss, alteration or degradation of habitat, alteration in movement, and injury or death prior to the consideration of mitigation measures, is presented in **Table 12-36**.

Table 12-36: Summary of Threat Assessment for Potential Effects on Raptors

Pathway of Effect	Scope	Severity	Magnitude	Irreversibility	Threat Assessment
Habitat Loss – Clearing Activities	Small	Serious	Low	Very High	Moderate
Habitat Loss – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Accidental Spills	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Hydrological Changes	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Sensory Disturbance	Small	Slight	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Slight	Low	High	Low
Habitat Alteration or Degradation – Invasive Species	Small	Slight	Low	High	Low
Alteration in Movement – Loss of Connectivity	Small	Slight	Low	Low	Low
Alteration in Movement – Sensory Disturbance	Small	Slight	Low	Low	Low
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Changes in Predator-Prey Dynamics	Small	Slight	Low	High	Low
Injury or Death – Collisions with Vehicles	Small	Moderate	Low	Low	Low

12.3.12 Reptiles and Amphibians

Eastern Gartersnakes occupy a wide variety of habitats such as wetland edges, mixed forests, and rocky areas. During the winter they move below the frost line, using rock crevices, other natural underground cavities, and mammal burrows (Ontario Nature, 2024).

American Toads breed in a wide range of permanent and temporary shallow aquatic features. Outside of the breeding season, they can be found in a variety of terrestrial habitats including deciduous and mixed forests, forest clearings, rock barrens, and muskeg. During the winter they move below the frost line by burrowing in sandy soils or using mammal burrows, crevices in bedrock, or other underground cavities (Ontario Nature, 2024).

Boreal Chorus Frogs breed in open wetlands that are small, shallow, and fish-free. Outside of the breeding season they remain close to their breeding sites, occupying deciduous and mixed Boreal coniferous forests. During the winter they use mammal burrows, tree root cavities, burrow under logs or rocks, or bury under leaf litter (Ontario Nature, 2024).

Spring Peepers breed in a number of different shallow, open aquatic habitats that are typically temporary and fish-free. Outside of the breeding season they inhabit forests near their breeding sites and can be found several metres off the ground in trees and vegetation. During the winter they move into mammal burrows, tree root cavities, under logs, or bury under leaf litter (Ontario Nature, 2024).

Wood Frogs are closely associated with deciduous and Boreal Forest, inhabiting open and forested muskeg and wet meadows. They breed in shallow, fish-free ephemeral wetlands within or near forests. During the winter they bury themselves under shallow leaf litter (Ontario Nature, 2024).

In Northern Ontario, the reptile and amphibian active season is generally understood to occur between May 1 and September 30. The overwintering period for reptiles and amphibians in Northern Ontario typically occurs between October 1 and April 30; however, this time period may vary depending on fluctuation in seasonal temperatures such as an early spring thaw or warm fall weather.

12.3.12.1 Habitat Loss

Reptile and amphibian habitat loss, including overwintering habitat, thermoregulation habitat and breeding habitat, may result from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathway or activity which may result in loss or destruction of reptile and amphibian habitat during the construction and operations phases are described below.

Site preparation, vegetation clearing and roadbed construction → Permanent removal of vegetation and hydrological changes → Loss of reptile and amphibian habitat

Construction

Clearing Activities

Reptile and amphibian habitat loss and destruction is expected due to site preparation and construction activities, such as vegetation clearing and quarry creating, as well as hydrological changes resulting from road construction. Creation of the Project Footprint will directly and permanently remove habitat suitable for reptiles and amphibians to overwinter, breed, and thermoregulate for the duration of road operations. The results of habitat modelling via Ecological Land Classification (Refer to Section 11: Assessment of Effects on Vegetation and Wetlands), and an understanding of the Project Footprint, estimate construction activities will result in the removal of 380.34 ha of wetland habitat in the Project Footprint.

RSF modelling was done for American Toad and three frog species: Boreal Chorus Frog, Spring Peeper and Wood Frog. To calculate habitat loss the Project Footprint was overlayed, and the underlying habitat removed. Pre-construction amount of amphibian high-use habitat (ha) in the LSA and RSA and the percent proposed for removal due to road construction and operations are presented in **Table 12-37**. **Figure 12.24** through **Figure 12.27** show the predicted use of the RSA under existing conditions for amphibians.

Table 12-37: Amphibian Species High-Use Habitat by Study Area

Species	LSA		RSA	
	Pre-construction (ha)	% Removed	Pre-construction (ha)	% Removed
American Toad	6,445.32 ha	1.43%	25,607.58 ha	0.36%
Boreal Chorus Frog	7,837.4 ha	1.32%	38,731.84 ha	0.27%
Spring Peeper	10,363.4 ha	1.30%	29,034.54 ha	0.46%
Wood Frog	7,454.31 ha	1.92%	28,689.46 ha	0.50%

Quantification of reptile habitat change in use has not been calculated due to the cryptic nature of Eastern Garter Snake and low detectability across the RSA. Habitat loss has been found to have a negative effect on Eastern Garter Snake occupancy probability within a 10 km by 10 km area (Paterson et al. 2021). Eastern Garter Snake is considered a habitat generalist, similar to American Toad, occurring in a variety of terrestrial habitats that include field and forest. As such, Eastern Garter Snake high-use habitat area and percent removed is anticipated to be the same as that of the American Toad (**Table 12-37**).

Operations

Clearing *Activities*

Road operations are unlikely to result in additional loss of reptile and amphibian overwintering, breeding, and thermoregulation habitats, as regular maintenance will involve managing re-growth of vegetation along the ROW within the Project Footprint. There is a very low probability that reclaimed temporary laydown areas and clearings may need to be reused during operations. While the quarries are expected to remain operational following construction, the footprints will not be expanded and as such no additional habitat loss or destruction is anticipated to occur during operations.

N

Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.014
- 0.014 - 0.019
- 0.019 - 0.028
- 0.028 - 0.050
- 0.050 - 0.646

WSR
WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
4. Service Layer Credits: Earthstar Geographics

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0 5 10 km

Webequie Supply Road

RSF Modeling for American Toad based on Probability of Use Under Existing Conditions

Figure Number:	12-24	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	
DSC		DRN	CHK	APP
		TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

N

Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.003
- 0.003 - 0.004
- 0.004 - 0.007
- 0.007 - 0.014
- 0.014 - 0.896

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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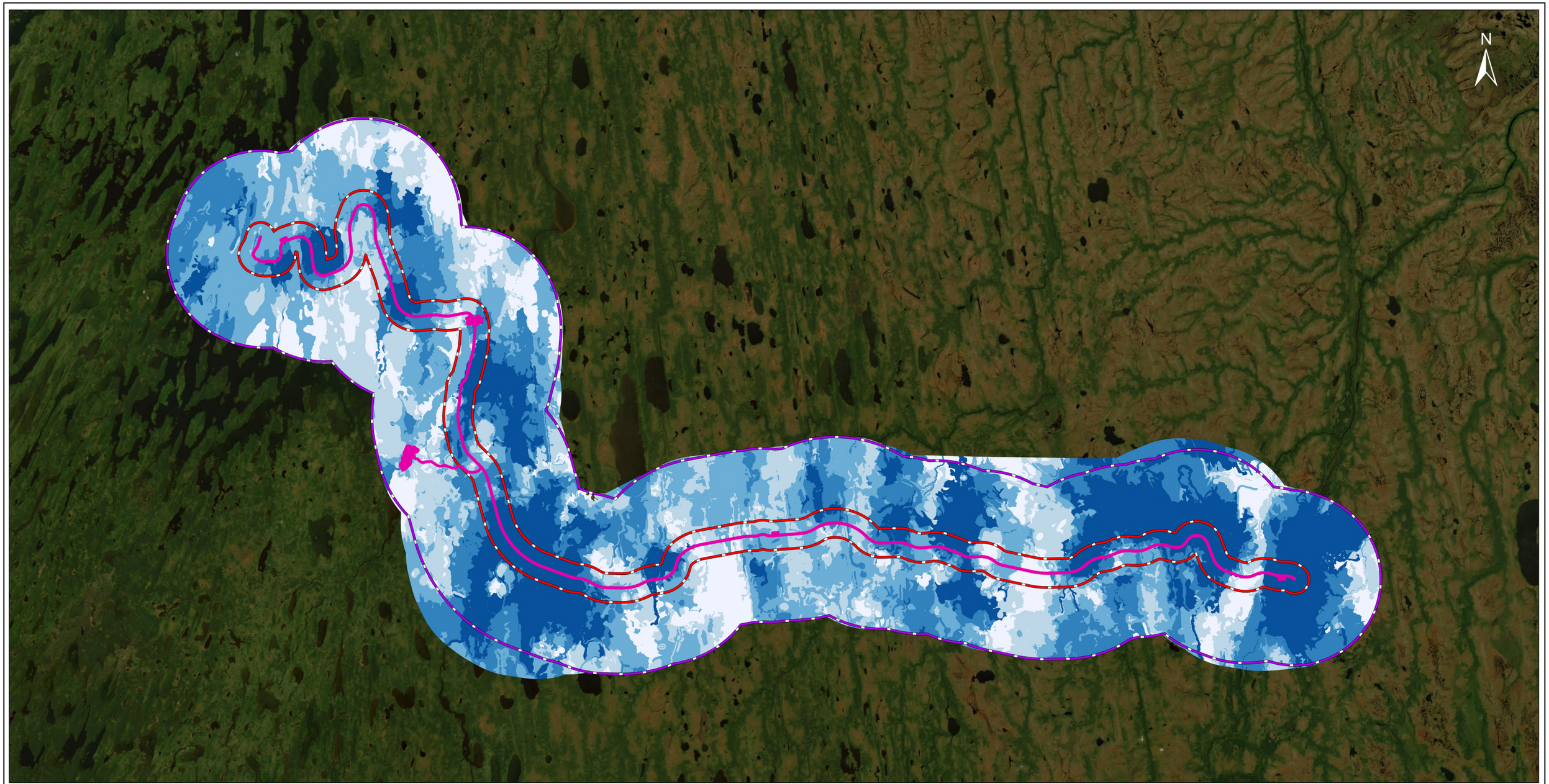
0 5 10 km

Webequie Supply Road

RSF Modeling for Boreal Chorus Frog based on Probability of Use Under Existing Conditions

Figure Number:	12-25	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	

DSC	DRN	CHK	APP
	TE	GS	GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.012
- 0.012 - 0.018
- 0.018 - 0.031
- 0.031 - 0.056
- 0.056 - 0.644

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information, and, Land Information Ontario (LIO) Warehouse Open Data (https://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF)
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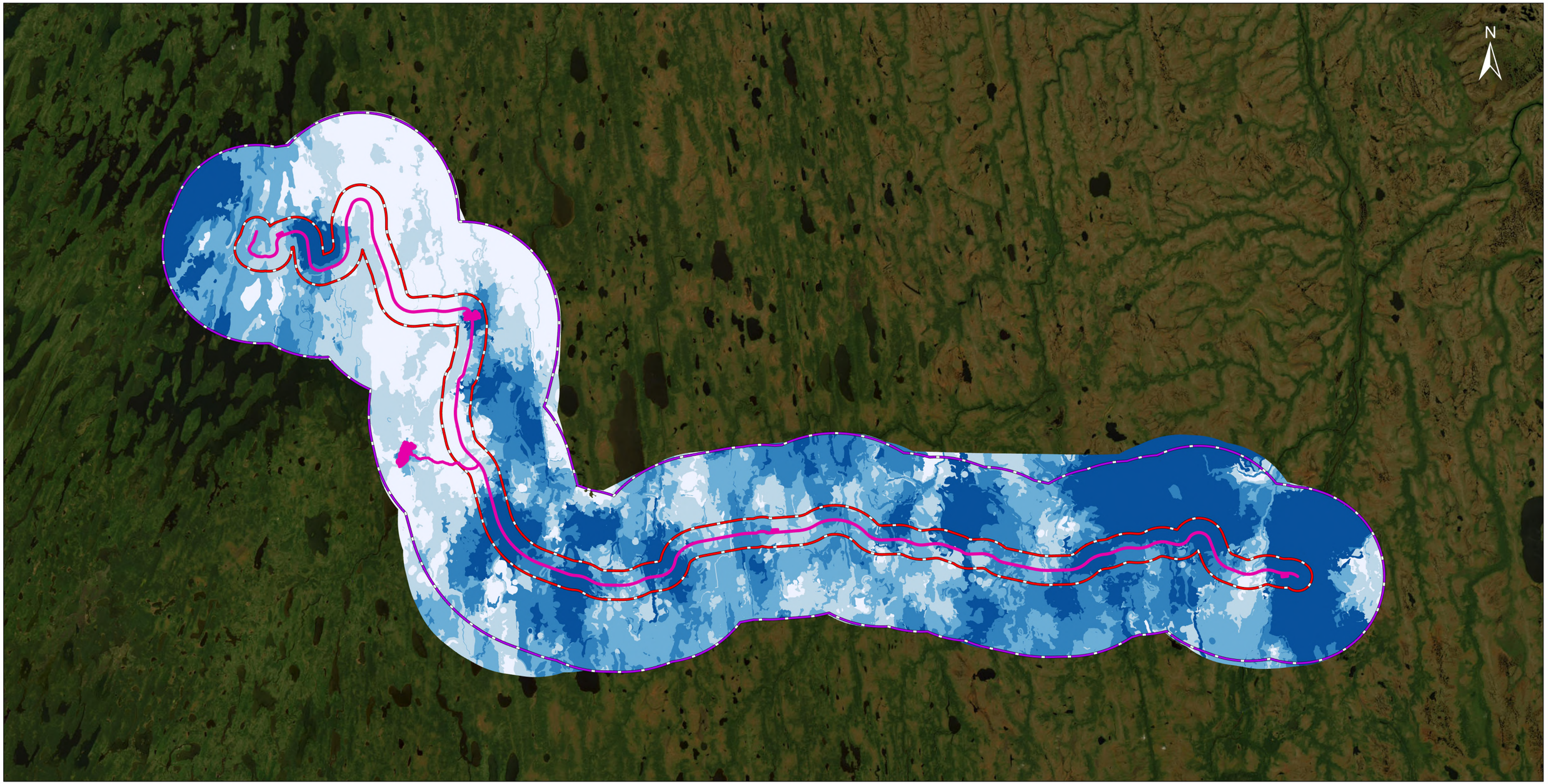
0 5 10 km

Webequie Supply Road

RSF Modeling for Spring Peeper based on Probability of Use Under Existing Conditions

Figure Number:	12-26			**REV:**	PA
Client:	Webequie First Nation	**Project Number:** 661910	**Date:** 5/15/2025		
DSC				**DRN**	**CHK**	**APP**
				TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.011
- 0.011 - 0.016
- 0.016 - 0.024
- 0.024 - 0.043
- 0.043 - 0.676

WSR WEBEQUIE SUPPLY ROAD

NOTES

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0 5 10 km

Webequie Supply Road

RSF Modeling for Wood Frog based on Probability of Use Under Existing Conditions

Figure Number:	12-27	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

12.3.12.2 Habitat Alteration and Degradation

Reptile and amphibian habitat alteration or degradation may result from vegetation clearing, hydrological changes and disturbance during construction and throughout operations. The pathways or activities which may result in alteration or degradation of reptile and amphibian habitat are described below.

Construction of road and vegetation removals change drainage and alter soil moisture regimes → Hydrological changes to ground or surface water → Alteration and degradation of reptile and amphibian habitat

Construction activities and road operations generate noise, light, and other sensory disturbances → Noise masks amphibian breeding calls → Sensory disturbances alter or degrade reptile and amphibian habitat

Construction and operation requires vegetation removal, clearing, and maintenance → Changes to habitat structure, size, and connectivity → Alteration and degradation of reptile and amphibian habitat

Accidental spills or releases occur during construction or road operations → Harmful substances enter habitat adjacent to the road or worksite → Alteration and degradation of reptile and amphibian habitat

Construction

Hydrological Changes

Herpetofaunal habitat may be altered hydrologically, with construction activities such as grading for road installation resulting in changes to both surface water and groundwater causing flooding or drying of vegetation communities. As described in Section 11.3.3.3 (Loss or Alteration of Wetland Function) 91.82% of the Project RSA is wetlands, primarily peatlands susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by roads. The effects of roads on hydrology and herpetofaunal habitat can occur up to 250 m from the ROW; the habitat alteration assessment uses the same values as those shown in Section 11.3.3.3, with high effects expected within 20 m, moderate effects within 60 m and minimal effects experienced at 250 m.

Sensory Disturbance

During construction, activities such as blasting at quarries and pits, earth hauling and vegetation clearing may reduce the ability of Reptiles and Amphibians to use habitat along the ROW and supportive infrastructure due to sensory disturbances. Traffic noise is known to mask the calls of amphibians (Duarte et al. 2003; Schou et al. 2021; and Tennessen et al. 2014), which may be similar to noise generated by construction vehicles and equipment.

Change in Habitat Structure

Road construction may result in a change in reptile and amphibian habitat structure, such as reduced connectivity (movement corridors) between overwintering habitat and breeding habitat, or a reduction in size of overwintering and breeding habitats due to loss of vegetation, changes in vegetation community structure, hydrological changes, and construction of the roadbed.

Changes in amphibian distribution following construction of the Project was modelled by estimating probability of use (pUse) based on RSFs across the RSA. Details of the modelling methods are discussed in Section 11.2.1 (Methods) and further details are provided in the Existing Conditions report. **Figure 12.28** through **Figure 12.31** show the probabilities of use under future conditions. It should be noted that the model used current disturbances to predict future habitat use (refer to **Section 12.2.1.1**: Resource Selection Function Models). As there are no existing permanent roads, current types of disturbance in the RSAs (i.e., winter road, cutlines, old camps, pads) are not used by humans for most of the time and may therefore be used by species that are known to otherwise avoid human activities/presence. RSF based on future disturbance effects predicts amphibian utilization to decrease 40.6% in the Project Footprint, decrease 16.6% in the LSA, and to decrease 3.0% in the RSA. This has also been calculated for the four amphibian (anuran) species detected during the existing conditions studies (**Table 12-38**) with net habitat utilization change in the Project Footprint ranging from -21.5% (Wood Frog) to -80.4% (Boreal Chorus Frog). One species, Spring Peeper, is predicted to have a small gain of 2.2% habitat utilization at the RSA level. Overall, amphibians as a group are predicted to have a 40.6% decrease in habitat utilization in the Project Footprint; a 16.6% decrease in the LSA; and a 3.0% decrease in the RSA. Overall, the change in habitat utilization can be attributed to habitat loss (discussed in **Section 12.3.12.1** above) and due to the net effects resulting in habitat alteration and degradation.

Table 12-38: Amphibian Species Probability of Habitat Use Percent Change by Study Area

Species	% Change		
	FP	LSA	RSA
American Toad	-33.9%	-20.0%	-5.6%
Boreal Chorus Frog	-80.4%	-27.8%	-5.9%
Spring Peeper	-26.4%	-6.2%	2.2%
Wood Frog	-21.5%	-12.6%	-3.0%
Amphibian Group	**-40.6%**	**-16.6%**	**-3.0%**

Accidental Spills

Accidental spills and releases that occur during the construction phase may result in reptile and amphibian habitat degradation. Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds through which pollutants can spread. Such pollutants may alter water quality and vegetation (i.e., die-off, growth rate, community composition) making areas uninhabitable.

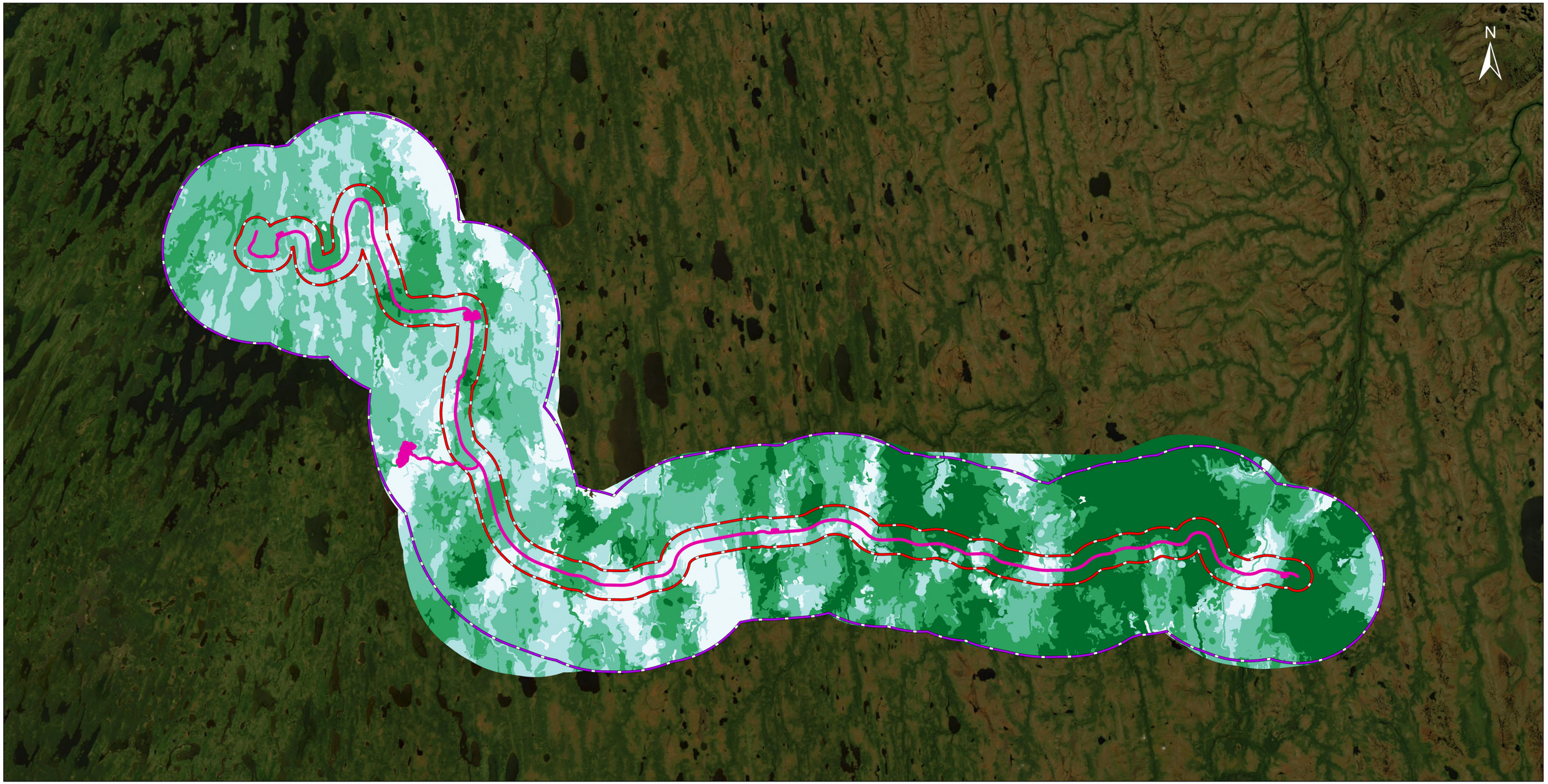
Operations

Hydrological Changes

Operation of the road is not anticipated to result in further changes to hydrology than those initiated during the construction phase. It is possible that changes to hydrology may occur during the operations, such as accumulation of debris affecting culverts and drainage that results in localized flooding and drying of areas.

Sensory Disturbance

Noise and light from vehicles travelling on the road during operations may affect reptile and amphibian habitat along the ROW and supportive infrastructure. There is evidence that traffic noise can affect anurans in a variety of ways, such as through masking calls and increasing stress responses (Duarte et al. 2003; Schou et al. 2021; and Tennessen et al. 2014). Traffic is expected to be relatively low, with a maximum of 500 vehicles a day, and some anuran species such as Wood Frog have demonstrated an ability to adapt to traffic noise levels (Tennessen et al. 2018). Less research has been conducted on the effects of relevant sensory disturbances on reptiles such as Eastern Garter Snakes; however, road-related vibrations are not believed to influence the use of a road-adjacent hibernaculum by garter snakes (Patching et al.,2015).



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.013
- 0.013 - 0.018
- 0.018 - 0.027
- 0.027 - 0.049
- 0.049 - 0.646

WSR WEBEQUIE SUPPLY ROAD

NOTES

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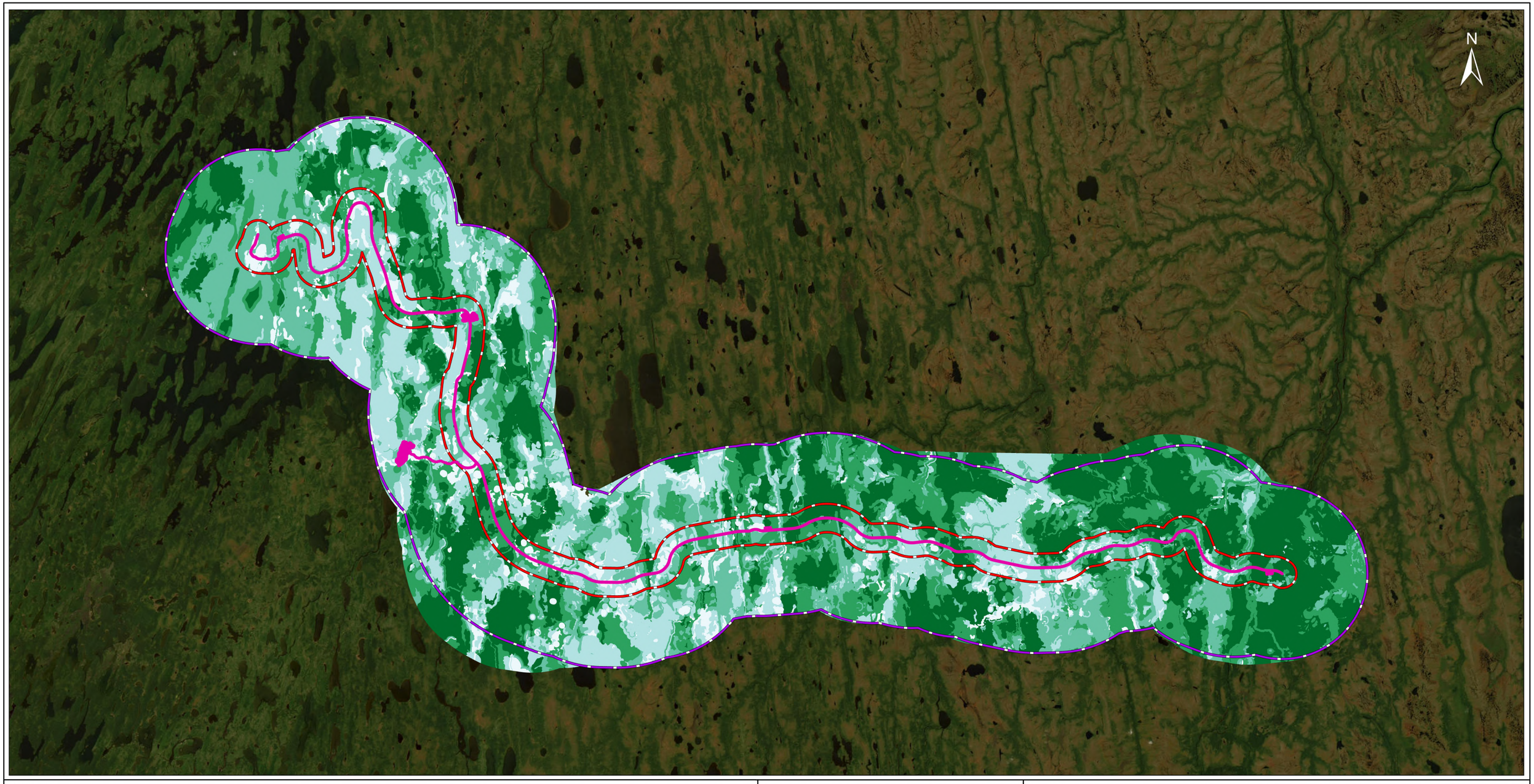
Webequie Supply Road

RSF Modeling for American Toad based on Probability of Use Under Future Conditions

Figure Number:	12-28	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/15/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.003
- 0.003 - 0.004
- 0.004 - 0.006
- 0.006 - 0.013
- 0.013 - 0.536

WSR WEBEQUIE SUPPLY ROAD

NOTES

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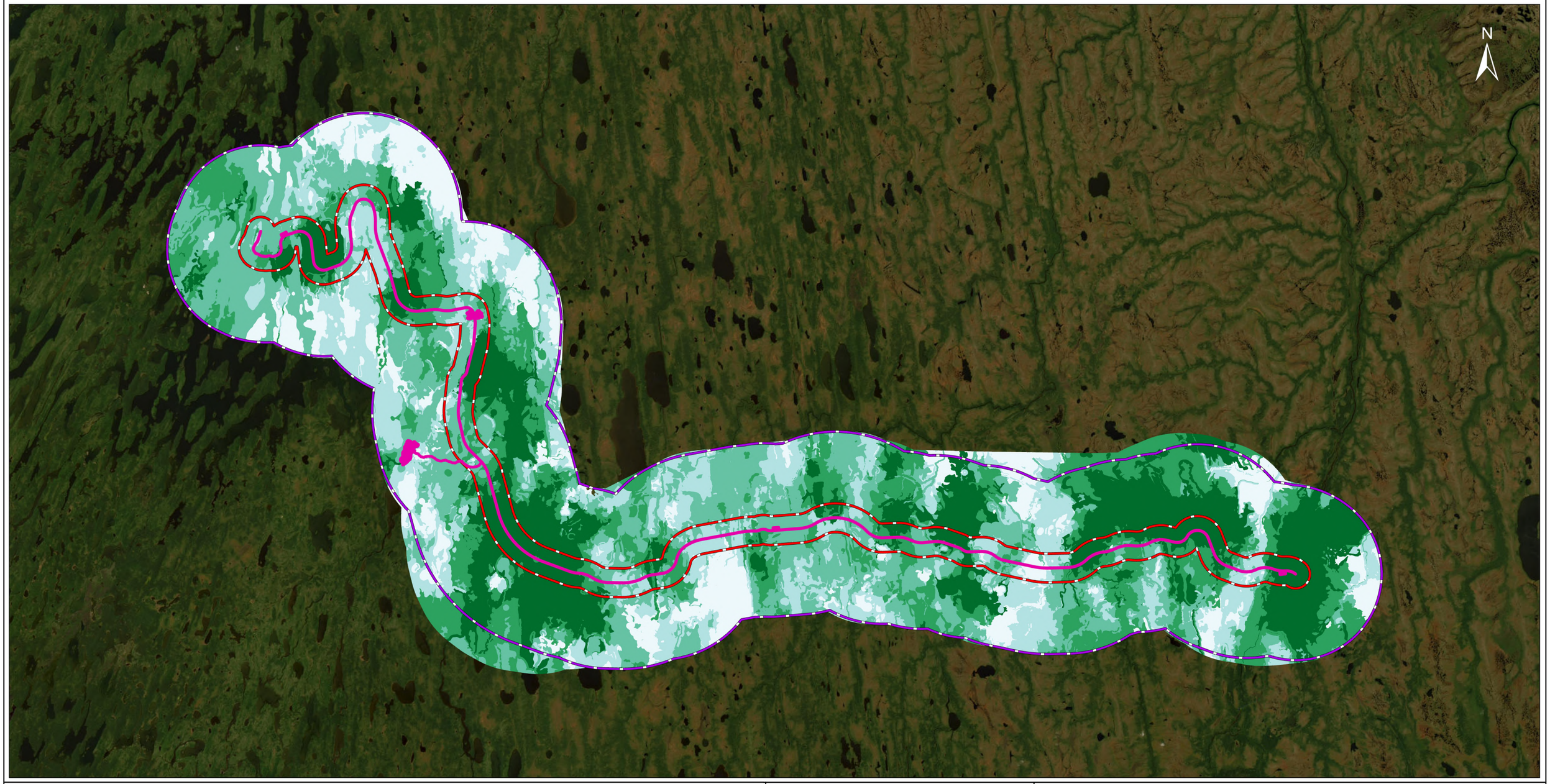
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0 5 10 km

Webequie Supply Road

RSF Modeling for Boreal Chorus Frog based on Probability of Use Under Future Conditions

Figure Number: 12-29		**REV:** PA	
Client: Webequie First Nation	**Project Number:** 661910	**Date:** 5/15/2025	
DSC		**DRN** TE	**CHK** GS	**APP** GS



Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.014
- 0.014 - 0.020
- 0.020 - 0.034
- 0.034 - 0.060
- 0.060 - 0.540

WSR WEBEQUIE SUPPLY ROAD

NOTES

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0 5 10 km

Webequie Supply Road

RSF Modeling for Spring Peeper based on Probability of Use Under Future Conditions

Figure Number:	12-30	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/16/2025	
DSC		DRN	CHK	APP
		TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

N

Legend:

- Project Footprint
- Wildlife Local Study Area (LSA 1km from Preferred Route)
- Wildlife Regional Study Area (RSA 5km from either side of LSA boundary)

Relative Probability of Use

- 0.000 - 0.011
- 0.011 - 0.016
- 0.016 - 0.024
- 0.024 - 0.042
- 0.042 - 0.585

WSR WEBEQUIE SUPPLY ROAD

NOTES

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0 5 10 km

Webequie Supply Road

RSF Modeling for Wood Frog based on Probability of Use Under Future Conditions

Figure Number:	12-31	REV:	PA
Client: Webequie First Nation	Project Number: 661910	Date: 5/16/2025	

DSC	DRN	CHK	APP
	TE	GS	GS

Path: \\tor01\PROJECTS\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\EARIS\Wildlife\661910_WSR_BIO_RSFModelingSec12_0001.aprx

Habitat Structural Change

Habitat alteration or degradation due to change in habitat structure initiated during the construction phase from vegetation clearing and changes to vegetation community structure is expected to continue during the operations phase. These vegetation changes will be maintained during road operations, but no new changes to habitat structure are expected to be generated as a result.

Accidental Spills

Accidental spills and releases that occur during the operations phase may result in reptile and amphibian habitat degradation. Boreal wetlands are often hydrologically connected through subsurface flows (Smerdon et al., 2005), resulting in large watersheds through which pollutants can spread. Such pollutants may alter water quality and vegetation (i.e., die-off, growth rate, community composition) making areas uninhabitable, including roadside ditches which may be used as refugia by amphibians when containing standing water. Accidental spills and releases during road operations may occur due to mechanical failure (e.g., tire blow-out), human error (e.g., distracted or tired driver), poor visibility or slippery road surface, for example. In Ontario, between 2021 and 2022 (the most recent data available; no data reported between 2015 and 2020) there were 172 spills in water (surface water and groundwater) with confirmed environmental effects recorded by the MECP, which were caused by accidents/collisions, intentional discharge, dumping, human/operator error, truck or trailer overturn, and other transport accidents (MECP, 2025). Most spills (121; 70%) during that two-year period consisted of fuels (gasoline, diesel, aviation) and oils (hydraulic, motor, engine, transmission, transformer, petroleum-based) (MECP, 2025). Michel and Rutherford (2014) found that oil spills in marshes in cold climates have the longest recovery periods (>10 years), even with intense treatment.

12.3.12.3 Alteration in Movement

Alteration in reptile and amphibian movement may result from vegetation clearing and disturbance during construction and throughout operations. The pathways or activities which may result in alteration in reptile and amphibian movement are described below.

Construction of the road surface creates physical barriers → Reptiles and amphibians avoid crossing large gaps and using paved and gravel surfaces during construction and operations → Alteration in reptile and amphibian movement

Construction activities and road operations generate noise, light, and other sensory disturbances → sensory disturbances result in avoidance of area → Sensory disturbances alter reptile and amphibian movement

Construction

Loss of Connectivity

Herptile movement is likely to be altered by the road due to the open space, and due to paved and gravel substrates acting as deterrents. Garter snakes are less abundant near roads (Gigeroff and Blouin-Demers, 2023) and have also been found to avoid gravel roads, potentially due to the lower substrate temperature (Shine et al. 2004).

Sensory Disturbance

Herptile movement is likely to be altered by sensory disturbances generated during construction. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of herptiles as they avoid the project ROW and supportive infrastructure.

Operations

Loss of Connectivity

Changes in reptile and amphibian movement will occur in the Project Footprint due to physical barriers created by the construction of the road, such as paved and gravel surfaces acting as deterrents. The paved and gravel surfaces will be maintained during road operations, but no new physical barriers are expected to be generated as a result.

Sensory Disturbance

Herptile movement is likely to be altered by sensory disturbances generated during operations. Amphibian abundance has been found to decrease with increasing traffic intensity (Fahrig et al. 1994), with effects on abundance experienced up to 1 km from the road (Hamer et al. 2021).

12.3.12.4 Injury or Death

The creation of the road may lead to both direct and indirect reptile and amphibian mortality. There could be increases in reptile and amphibian injury or death stemming from increased vehicle traffic during both construction and operation of the road, with indirect mortalities arising from increased energy expenditures and habitat change. The pathways or activities which may result in reptile and amphibian injury, or death are described below.

Equipment and vehicles move within Project Footprint → Collisions with reptiles and amphibians within Project Footprint → Injury/Death of reptiles and amphibians

Construction and operations activities clear vegetation → Increased access for predators of reptiles and amphibians → Injury/Death of reptiles and amphibians

Construction and operations activities clear vegetation → Incidental encounters with reptiles and amphibians → Injury/Death of reptiles and amphibians

Vehicles and equipment moving through the Project Footprint and LSA transfer disease (ranavirus) from other areas to aquatic habitat → Ranavirus infects reptiles and amphibians in aquatic habitat → Injury/Death of reptiles and amphibians

Construction

Collisions with Vehicles

Reptile and amphibian injury and death may occur during construction due to collisions with construction vehicles and equipment (i.e., getting run over) during the active season.

Changes to Predator-Prey Dynamics

Effects on herptile survival from improved predator access and movement rates due to the construction of the road are probable. Both mammalian and avian predators of reptiles and amphibians are drawn to linear features for movement and foraging opportunities (Hill et al., 2020; Towerton et al., 2016; Kuskemoen 2020; Knight and Kawashima, 1993).

Introduction of Disease

Increased anthropogenic activity during road construction may result in the introduction of ranavirus to reptiles and amphibians and their aquatic habitats. Indirect transmission of ranavirus can occur through spread of water and sediment transferred from areas where ranavirus is prevalent (Harp & Petranka, 2006), which may happen if construction vehicles and equipment have previously been used in areas with ranavirus. St-Amour et al. (2008) found that proximity to human activities such as construction or industry is associated with higher prevalence of ranavirus in amphibian populations. In Ontario, ranavirus was first reported in amphibians in 2004, and since has been documented as causing mass-mortality events with rates in local populations as high as 90-100% (Greer et al., 2005; Duffus et al., 2008; Duffus and Andrews, 2013).

Incidental Take

Vegetation clearing in reptile and amphibian habitat during road construction may result in injury or death to these species groups. Species such as Spring Peepers and Boreal Chorus Frogs are capable of climbing vegetation and may be located up to 1 m above the ground, camouflaged among foliage or in cracks, crevices and knot holes. These two species, as well as recently metamorphosed American Toads and Wood Frogs are very small (2-4 cm in body length) making them inconspicuous in vegetated areas. Overwintering amphibians are very challenging to detect and may be present in wetlands during construction activities such as vegetation clearing.

Accidental Spills

Accidental spills and releases of harmful chemicals and substances during road construction may result in injury or death to reptiles and amphibians. Amphibians are particularly sensitive to environmental releases as their skin is moist and absorptive for oxygen exchange.

Operations

Collisions with Vehicles

During operations, the predicted maximum vehicles travelling on the road is 500 per day, with the majority of travel anticipated to take place during daylight hours. Mortality during the operations phase is expected to occur throughout the reptile and amphibian active season, primarily: at nighttime during the sensitive spring breeding period for amphibians, during seasonal dispersal or migration, and after periods of heavy rain (Gunson & Schueler, 2019); and in areas where wetlands occur on both sides of the road (Lagen et al. 2009) in the Project Footprint. American Toad mortality is also known to increase with increasing traffic intensity, while Wood Frog mortality can be greatest at moderate traffic intensities (i.e., 10-18 vehicles per hour) (Mazerolle, 2004). Hels and Buchwald (2001) found that a traffic load of 3,200 vehicles per day annually killed approximately 10% of the adult population of three frog species living within 250 m of the highway: when scaled to 500 vehicles per day, this annual number is reduced to 1.6%.

Changes to Predator-Prey Dynamics

Operation of the road may provide resources that attract predators (Hill et al., 2020), such as increased rodent populations attracting carnivores. Red Foxes (*Vulpes vulpes*) have been documented taking advantage of roads for movement (Towerton et al., 2016; Kuskemoen 2020) and may also be drawn to forage at the roadside as well (Silva et al., 2009). Ravens (*Corvus corax*) have also been found to be more abundant along highways due to automobile-generated carrion (Knight and Kawashima, 1993).

Introduction of Disease

Increased anthropogenic activity during road operations may result in the introduction of ranavirus to reptiles and amphibians and their aquatic habitats. Indirect transmission of ranavirus can occur through spread of water and sediment transferred from areas where ranavirus is prevalent (Harp & Petranka, 2006), which may happen if vehicles travelling on the road shed contaminated sediments into adjacent habitats, or recreational vehicles (i.e., all-terrain vehicle, utility terrain vehicle) and boats are brought from areas with ranavirus and used in adjacent habitats.

Incidental Take

Vegetation management activities in reptile and amphibian habitat during road operations may result in injury or death to these species groups. Species such as Spring Peepers and Boreal Chorus Frogs are capable of climbing vegetation and may be located up to 1 m above the ground, camouflaged among foliage or in cracks, crevices and knot holes. These two species, as well as recently metamorphosed American Toads and Wood Frogs are very small (2-4 cm in body length) making them inconspicuous in vegetated areas. Overwintering amphibians are very challenging to detect and may be present in wetlands and ditches during vegetation management.

Accidental Spills

Accidental spills and releases of harmful chemicals and substances during road operations may result in injury or death to reptiles and amphibians. Accidental spills and releases during road operations may occur due to mechanical failure (e.g., tire blow-out), human error (e.g., distracted or tired driver), poor visibility or slippery road surface, for example. Amphibians are particularly sensitive to environmental releases as their skin is moist and absorptive for oxygen exchange. For example, sodium chloride (NaCl), a major component of road run-off when used as a de-icing agent, results in low survivorship, decreased time to metamorphosis, reduced wet and activity, and increased physical abnormalities in Wood Frog tadpoles (Sanzo, 2004). In Ontario, between 2021 and 2022 (the most recent data available; no data reported between 2015 and 2020) there were 172 spills in water (surface water and groundwater) with confirmed environmental impacts recorded by the MECP, which were caused by Accidents/Collisions, Intentional Discharge, Dumping, Human/Operator Error, Truck or Trailer Overturn, and Other Transport Accidents (MECP, 2025). Most spills (121; 70%) during that two-year period consisted of fuels (gasoline, diesel, aviation) and oils (hydraulic, motor, engine, transmission, transformer, petroleum-based) (MECP, 2025). Wood Frog larvae (i.e., tadpoles) are often selected as amphibian models for toxicological studies and have been found to be resilient when exposed to a variety of oil spill scenarios/concentrations for a 3-week period (Patterson et al., 2022). This species may not be representative of other amphibian genera, however, such as *Anaxyrus* and *Pseudacris* which are found in the RSAs. Krutzweiser et al. (2013) identified the scarcity of empirical studies on amphibians in the boreal zone and little has changed in the years since.

12.3.12.5 Threat Assessment

Each of the four potential effects categories was evaluated based on the threats assessment criteria outlined in the TISG (refer to **Section 12.3.1**) and is based on the IUCN-CMP unified threat classification system (NatureServe, 2012). These assessments (refer to **Table 12-39**) are made prior to the application of mitigation measures, considering each of the threats posed to reptiles and amphibians during the construction and operations phases as outlined in the previous subsections.

Scope is either small or restricted for all threats, as the percentage of the population affected is less than 10% (i.e., for clearance activities, sensory disturbances, habitat structural change, loss of connectivity, collisions, changes to predator prey relationships or incidental take) or between 11 and 30% (i.e., for hydrological changes, accidental spills and disease). Severity of threats range from slight to serious: threats related to habitat loss and hydrological change are serious based on the degree of habitat loss; incidental take is slight as most herpetofauna will remain in habitats less likely to be affected by construction or operational activities; the remainder are moderate. Magnitude is rated as either low or medium for all threats.

Irreversibility very high for clearance activities and disease as the roadbed is unlikely to be removed, and once ranavirus has been introduced to the population, it will remain for numerous years. Irreversibility is high for hydrological change, structural change and loss of connectivity because measures to mitigate for such changes to habitat require adequate time for vegetation to reestablish itself and successional processes to advance. Sensory disturbances, collisions with vehicles and incidental take are considered low because the threat is removed when operational activities cease. The remaining threats could be reversed with a reasonable commitment of time and resources. The degree of effect is high for disease, and moderate for habitat loss, hydrological changes and accidental spills. Remaining threats were deemed to have a low degree of effect.

Table 12-39: Summary of Threat Assessment for Potential Effects on Reptiles and Amphibians

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Habitat Loss – Clearance Activities	Small	Serious	Low	Very High	Moderate
Habitat Alteration or Degradation – Hydrological Changes	Restricted	Serious	Medium	High	Moderate
Habitat Alteration or Degradation – Sensory Disturbances	Small	Moderate	Low	Low	Low
Habitat Alteration or Degradation – Habitat Structural Change	Small	Moderate	Low	High	Low
Habitat Alteration or Degradation – Accidental Spills	Restricted	Moderate	Medium	Medium	Moderate
Alteration in Movement – Loss of Connectivity	Small	Moderate	Low	High	Low
Alteration in Movement – Sensory Disturbances	Small	Moderate	Low	Low	Low
Injury or Death – Collisions	Small	Moderate	Low	Low	Low
Injury or Death – Altered Predator-Prey Relationships	Small	Slight	Low	Medium	Low
Injury or Death – Disease	Restricted	Serious	Medium	Very High	High

Threat	Scope	Severity	Magnitude	Irreversibility	Degree of Effect
Injury or Death – Incidental Take	Small	Slight	Low	Low	Low
Injury or Death – Accidental Spills	Restricted	Moderate	Medium	Medium	Moderate

Table 12-40 summarizes the potential effects, pathways and indicators for each representative species within the Wildlife and Wildlife Habitat VC.

Table 12-40: Summary Table for Potential Effects, Pathways and Indicators for Wildlife and Wildlife Habitat VC

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
MOOSE					
Construction	Habitat Loss	Vegetation clearing and ground disturbance may cause loss of moose habitat. Filling in riparian areas result in hydrological changes may cause moose aquatic habitat loss.	Changes to moose habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Accidental spill during construction leads to degradation or alteration of moose habitat. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of moose habitat. Hydrological changes cause alterations in wetlands degrading moose aquatic habitat. Sensory disturbance from construction activities, including noise, and light may alter available habitat for moose. Construction equipment and personnel have potential to Introduce invasive (non-native) plant species into new areas by transporting seed or plants on equipment or clothing.	Changes to moose habitat availability (quantity – hectare and quality) Changes to abundance and distribution of moose (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Vegetation clearing and ground disturbance lower connectivity and alter moose use of study areas. Sensory disturbance (noise, light and smell) during construction may cause moose to avoid study areas.	Changes to abundance and distribution of moose (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction vehicles may cause moose injury and mortality. Increased predation on moose due to predator usage of roadway and access roads for movement. Increased hunting of moose due to better access. Introduction of disease (Brainworm) due to movement of deer into region.	Changes to survival abundance and distribution of moose (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of moose habitat. Hydrological changes to ground or surface water leads to loss of moose habitat.	Changes to moose habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
					▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Accidental spills during operations leads to degradation or alteration of moose habitat. Maintenance related to clearing of vegetation maintains early seral and edge habitat along ROW. Maintenance related to culverts and other structures could cause alterations in wetlands degrading moose habitat. Sensory disturbance from road usage degrades effective habitat for moose. Introduction of invasive species to moose habitat due to maintenance activities.	Changes to moose habitat availability (quantity – hectare and quality) Changes to abundance and distribution of moose (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain low connectivity for moose. Road traffic causes sensory disturbance and moose avoidance of the roadway.	Changes to abundance and distribution of moose (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with road traffic during operations cause injury or death. Maintenance activities maintain predator access along roadway and access roads decreasing moose survival. Increased hunting of moose due to better access. Introduction of disease (Brainworm) due to movement of deer into region.	Changes to survival abundance and distribution of moose (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
FURBEARER – AMERICAN MARTEN					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of marten habitat. Hydrological changes to ground or surface water leads to loss of marten habitat.	Changes to marten habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Accidental spill during construction leads to degradation or alteration of marten habitat. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of marten habitat. Hydrological changes cause alterations in wetlands degrading marten habitat. Sensory disturbance from road usage degrades may affect marten habitat near roadway. Introduction of invasive plant species from vehicles and maintenance equipment using the road.	Changes to marten habitat availability (quantity – hectare and quality) Changes to abundance and distribution of martens (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
					▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Vegetation clearing and ground disturbance lower connectivity during construction for marten. Sensory disturbances during construction causes marten to alter movements to avoid construction areas.	Changes to abundance and distribution of martens (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in marten loss of dens and mortality of young. Construction activities increase predator access along roadway and access roads decreasing marten survival. Increased trapping of marten due to better access.	Changes to survival abundance and distribution of martens (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of marten habitat. Hydrological changes to ground or surface water leads to loss of marten habitat.	Changes to marten habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Accidental spills during operations leads to degradation or alteration of marten habitat. Maintenance related to clearing of vegetation maintains early seral and edge habitat along ROW. Maintenance related to culverts and other structures could cause alterations in wetlands degrading marten habitat. Sensory disturbance from road usage degrades effective habitat for marten. Introduction of invasive species to marten habitat due to maintenance activities.	Changes to marten habitat availability (quantity – hectare and quality) Changes to abundance and distribution of martens (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain low connectivity for marten. Road traffic causes sensory disturbance and marten avoidance of the roadway.	Changes to abundance and distribution of martens (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
	Injury or Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially result in marten loss of dens and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing marten survival. Increased trapping of marten due to better access.	Changes to survival abundance and distribution of martens (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
FURBEARER – NORTH AMERICAN BEAVER					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of beaver habitat. Hydrological changes to ground or surface water leads to loss of beaver dams, lodges, and habitat.	Changes to beaver habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Accidental spill during construction leads to degradation or alteration of beaver habitat. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of beaver habitat. Hydrological changes cause alterations in wetlands degrading beaver habitat. Sensory disturbance from road usage degrades may affect beaver habitat near roadway. Introduction of invasive plant species from vehicles and maintenance equipment using the road.	Changes to beaver habitat availability (quantity – hectare and quality) Changes to abundance and distribution of beavers (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Vegetation clearing and ground disturbance lower connectivity during construction for beaver. Watercourses and waterbodies become isolated during in water works. Sensory disturbances during construction causes beaver to alter movements to avoid construction areas.	Changes to abundance and distribution of beavers (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in beaver loss of dams or lodges and mortality of young. Construction activities increase predator access along roadway and access roads decreasing beaver survival. Increased trapping of beaver due to better access.	Changes to survival abundance and distribution of beavers (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of beaver habitat. Hydrological changes to ground or surface water leads to loss of beaver habitat.	Changes to beaver habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Accidental spills during operations leads to degradation or alteration of beaver habitat. Maintenance related to clearing of vegetation maintains early seral and edge habitat along ROW. Maintenance related to culverts and other structures could cause alterations in wetlands degrading beaver habitat. Sensory disturbance from road usage degrades effective habitat for beaver. Introduction of invasive species to beaver habitat due to maintenance activities.	Changes to beaver habitat availability (quantity – hectare and quality) Changes to abundance and distribution of beavers (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain low connectivity for beaver. Road traffic causes sensory disturbance and beaver avoidance of the roadway.	Changes to abundance and distribution of beavers (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially result in beaver loss of dams or lodges and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing beaver survival. Increased trapping of beaver due to better access.	Changes to survival abundance and distribution of beavers (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
BATS					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of bat habitat.	Changes to bat habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
					▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of bat habitat. Hydrological changes cause alterations in wetlands degrading bat habitat. Sensory disturbance from road usage degrades may affect bat habitat near roadway.	Changes to bat habitat availability (quantity – hectare and quality) Changes to abundance and distribution of bats (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Vegetation clearing and ground disturbance lower connectivity during construction for bat. Sensory disturbances during construction causes bat to alter movements to avoid construction areas.	Changes to abundance and distribution of bats (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in bat loss of dams or lodges and mortality of young. Construction activities increase predator access along roadway and access roads decreasing bat survival. Increased energy expenditures during road construction as a result of increase stress due to habitat alteration and disturbance decreases bat survival.	Changes to survival abundance and distribution of bats (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of bat habitat.	Changes to bat habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Maintenance related to clearing of vegetation maintains early seral and edge habitat along ROW. Maintenance related to culverts and other structures could cause alterations in wetlands degrading bat habitat. Sensory disturbance from road usage degrades effective habitat for bat.	Changes to bat habitat availability (quantity – hectare and quality) Changes to abundance and distribution of bats (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
	Alteration in Movement	Maintenance activities maintain low connectivity for bat. Road traffic causes sensory disturbance and bat avoidance of the roadway.	Changes to abundance and distribution of bats (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially result in bat loss of dams or lodges and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing bat survival. Increased energy expenditures during road operations as a result of habitat alteration decreases bat survival.	Changes to survival abundance and distribution of bats (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
FOREST BIRDS – TENNESSEE WARBLER AND ORANGE-CROWNED WARBLER					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of forest songbird habitat.	Changes to forest songbird habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to forest songbird habitat due to construction activities. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of forest songbird habitat. Accidental spill during construction leads to degradation or alteration of forest songbird habitat. Sensory disturbance from construction activities leads to degradation or alteration of forest songbird habitat.	Changes to forest songbird habitat availability (quantity – hectare and quality) Changes to abundance and distribution of forest songbird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Changes to vegetation structure from construction activities alter forest songbird movement and usage of study areas. Sensory disturbance during construction activities causes forest songbird to avoid and alter movement within study areas.	Changes to abundance and distribution of forest songbird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in forest songbird loss of nests and mortality of young. Construction activities increase predator access along roadway and access roads decreasing forest songbird survival.	Changes to survival abundance and distribution of forest songbird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of forest songbird habitat.	Changes to forest songbird habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to forest songbird habitat due to maintenance activities. Maintenance related to vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of forest songbird habitat. Accidental spills during operations leads to degradation or alteration of forest songbird habitat. Sensory disturbance from traffic leads to degradation or alteration of forest songbird habitat.	Changes to forest songbird habitat availability (quantity – hectare and quality) Changes to abundance and distribution of forest songbird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities retain fragmented habitat structure altering movement of forest songbird within the study areas. Sensory disturbance from traffic and human activity causes forest songbird to avoid road and alter movement within the study areas.	Changes to abundance and distribution of forest songbird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially results in forest songbird loss of nests and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing forest songbird survival.	Changes to survival abundance and distribution of forest songbird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
WETLAND BIRDS – ALDER FLYCATCHER AND PALM WARBLER					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of wetland songbird habitat. Hydrological changes to ground or surface water leads to loss of wetland songbird habitat.	Changes to Wetland Birds habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to wetland songbird habitat due to construction activities. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of wetland songbird habitat. Hydrological changes to ground or surface water leads to loss of wetland songbird habitat. Accidental spill during construction leads to degradation or alteration of wetland songbird habitat. Sensory disturbance from construction activities leads to degradation or alteration of wetland songbird habitat.	Changes to Wetland Birds habitat availability (quantity – hectare and quality) Changes to abundance and distribution of Wetland Birds (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Changes to vegetation structure from construction activities alter wetland songbird movement and usage of study areas. Sensory disturbance during construction activities causes wetland songbird to avoid and alter movement within study areas.	Changes to abundance and distribution of Wetland Birds (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in wetland songbird loss of nests and mortality of young. Construction activities increase predator access along roadway and access roads decreasing wetland songbird survival.	Changes to survival abundance and distribution of Wetland Birds (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of wetland songbird habitat. Hydrological changes to ground or surface water leads to loss of wetland songbird habitat.	Changes to Wetland Birds habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
					The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to wetland songbird habitat due to maintenance activities. Maintenance related to vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of wetland songbird habitat. Maintenance activities cause changes to ground or surface water leads and degradation or alteration of wetland songbird habitat. Accidental spills during operations leads to degradation or alteration of wetland songbird habitat. Sensory disturbance from traffic leads to degradation or alteration of wetland songbird habitat.	Changes to Wetland Birds habitat availability (quantity – hectare and quality) Changes to abundance and distribution of Wetland Birds (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain fragmented habitat structure altering movement of wetland songbird within the study areas. Sensory disturbance from traffic and human activity causes wetland songbird to avoid road and alter movement within the study areas.	Changes to abundance and distribution of Wetland Birds (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially results in wetland songbird loss of nests and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing wetland songbird survival.	Changes to survival abundance and distribution of Wetland Birds (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
WATERFOWL – CANADA GOOSE AND MALLARD					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of waterfowl habitat. Hydrological changes to ground or surface water leads to loss of waterfowl habitat.	Changes to waterfowl habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
	Habitat Alteration or Degradation	Hydrological changes cause alterations in wetlands degrading waterfowl breeding habitat. Introduction of invasive species to waterfowl habitat due to construction activities. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of waterfowl habitat. Accidental spill during construction leads to degradation or alteration of waterfowl habitat. Sensory disturbance from construction activities leads to degradation or alteration of waterfowl habitat.	Changes to waterfowl habitat availability (quantity – hectare and quality) Changes to abundance and distribution of waterfowl (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Changes to vegetation structure from construction activities alter waterfowl movement and usage of study areas. Sensory disturbance during construction activities causes waterfowl to avoid and alter movement within study areas.	Changes to abundance and distribution of waterfowl (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in waterfowl loss of nests and mortality of young. Construction activities increase predator access along roadway and access roads decreasing waterfowl survival. Increased human access leads to injury or death of waterfowl from trapping or shooting.	Changes to survival abundance and distribution of waterfowl (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of waterfowl habitat. Hydrological changes to ground or surface water leads to loss of waterfowl habitat.	Changes to waterfowl habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to waterfowl habitat due to maintenance activities. Maintenance related to vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of waterfowl habitat. Accidental spills during operations leads to degradation or alteration of waterfowl habitat. Sensory disturbance from traffic leads to degradation or alteration of waterfowl habitat.	Changes to waterfowl habitat availability (quantity – hectare and quality) Changes to abundance and distribution of waterfowl (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
					The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain fragmented habitat structure altering movement of waterfowl within study areas. Sensory disturbance from traffic and human activity causes waterfowl to avoid road and alter movement within study areas.	Changes to abundance and distribution of waterfowl (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially results in waterfowl loss of nests and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing waterfowl survival. Increased human access leads to injury or death of waterfowl from trapping or shooting.	Changes to survival abundance and distribution of waterfowl (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
SHOREBIRDS – GREATER YELLOWLEGS					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of shorebird habitat. Hydrological changes to ground or surface water leads to loss of shorebird habitat.	Changes to shorebird habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Hydrological changes cause alterations in wetlands degrading shorebird breeding habitat. Introduction of invasive species to shorebird habitat due to construction activities. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of shorebird habitat. Accidental spill during construction leads to degradation or alteration of shorebird habitat. Sensory disturbance from construction activities leads to degradation or alteration of shorebird habitat.	Changes to shorebird habitat availability (quantity – hectare and quality) Changes to abundance and distribution of shorebird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
	Alteration in Movement	Changes to vegetation structure from construction activities alter shorebird movement and usage of study areas. Sensory disturbance during construction activities causes shorebird to avoid and alter movement within study areas.	Changes to abundance and distribution of shorebird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in shorebird loss of nests and mortality of young. Construction activities increase predator access along roadway and access roads decreasing shorebird survival. Increased human access leads to injury or death of shorebird from trapping or shooting.	Changes to survival abundance and distribution of shorebird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operations	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of shorebird habitat. Hydrological changes to ground or surface water leads to loss of shorebird habitat.	Changes to shorebird habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to shorebird habitat due to maintenance activities. Maintenance related to vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of shorebird habitat. Accidental spills during operations leads to degradation or alteration of shorebird habitat. Sensory disturbance from traffic leads to degradation or alteration of shorebird habitat.	Changes to shorebird habitat availability (quantity – hectare and quality) Changes to abundance and distribution of shorebird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain fragmented habitat structure altering movement of shorebird within study areas. Sensory disturbance from traffic and human activity causes shorebird to avoid road and alter movement within study areas.	Changes to abundance and distribution of shorebird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
					▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death of shorebirds	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially results in shorebird loss of nests and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing shorebird survival. Increased human access leads to injury or death of shorebird from trapping or shooting.	Changes to survival abundance and distribution of shorebird (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
RAPTORS – RED-TAILED HAWK AND GREAT GRAY OWL					
Construction	Habitat Loss	Site preparation and vegetation clearing and ground disturbance leads to loss of raptor habitat. Hydrological changes to ground or surface water leads to loss of raptor habitat.	Changes to raptor habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Hydrological changes cause alterations in wetlands degrading raptor breeding habitat. Introduction of invasive species to raptor habitat due to construction activities. Site preparation and vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of raptor habitat. Accidental spill during construction leads to degradation or alteration of raptor habitat. Sensory disturbance from construction activities leads to degradation or alteration of raptor habitat.	Changes to raptor habitat availability (quantity – hectare and quality) Changes to abundance and distribution of raptor (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Changes to vegetation structure from construction activities alter raptor movement and usage of the study areas. Sensory disturbance during construction activities causes raptor to avoid and alter movement within the study areas.	Changes to abundance and distribution of raptor (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury of Death	Collisions with construction related vehicles or equipment cause injury or death. Clearance activities related to road construction potentially results in raptor loss of nests and mortality of young.	Changes to survival abundance and distribution of raptor (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
		Construction activities increase predator access along roadway and access roads decreasing raptor survival. Increased human access leads to injury or death of raptor from trapping or shooting.			The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operation	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of raptor habitat. Hydrological changes to ground or surface water leads to loss of raptor habitat.	Changes to raptor habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Habitat Alteration or Degradation	Introduction of invasive species to raptor habitat due to maintenance activities. Maintenance related to vegetation clearing and ground disturbance leads to structural changes and degradation or alteration of raptor habitat. Accidental spills during operations leads to degradation or alteration of raptor habitat. Sensory disturbance from traffic leads to degradation or alteration of raptor habitat.	Changes to raptor habitat availability (quantity – hectare and quality) Changes to abundance and distribution of raptor (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Alteration in Movement	Maintenance activities maintain fragmented habitat structure altering movement of raptor within the study areas. Sensory disturbance from traffic and human activity causes raptor to avoid road and alter movement within the study areas.	Changes to abundance and distribution of raptor (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Atmospheric Environment (Section 9) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury of Death	Collisions with road traffic during operations cause injury or death. Clearance activities related to ROW maintenance potentially results in raptor loss of nests and mortality of young. Maintenance activities maintain predator access along roadway and access roads decreasing raptor survival. Increased human access leads to injury or death of raptor from trapping or shooting.	Changes to survival abundance and distribution of raptor (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Species at Risk (Section 13) ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
HERPETOFAUNA – REPTILES AND AMPHIBIANS					
Construction	Habitat Loss	Vegetation clearing and ground disturbance could cause loss of habitat for herpetofauna including breeding locations. Filling in of watercourses/wetlands will result in a loss of herpetofaunal habitat.	Changes to herpetofaunal habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19).
	Habitat Alteration or Degradation	Vegetation clearing and ground disturbance alter herpetofaunal habitat. Deposition of dust and other airborne particles degrades herpetofaunal habitat near construction areas. Aquatic amphibian habitat could be contaminated and degraded through accidental spills. Sensory disturbance from construction activities degrades effective habitat for herpetofauna.	Changes to herpetofaunal habitat availability (quantity – hectare and quality) Changes to abundance and distribution of herpetofauna (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Fish and Fish Habitat (Section 10) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19).
	Alteration in Movement	Construction activities could act as a physical barrier to herpetofaunal movement.	Changes to abundance and distribution of herpetofauna (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Movement of construction equipment cause herpetofaunal injury or death. Filling in of watercourses/wetlands may result in direct amphibian death. Aquatic spills/releases could kill amphibians directly.	Changes to survival abundance and distribution of herpetofauna (number/ha)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
Operation	Habitat Loss	Maintenance related to vegetation clearing and ground disturbance leads to loss of herpetofauna habitat. Hydrological changes to ground or surface water leads to loss of herpetofauna habitat.	Changes to herpetofaunal habitat availability (quantity – hectare)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

Project Phase	Potential Effect	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
	Habitat Alteration or Degradation	Road maintenance related to the potential release of deleterious substances (e.g., fuel, oil, etc.) that could impair water quality and reduce herpetofauna habitat quality. Maintenance related to clearing of watercourse control structures could cause alterations in wetlands degrading herpetofauna habitat. Deposition of dust and other airborne particles from traffic degrades herpetofaunal habitat near roadway. Sensory disturbance from road usage degrades effective habitat for herpetofauna. Maintenance related to vegetation clearing and ground disturbance may alter herpetofaunal habitat.	Changes to herpetofaunal habitat availability (quantity – hectare and quality) Changes to abundance and distribution of herpetofauna (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Fish and Fish Habitat (Section 10) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19).
	Alteration in Movement	Open areas around road and roadbed act as barrier limiting herpetofaunal movement including dispersal and home range movements.	Changes to abundance and distribution of herpetofauna (number/ha)	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)
	Injury or Death	Collisions with vehicles cause herpetofaunal injury or death. Aquatic spills/releases could kill amphibians directly.	Changes to survival abundance and distribution of herpetofauna (number/ha)	Direct	The assessment of this VC is informed by the effects assessment for other VCs: ▪ Surface Water Resources (Section 7) ▪ Groundwater Resources (Section 8) ▪ Vegetation and Wetlands (Section 11) The assessment of this VC informs and is informed by the effects assessment for other VCs: ▪ Non-Traditional Land and Resource Use (Section 16) ▪ Aboriginal and Treaty Rights and Interests (Section 19)

12.4 Mitigation and Enhancement Measures

This section presents the proposed mitigation measures to eliminate, reduce, control, or offset potential adverse effects to wildlife and wildlife habitat during the construction and operations phases of the Project (as described in **Section 12.3**). In Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) approaches designed to ameliorate or eliminate the potential effects of the Project on vegetation, wetlands and riparian areas were discussed. Many of these measures can minimize habitat loss or alteration of habitat in the short-term (e.g., Vegetation and Invasive Species Management Plan, Erosion and Sediment Control Plan, Wildlife Management Plan). Other measures, such as the restoration of non-permanent worksites and the implementation of environmental monitoring and inspection programs during operation, will facilitate habitat enhancement in the long-term.

The Project Team has strived to avoid potential effects to the natural environment. (Refer to Section 3, which describes the evaluation process that was used to identify the preliminary preferred route). When complete avoidance was not practicable, mitigation measures have been proposed, including aspects of Project design that reduced negative (adverse) effects prior to the onset of construction. These measures are expected to reduce the resulting adverse net effects on wildlife habitat quality and quantity, survival and reproduction, and injury or death.

Certain adverse effects (including net effects) cannot be fully avoided or mitigated. Such cases are often compensated for by undertaking positive environmental activities, including measures that involve habitat restoration or habitat off-setting. This section and the following sections in Appendix E (Mitigation Measures) outline key mitigation and enhancement measures to reduce potential adverse effects on the Wildlife and Wildlife Habitat VC. Additional measures will be provided in the Construction Environmental Management Plan (CEMP) and Operations Environmental Management Plan (OEMP) that will be developed for the Project.



Indigenous community members will have an active role in developing and implementing management plans.



An Environment Committee will be established to facilitate communication and engagement during construction and operations of the Project. Committee members will include Webequie First Nation Elders and Knowledge Holders, other First Nations with interest in participating, and appropriate project representatives, to: facilitate communication and engagement during construction and operations of the Project; facilitate use of Indigenous Knowledge in project activities; facilitate evaluation of land use information; and facilitate development of appropriate monitoring programs, protocols and management plans as it relates to Wildlife and Wildlife Habitat VC.

Section 12.4.2 describes mitigation and enhancement measures that are appliable across species groups; however, some potential effects are either species-specific or specific to a group of species and measures to address these potential effects are described in the following sections: Moose (**12.4.3**), Furbearers (**12.4.4**), Bats (**12.4.5**), Birds (**12.4.6**), and Reptiles and Amphibians (**12.7**). The effectiveness of mitigation during construction and operations will be evaluated as part of the follow-up monitoring program for the Project, and measures will be modified or enhanced as necessary through an adaptive management process.

12.4.1 Habitat Availability and Key Mitigation Measures

In this EAR/IS, the term '*habitat availability*' refers to the amount of habitat that is available to a species or species group prior to, during or after Project implementation. This represents habitat that is likely to be used without negative consequences to survival, reproduction, or population of wildlife. Habitat availability will be reduced through direct habitat loss, and indirectly through habitat alteration and degradation. Direct habitat loss is a quantitative measure, and an example of this would be from the physical development footprint of the Project. Habitat can also become unavailable to species indirectly through avoidance. An example of this is habitat degradation from sensory disturbances, such as noise, light, and scent, which often deter wildlife. Further, altered habitat that has been reduced in quality might continue to be used by species at their own detriment; for example, increasing habitat edges can attract predators which put their prey species at higher risk of injury or death.

The Project Team has taken steps to during the planning and development phase to limit potential adverse effects on habitat availability, particularly for sensitive species or wildlife habitat. Existing conditions studies for species and species groups that were conducted have been used to inform the recommended mitigation measures and follow-up monitoring program which will be implemented during the construction and operational phases of the Project. Environmental management plans will also be developed for each respective phase. The frameworks for the Construction Environmental Management Plan and Operation Environmental Management Plan are described in Appendix E (Mitigation Measures).

During the construction phase, the following key mitigation measures, in addition to those described in **Sections 12.4.2 – 12.4.7**(Wildlife and Wildlife Habitat, Moose, Furbearers, Bats, Birds, and Reptiles and Amphibians) and those specified in Appendix E, will be applied and monitored:

- Habitat delineation and mapping activities will be used to develop accurately located protective measures. This will include construction fencing installed to clearly delineate the boundaries of work areas and prevent habitat damage and loss beyond the limits of the work area. Delineation and fencing will also restrict human access to sensitive habitats.
- Restrictions will be put in place to reduce the stopping of vehicles and equipment along the roadway. Maps will be created identifying no-go zones and the importance of these zones will be shared during environmental training and awareness program for workers.
- Vegetation clearing will be undertaken using appropriate equipment to minimize and avoid effects outside of the clearing zone (Project Footprint). Cleared vegetation will be disposed of according to best practices, such as chipping, spreading, compacting and/or transporting logs or timber to Webequie First Nation for community use.
- The CEMP that will be prepared and implemented for the Project will identify the protocols and procedures for the stockpiling and management of vegetation and soils, including how disturbed areas will be stabilized and monitored.
- Petroleum handling and storage procedures have been developed, including spills prevention and emergency response to avoid effects to soil, groundwater, surface water, vegetation and wildlife. (Refer to Section **5.2 and 5.3** of Appendix E: Mitigation Measures).

- Timing for construction activities will be established to reduce the potential effect on wildlife species and their habitat. The timing windows[2] for construction activities (e.g., vegetation clearing) have been determined in consultation with the MNR and Canadian Wildlife Service – Environment and Climate Change Canada (CWS-ECCC).
- Site-specific erosion and sediment control and construction staging plans, along with air and dust control measures will be developed and approved prior to construction to address potential deposition of dust and/or sediment that can change soil quality, alter vegetation and wetlands, which can adversely influence wildlife habitat. Water will be used to control dust from exposed excavations, disturbed ground surfaces, pits, quarries and traffic areas. Erosion and sediment control measures may include use of sediment fencing, silt curtains, and temporary erosion control cover (e.g., straw mulch, wood chips, erosion control blanket, etc.) to prevent the migration of sediment off-site. (Please refer to Section 5.16 and 5.18 of Appendix E: Mitigation Measures).

The effectiveness of mitigation measures will be evaluated during construction and operations, with measures being modified or enhanced as necessary through adaptive management.

12.4.2 General Wildlife and Wildlife Habitat Mitigation

The following section outlines key measures that are applicable to mitigate potential effects on wildlife habitat, inclusive of habitat loss, habitat alteration or degradation, wildlife movement patterns and wildlife injury or death. A summary of the potential effects, mitigation measures, and predicted net effects of the Project on wildlife is presented in **Table 12-41.**

12.4.2.1 Wildlife Habitat Loss

12.4.2.1.1 Construction

Clearance Activities

Vegetation clearing and ground disturbances during the construction phase will result in the loss of structures that provide shelter to wildlife, reduce sources of foraging material, and change other environmental attributes that wildlife depend on for survival and reproduction. Mitigation measures designed to eliminate or minimize the potential effect of the Project on vegetation communities and plant species are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). The loss of wildlife habitat will be minimized by:

- Developing a Vegetation and Invasive Species Management Plan, Wildlife Management Plan and Site Restoration and Monitoring Plan in advance of construction. These plans will form subcomponents of the CEMP and will be implemented following Project initiation. To the extent possible, restoration and management plans will be developed in cooperation with Webequie First Nation and other Indigenous communities and groups, Local Rights Holders, relevant Federal and/or Provincial Agencies and other Stakeholders.

[2] In wildlife biology, timing windows are specific periods of the year when certain activities can be conducted with minimal impact on wildlife. Timing windows vary based on the ecological needs of certain species (or species groups) and are often tied to life cycles, with stages that involve breeding, nesting or young often being considered the most important to avoid.

- During Project planning, where practicable, construction camps, laydown yards, and other temporary areas of disturbance were placed in strategic locations that avoided habitat identified as being important to wildlife (e.g., beaver lodges and dams, known raptor nests).
- To the extent practicable, temporary construction areas were also placed outside of areas identified as being of high use for wildlife (e.g., those identified through Resource Selection Functions/RSF habitat models). For additional information about mitigation measures for specific species or species group, please refer to **Sections 12.4.3 – 12.4.7** (Moose, Furbearers, Bats, Birds, and Reptiles and Amphibians).
- Using existing roads, trails, and other areas of disturbance to access to Project Footprint, to the extent possible, thereby minimizing habitat loss through the creation of new access roads.
- Qualified project personnel will identify sensitive habitats that are important to wildlife prior to and during construction (e.g., significant wildlife habitat, areas of high use). Should any be found, they will be assessed by a qualified biologist or resource specialist, and an appropriate course of action will be determined, in consultation with regulatory agencies (e.g., CWS-ECCC, MECP, MNR) as required. This may involve receiving approvals or permissions from appropriate regulatory agencies.
- Limiting the Project Footprint where practicable and minimizing the extent of clearing near areas known to be sensitive (for example, areas where suitable maternity roosting habitat for bats have been identified). Project components have been sited to provide buffer zones around such areas.
- Engaging and receiving approval from the appropriate agencies (e.g., MECP, MNR, CWS-ECCC) prior to the removal of any identified SWH, high-use areas, or other sensitive ecological features that have been identified as being important to wildlife.
- Using construction fencing to clearly define and delineate the boundaries of work areas to prevent habitat loss or damage beyond the limits of the Project Footprint. Clearing and grubbing activities shall be limited to the permanent development area and any associated supportive infrastructure during the construction phase.
- Delineating and marking construction boundaries and restricting the clearing of vegetation outside of species-specific, or group-specific timing windows.
- If adherence to the timing windows and restrictions is not possible, the proponent's contractor will develop site specific mitigation and monitoring in consultation with appropriate regulatory agencies (e.g., MNR, CWS-ECCC).
- Retaining compatible wildlife trees, shrubs, and coarse woody debris (CWD) in environmentally sensitive areas where it is safe to do so. Known sensitive ecological features will be clearly marked and have associated setbacks to prevent their loss.
- To the extent practicable, progressively reclaiming areas during construction and restoring it to a functional stage. All non-permanent worksites will be restored as soon as feasible after work has been completed. The restoration work will include the removal of construction debris, decompaction and amendments to soils, and the revegetation of disturbed areas.
- Restoration approaches will be designed to permit natural regeneration of vegetation, and, where necessary, the establishment of self-sustaining species that are indigenous to the area via transplanting, use of root or stem cuttings, planting of area-appropriate native stock supplies or the application of approved seed mixes (for groundcover).
- Enhancing existing wildlife habitat, where appropriate, by planting and seeding self-sustaining species that are indigenous to the area. All planting and/or seeding must be carried out under appropriate weather conditions (e.g., low or no wind, low or no rainfall, soft, thawed ground).

- Having qualified personnel conduct site visits and inspections to verify that site-specific environmental protection measures have been implemented correctly, maintained and, as necessary, repaired, until the vegetation has been re-established (e.g., erosion and sediment control).
- Prioritizing on-site restoration (i.e., Project Footprint) opportunities, while also utilizing suitable off-site compensation opportunities (e.g., disturbed lands within or near the community of Webequie and the western end of the LSA in the vicinity of the Noront camp) where on-site options are limited. WSR Natural Heritage Existing conditions data and input from Local Rights Holders, Federal and/or Provincial Agencies and other Stakeholders was reviewed when identifying restoration objectives and sites. If insufficient area is available for restoration in the LSA, other mechanisms such as cash-in-lieu and research may be considered. For additional information, refer to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands).
- Conducting ecological monitoring to verify restoration efforts have been successful (e.g., for upland habitats, a minimum 70-75% success rate in terms of species richness and density for trees/shrubs and minimum 50% establishment of healthy reproducing populations from the herbaceous seed mixes).

The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary; however, it is anticipated that these measures will only partially mitigate the potential effects of vegetation clearance on wildlife habitat. As a result, this topic has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.2.2 Wildlife Habitat Alteration or Degradation

12.4.2.2.1 Construction

Habitat Structural Change

Vegetation clearing and ground disturbances during the construction phase may alter the structure of wildlife habitat and increase the short-term availability of early successional habitat. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary (i.e., through adaptive management). The alteration or degradation of wildlife habitat will be minimized by:

- Following approval conditions, authorizations or permits issued for the Project, including those from MNR, CWS-ECCC and MECP.
- Retaining wildlife trees, shrubs, and coarse woody debris (CWD) in environmentally sensitive areas where it is safe to do so. Known sensitive ecological features will be clearly marked and have associated setbacks to minimize the likelihood of habitat change.
- To the extent possible, progressively reclaiming areas during construction and restoring the habitat to resemble pre-construction conditions. Ideally, this would mean that all non-permanent worksites are restored as soon as possible after work in each area has been completed. The restoration work would include the removal of construction debris, decompaction and amendments to soils, and revegetating disturbed areas.

- Restoration activities will incorporate approaches designed to permit natural regeneration of vegetation, and, when necessary, the establishment of self-sustaining species that are indigenous to the area by transplanting individuals or using root or stem cuttings. Where transplanting species from within the LSA is not practicable, native species will be obtained from a reputable supplier based on approved lists. All planting and seeding must be carried out under appropriate weather conditions (e.g., low or no wind, low or no rainfall, soft or thawed ground).
- Having qualified personnel conduct site visits and inspections to verify that site-specific environmental protection measures have been implemented correctly, maintained and, as necessary, repaired, until the vegetation has been re-established (e.g., erosion and sediment control).
- Conducting follow-up monitoring to evaluate the effectiveness of mitigation and enhancement measures.

It is anticipated that the potential effects of habitat structural change will be reduced through these measures but not eliminated. Therefore, additional discussion has been carried forward to Predicted Net Effects (**Section 12.7**).

Hydrological Changes

Hydrological changes in surface and/or groundwater quantity or quality may cause an alteration in wetlands or riparian areas, potentially degrading wildlife habitat. During development, the Project Team considered consolidation and compression processes of the peat layers associated with placement of fill for road construction, which could reduce the permeability of the peatlands and thus alter groundwater directions and pathways. Mitigation measures to reduce changes to hydrology and drainage patterns are provided in Section 7.4 (Mitigation Measures for Effects on Surface Water Resources), Section 8.4 (Mitigation Measures for Effects on Groundwater Resources), and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. These measures include:

- Development of a Surface Water and Storm Water Management and Monitoring Plan as part of the CEMP and implementing it during the construction phase.
- Development of Erosion and Sediment Control Plans as part of the CEMP and implementation during the construction phase.
- Ensuring that any short-term water takings from surface water and/or groundwater sources for construction purposes are carried out in accordance with O. Reg. 387/04, as amended by O. Reg. 64/16 under the Ontario *Water Resources Act* and industry best standards. Appropriate permits (e.g., permit to take water) and registrations (e.g., Environmental Activity Sector Registry registration) will be obtained prior to the commencement of work.
- Following any conditions, permits or authorizations relating to environmental approvals for the Project, including those from ECCC, MNR and MECP, during the construction phase of the Project.
- Minimizing areas where site grading or ground hardening occurs. This can include designing areas used for temporary infrastructure, including access roads and storage yards, efficiently, and incorporating the use of coarse materials (i.e., with the same or higher permeability compared to surrounding native soils) in the base of permanent roads to permit infiltration and groundwater recharge.
- Utilizing industry Best Management Practices (BMPs) to assist in ensuring that dewatering (pumping) volumes are minimal.

- Restoring disturbed areas (from temporary support infrastructure) through the decompaction of and replacement with similar native soils, prior to planting or seeding self-sustaining indigenous vegetation as part of site remediation.
- Timing construction of permanent and/or temporary waterbody crossing structures with low-flow conditions to minimize diversions of surface water and including temporary flow diversions or bypass pumping during construction to minimize environmental effects (including flow volumes) upstream and downstream of the site. These measures will allow Moose, furbearers, herpetofauna and other species groups continued access to their source of surface water.
- Further minimizing potential changes to water quantity by designing permanent waterbody crossings with bridges or culverts whenever possible. The use of single-span elements will limit the encroachment of structures into stream channels and thus minimize their effect(s) on discharge.
- Installing localized drainage cross-culverts (900 mm diameter) at regular intervals in low-lying areas to prevent water from ponding on either side of the roadway, instead maintaining existing hydrological flow paths. In wetland habitat, crossing structures should be spaced no more than 50 m apart, and up to 300 m apart in other continuous habitat features (Schmidt and Zumbach, 2008; OMNRF, 2016).
- Designing the roadway and swales with Low Impact Development procedures in mind. The designs include permanent swales that are designed to convey, treat, and attenuate stormwater runoff from the road, thereby improving the removal of contaminants over traditional channel roadside ditch designs.
- Ensuring all mitigation measures implemented during the construction phase comply with relevant federal and provincial regulations and guidelines regarding the collection and storage of explosives and solid waste (e.g., federal Explosives Act).
- Testing discharge water quality to verify that it meets Ontario Provincial Water Quality Objectives, with detailed plans in place for monitoring and contingency measures recommended. Construction workers may be required to temporarily stop their work so contingency measures can be employed.
- Avoiding the use of herbicides during the construction phase and avoiding the use of road salt or sand on the road for de-icing.

It is anticipated that the potential effects of hydrological change will be sufficiently mitigated such that they are not expected to cause net effects on most wildlife habitat in the LSA or RSA; however, potential effects on some species, such as North American beaver, may still occur. As a result, discussion of hydrological change has been carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

The Project is expected to generate airborne contaminants, dust emissions and/or depositions during the construction and operations phases. The deposition of contaminants could result in changes to soil and surface water quality; thus, altering the composition, structure and diversity of plant communities. Airborne dust produced from the Project could cause direct, localized changes to vegetation by interfering blocking sunlight and directly interfering with photosynthesis, also causing changes to the structure and composition of plant communities. Mitigation measures designed to minimize the risk of air and dust emissions and depositions, which can impact wildlife habitat, are described in Section 9.4 (Mitigation of Effects on Atmospheric Environment) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. These measures include:

- Developing an Air Quality and Dust Control Management Plan as part of the CEMP. Recommendations from this plan will be implemented during construction. Typical mitigation measures include using environmentally certified equipment to conduct the work, ensuring the equipment is maintained

regularly, minimizing the idling of equipment, and setting speed limits within the Project Footprint and LSA.

- Incorporating emission and pollution control equipment on vehicles, equipment and machinery operating in the Project Footprint, and ensuring that all vehicles.
- Regularly inspecting equipment and machinery to verify they are in good working order.
- Following industry best management practices and adhering to relevant federal and/or provincial thresholds regarding the deposit of acidifying compounds on plants.
- Where practicable, using multi-passenger vehicles to transport personnel to the job site and limit vehicle emissions.
- Turning off vehicles and equipment when not in use and minimizing idling unless weather and/or safety conditions require them to remain turned on.
- When practicable, retaining compatible vegetation on steep slopes, drainage ways, areas prone to wind erosion and adjacent to waterbodies and waterways.
- Minimizing the burning of wooden logs, branches and other vegetation that has been removed from the Project Footprint (current objective is ≤ ten percent). Verify any slash pile burning from clearing operations has been approved by the appropriate regulatory agencies and complies with O. Reg. 207/96, subject to agreements with nearby Indigenous communities and groups.
- Minimizing dust-generating activities during periods of high wind to limit dust emissions.
- Where necessary, implementing dust control measures, such as water sprays or dust control solutions that can be applied on the road surface. The use of chloride containing compounds will be minimized to the extent possible. Sprays may also be used to increase moisture levels in the air on dry days. Water application rates shall be carefully monitored to assist in eliminating the erosion of sediments, or pooling and/or runoff of water.
- Should magnesium chloride, or other chemical dust suppressants be required, they will not be applied within 50 m of a water crossing or beyond the footprint of the road. In general, the use and application of dust suppressants, where applicable, will be conducted in accordance with MTO OPSS – Construction Specification for Dust Suppressants.
- Using temporary cover on soil and fill stockpiles (e.g., wood chips, straw, tarps) or alternately, keeping stockpiles moist during construction (i.e., by applying water) to minimize drifting of soils.
- Within the more upland western half of the Project Footprint, where more stable soil conditions are found, using a chip seal treatment on the road, which is similar to asphalt pavement, and consists of a tar slurry and gravel.
- Within the eastern portion of the LSA, where there are peatlands with relatively poor soil conditions, using a granular A-type gravel on the driving surface.

It is anticipated that application of these measures will effectively mitigate potential effects to wildlife habitat from the deposition of dust and other airborne particles on the Project Site. Since are not expected to cause net effects in either the LSA or RSA, the topic ‘Deposition of Dust and Other Airbourne Particles’ has not been carried forward to **Section 12.7** (Predicted Net Effects).

Accidental Spills

Chemical or hazardous materials stored on the Project site or spills of such materials in the Project Footprint could affect wildlife survival and reproduction. Spills, should they occur, are predicted to be generally localized in nature. Given the types of activities that will be associated with the Project, the most likely types of spills would be fuel and/or oil-based products from machinery and equipment. Mitigation measures designed to minimize the potential risks of accidental spills and contingency measures for

appropriate rapid response in the event of a spill are described in Section 6.4 (Mitigation of the Effects on Geology, Terrain and Soils) Section 23.5 (Accidents and Malfunctions) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary via adaptive management. These measures include:

- Development of a Petroleum Handling and Storage Plan as part of the CEMP to minimize the chance of accidental spills or leaks in the Project Footprint or LSA, and a Spill Prevention and Emergency Response Plan to assist with effective and efficient clean-up response should any spills or leaks occur. This plan will be developed in accordance with all applicable contract specifications, environmental legislation, permits and authorizations.
- Handling and storing all petroleum products in compliance with the Ontario *Technical Standards and Safety Act* and transporting all petroleum products in accordance with the federal *Transportation of Dangerous Goods Act* and *Ontario Dangerous Goods Transportation Act.*
- Making Project personnel aware of the Petroleum Handling and Storage Plan and the Spill Prevention and Emergency Response Plan. Educating personnel to appropriately handle and store all products in compliance with provincial and federal legislation and guidelines.
- Storing and maintaining all vehicles and equipment at least 30 m from waterbodies and operating them in a way that prevents the release of deleterious substances into waterbodies or waterways, which could negatively effect wildlife habitat.
- Storing, transferring and dispensing fuels in areas well set back from waterbodies (e.g., 50 m setback from the ordinary high watermark) in designated areas at temporary construction camps and laydown areas along the road.
- Transporting fuel and hazardous materials in approved containers in licenced vehicles. Such containers will be routinely inspected for leaks.
- Incorporating signage and reduced speed limits within the LSA to reduce the risk of vehicle accidents and spills.
- Delaying construction during heavy precipitation or run-off events, to minimize the extent spilled substances may travel.
- Maintaining on-site spill kits that can be used to manage and adsorb any spilled material that is visible on the water's surface. Such kits will be provided in fuel and hazardous materials storage and handling facilities, in on-site work areas and/or in vehicles and equipment. All personnel will be trained in spill response practices and procedures.
- Reporting any major spill of petroleum or other hazardous material to the MECP Spill Action Centre, immediately after occurrence of the environmental accident (as per Ontario Regulation 675/98).
- Containing and immediately cleaning up any spill that is identified as "non-reportable" under subsection 6(2) of Ontario Regulation 224/07 in accordance with the onsite Emergency Response Plan.
- Removing any contaminated soil and/or vegetation from the local area and subsequently replacing the soils that have been exposed to spilled material as soon as possible.
- Allowing indigenous vegetation to regenerate local areas where soil and/or vegetation removal has occurred, occasionally enhancing re-establishment by planting or seeding programs that use self-sustaining species indigenous to the area.

It is anticipated that these measures will effectively mitigate any potential effects to wildlife habitat from chemical or hazardous materials on the Project site. As a result, the topic Accidental Spills has not been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

Loud noises, lights, smells and other sensory disturbances associated with human activity have the potential to cause the displacement of wildlife, loss of wildlife habitat, and changes in predator-prey relationships. Atmospheric environmental conditions, including vibration and noise are discussed in Section 9, while visual environmental conditions, including light, are discussed in Section 18. Mitigation measures designed to minimize sensory disturbances in the project area are discussed in Section 9.4 (Mitigation Measures for Effects on Atmospheric Environment), Section 18.4 (Mitigation Measures for Effects on Visual Environment), and Appendix E (Mitigation Measures). Additional measures will be provided in the CEMP and OEMP for the Project. The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. These measures include:

- Developing a Noise and Vibration Management Plan that includes guidance to mitigate the effects of noise and vibration from construction activities, a Light Management Plan that will describe procedures and BMPs to control light emissions from construction activities, and a Construction Blasting Management Plan with protocols to reduce sensory effects from blasting on wildlife.
- Following the conditions, permits or authorizations relating to environmental approvals that were issued for the Project, including those from ECCC, MNR, and MECP.
- Avoiding new disturbances (e.g., clearing and grubbing) beyond the Project Footprint to the extent practicable, particularly at waterbody crossing sites.
- Minimizing the extent of vegetation cleared at all navigable waterbody crossings within the Project Footprint to reduce sensory effects (both visual and auditory).
- To the extent practicable, maximizing efforts to retain vegetation and landforms along the ROW to provide screening (buffering) of Project activities and components on adjacent lands.
- Ensuring any temporarily disturbed habitats within the Project Footprint are allowed to regenerate (or, as necessary, planted or seeded to permit self-sustaining native vegetation to establish itself) as soon as possible following construction activities in that part of the Project Footprint have been completed.
- Adhering to timing windows and restrictions to avoid sensitive life-cycle periods (e.g., nesting, hibernation).
- If adherence to the timing windows and restrictions is not possible, the proponent's contractor will develop site specific mitigation measures and effectiveness monitoring programs in consultation with appropriate regulatory agencies (e.g., MECP, CWS-ECCC).
- Requiring the Contractor to comply with noise by-laws, and, where applicable, use other noise control measures as agreed to by the adjacent Indigenous communities and municipal authorities.
- Requiring all vehicles and equipment supplied by the Contractor for use on the Project to be effectively 'sound-reduced' though the use of noise abatement equipment such as silencers, mufflers, and acoustic shields. Noise abatement equipment will be maintained in good working order.
- Where practicable, turning off vehicles and equipment when not in use.
- To the extent possible, having construction activities typically occur during daylight hours, typically within one (1) 10-hour shift per day, with normal working hours of 7:00 to 19:00, unless otherwise regulated by adjacent Indigenous communities or municipal authorities with a written exemption that can be provided to the proponent upon request.
- Enforcing speed limits for vehicles and prohibiting the recreational use of vehicles (e.g., snowmobiles, ATVs) by Project personnel in the Project Footprint.

- Preparing and Submitting a Construction Blasting Management Plan for the Project to the Contractor prior to the initiation of blasting activities. Blasting restriction 'windows' for the protection of aquatic and wildlife species will be addressed in the plan.
- Carrying out blast operations in accordance with Department of Fisheries and Oceans (DFO) guidelines, where applicable, and Ontario Provincial Standard Specification 120 General Specification for the Use of Explosives.
- Blasting will be completed as quickly as possible to shorten the duration of disturbance.

It is anticipated that these measures will only partially mitigate potential effects from sensory effects on wildlife habitat at the Project site. As a result, the topic 'Sensory Disturbance' has been carried forward to **Section 12.7** (Predicted Net Effects).

Introduction of Invasive Species

The construction of roads produces edge environments that can influence adjacent habitat not only by changing abiotic conditions (e.g., increased light, chemical changes in the soil or water), but also by introducing noxious or exotic species to an area (i.e., via new access pathways). Further, materials used in construction of roads often create environmental conditions that are more easily tolerated by invasive species. Mitigation measures designed to minimize the introduction and/or spread of invasive plant species are discussed in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. These measures include:

- Developing an Invasive Species Management and Monitoring Plan as part of the Vegetation and Invasive Species Management Plan in the CEMP and implementing the plan during construction. This plan would include measures to detect, control (i.e., remove) and monitor areas containing exotic species.
- Following all environmental approval conditions, authorizations or permits issued for the Project, including those from ECCC, MNR and MECP.
- Holding information sessions, producing education materials, and/or installing signage to familiarize Project personnel with potential invasive species, as well as what they should do when invasive species are encountered in the LSA (i.e., appropriate reporting procedures). Such sessions or materials should be delivered prior to the start of construction and repeated whenever new personnel become engaged in Project-related construction activities.
- Prohibiting the recreational use of motorized vehicles by contractors and limiting the use of of-road vehicles during construction.
- Reducing the potential of introducing invasive plans by including visual inspections (of vehicles, machinery and equipment) as part of standard operating procedures during construction. Particular attention should be paid to undersides, wheels, wheel arches, guards, radiator grills and other attachments as applicable.
- Removing any invasive materials found, including seeds or other plant materials, by scraping or washing the exterior surfaces of vehicles and equipment. Removal activities will be conducted at least 30 m away from any watercourse, waterbody or vegetation community, with the material being isolated until it can be safely removed from the LSA.
- Such measures are aimed at ensuring construction machinery and vehicles arrive on the site in a clean condition, free of mud and debris that could harbor seeds of invasive vegetation species.

- Minimizing soil disturbance to the extent practicable, to reduce the loss of topsoil and preserving a base layer that is sufficient to permit natural regeneration. Disturbed areas shall be contoured to minimize soil erosion and encourage the growth of native vegetation. Where necessary, these areas may be enhanced by planting self-sustaining indigenous species and/or seeding a combination of self-sustaining native species and cover crop (mixture) as soon as possible following disturbance.
- Confirming imported fill or soil is free of contaminants, including seeds or materials from invasive species, to reduce the potential of their introduction or spread in the LSA.
- Where practicable, using local soil banks from grading operations for re-vegetation and restoration treatments, and when not practical, using an approved plant species of importance to Indigenous communities and/or native seed mix that has been sourced from a reputable supplier. Seed mixes will be checked for the presence of invasive plants prior to use in restoration treatments.
- Targeting invasive non-native species for removal through manual, mechanical and/or chemical methods. To the extent possible, mechanical methods of control such as mowing, tilling, digging or pulling will be used before chemical methods.
- Using herbicides only when other control methods have proven ineffective in weed management: (Should herbicide application be selected as a method of invasive plant control, all herbicides must be applied by a licensed applicator in accordance with Ontario regulations).

It is anticipated that these measures will mitigate potential effects from invasive or noxious plants on wildlife habitat at the Project site. As a result, the topic of 'Invasive Plant Species' has not been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.2.2.2 Operations

Habitat Structural Change

Repairs to the roadway and clearing of the ROW will periodically be required during the operations phase of the Project; however, it is expected that these activities will not result in disturbance beyond the area affected by construction, and will therefore cause no, or negligible, additional changes to the structure of wildlife habitat. Aggregate (sand, gravel) and rock material will be required for road maintenance and repair activities, and may involve additional vegetation clearing; however, these areas will be progressively rehabilitated during the construction and operation phases of the Project. A Vegetation Management and Monitoring Plan and a Wildlife Management and Monitoring Plan will also be updated and implemented as part of the OEMP. It is anticipated that these measures will only partially mitigate the potential effects of habitat structural change at the Project site. As a result, this topic has been carried forward to **Section 12.7** (Predicted Net Effects).

Hydrological Changes

It is not anticipated that the operations phase of the Project will result in hydrological changes beyond the area affected during the construction phase. As a result, the mitigation measures that have been described in **Section 12.4.2.2.1** (Construction) will serve to ameliorate habitat degradation (from hydrological change) in the long term. In addition, the following will occur:

- Review, revise as necessary, and implement mitigation measures from the Surface Water and Stormwater Management and Monitoring Plan as part of the OEMP. They will subsequently be implemented.
- Adherence to any conditions, permits or authorizations relating to environmental approvals, including those from ECCC, MNR and MECP, during the operations phase of the Project.

- Road maintenance activities will regularly check culverts and other crossings for blockages to flow. If found, they will be removed appropriately.
- Neither sand, nor salt will be used on the WSR for winter maintenance activities (i.e., de-icing).
- Herbicides will only be used when other control methods (e.g., mechanical, manual) for invasive plants have proven ineffective. If the application of herbicides is required, it will be done by licensed applicator in accordance with provincial regulations).

It is anticipated that the potential effects of hydrological change will be sufficiently mitigated such that they are not expected to cause net effects on most wildlife habitat in the LSA or RSA; however, this is not true for all wildlife. As a result, discussion of hydrological change has been carried forward to the Predicted Net Effects section under specific species groups (**Section 12.7**).

Sensory Disturbance

The operations phase of the WSR will involve vehicles regularly travelling along the road from Webequie to the eastern terminus of the supply road. In addition to the anticipated passage of vehicles (estimated to be less than 500 vehicles each day) from Webequie to the job site, machinery and equipment (e.g., heavy-duty trucks for visual patrols, snow clearing, road maintenance and aggregate hauling) will use the roadway. These vehicles, machinery and equipment will result in the generation of gas exhaust and/or dust emissions; however, it is anticipated that any associated disturbance would be limited to the area affected during the construction phase of the Project. Some of the measures recommended to minimize effects to wildlife because of dust and other airborne emissions include:

- Reviewing and updating (when necessary) the Air Quality and Dust Control Management Plan as part of the OEMP. The plan will include a procedure for documenting compliance with applicable standards and conditions (as identified in authorizations, permits and licences for the site).
- Integrating a monitoring program (as described in the Air Quality and Dust Control Management Plan) and measures to control or limit particulate emissions that result from handling of soil or aggregates by mobile equipment, or from passenger vehicles.
- Placing a permanent Maintenance Storage Facility (MSF) near the WSR for the storage of equipment and materials (i.e., for inspection, maintenance and repair activities).
- Installing of a dedicated diesel generator set(s) at the MSF that will include energy efficiency measures.
- Regularly inspecting and maintaining the road to confirm it meets minimum operational standards for roads.
- Having a water-spraying truck readily available for use by the maintenance crew on an ‘as needed’ basis during Operations, particularly between the months of May to November.
- Training members of the Webequie community involved in the operations phase in techniques that would facilitate eco-driving and encouraging them to follow recommended practices to minimize fuel use (e.g., avoidance of vehicle idling).
- Ensuring equipment is well maintained to mitigate fuel usage (e.g., tires, alignment, mechanized features are optimized).
- To the extent practicable, using logs, branches, and other biomass for purposes such as the production of timber or roundwood that could be used in Webequie for landscaping, erosion control or construction projects, rather than burning them. An objective of burning no more than 10% of cleared living biomass has been incorporated into Project plans.

It is anticipated that implementation of these measures will effectively mitigate potential effects to wildlife habitat from the deposition of dust and other airborne particles on the Project Site during operations. Since it is not expected to cause net effects in either the LSA or RSA, the topic 'Deposition of Dust and Other Airbourne Particles' has not been carried forward to **Section 12.7** (Predicted Net Effects).

Accidental Spills

Spilling contaminants along the road could occur during the operations phase as vehicles and equipment travel along the WSR. Should they occur, such spills are predicted to be generally localized in nature and are unlikely to result in disturbance beyond the area affected by the construction phase of the Project. In addition, there will be a Spill Prevention and Emergency Response Management component in the OEMP. The mitigation measures that have been described in **Section 12.4.2.2.1** (Construction) will also be effective in minimizing the potential risks of accidental spills during the operations phase of the Project. This topic has not been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

Sources of artificial light, noise and other sensory disturbances have the potential to cause the loss of wildlife habitat, changes in predator-prey relationships and the displacement of individuals. It is not anticipated that the WSR will be illuminated along its entire length; however, lighting may be required at certain locations for safety and security, such as at the eastern and western terminus points of the road, and at supportive infrastructure sites, such as construction camps, rest and maintenance areas, aggregate (rock) sites and the MSF. Mitigation measures designed to minimize effects include:

- To the extent practicable, limiting the use of lighting during operations of the Project while still allowing for safety.
- Using light shields for illumination fixtures on a site-specific basis to minimize and reduce light trespass where this is a concern to wildlife. A Noise Management Plan will also form a portion of the OEMP.

Effects from other sources of sensory disturbance are expected to be minimal during the operations phase of the Project. With the predicted low volume of vehicular traffic on the road, operational sensory disturbance is expected to have little effect on wildlife habitat beyond what occurs during the construction phase. Net effects will remain for wildlife in the LSA and additional discussion of 'Sensory Disturbance' has been carried forward to Predicted Net Effects (**Section 12.7**).

Invasive Plant Species

The distance that invasive species will be able to travel beyond the ROW will, in part, vary with the conditions of the adjacent habitats. It will also depend on how similar those habitat conditions are to where the species originated from. For example, a waterway may permit seeds to be carried well downstream of its intersection with the road (i.e., adjacent to a bridge or culvert), allowing invasive species to establish a new population providing there are similar conditions to their point of origin (i.e., roadside edge). Conversely, a nutrient poor, acidic environment (such as a bog) has been known to reduce the success of invasive species surviving much beyond their source (i.e., parent plant). Many species native to northern Ontario have never been exposed to significant landscape change, and while they may be more tolerant of cold conditions, they are generally less tolerant of sudden changes in temperature or moisture levels when compared to plants in southern Ontario.

During the operations phase of the Project, repairs to the roadway and occasional clearing of the ROW will be required; however, it is expected that these activities will not result in disturbance beyond the area that was affected by the construction phase. They are unlikely to cause additional habitat alteration. Some of the mitigation measures described in **Section 12.4.2.2.1** (Construction) can also be effectively applied during the operations phase of the Project. These include:

- Reviewing and updating (as necessary) the Invasive Species Monitoring and Management Plan that was prepared for the construction phase (i.e., as part of the OEMP) and implementing it during the operations phase.
- Holding information sessions, and/or circulating education materials that will familiarize individuals that travel the road with harmful invasive species and/or introducing BMPs to prevent the introduction or spread of exotic species within the LSA. Signage placed near major river crossings will assist in raising awareness of invasive aquatic plants.
- Conducting visual inspections of equipment and vehicles that travel the WSR, paying particular attention to wheels, wheel arches, undersides and other attachments to which invasive species may adhere.
- Removing components of invasive species (e.g., seeds, buds, cuttings) by washing vehicles and equipment prior to moving them from one portion of the LSA to another. Such components should be isolated until they can be safely removed from the site.
- Targeting invasive species that establish themselves along the WSR for removal through manual, mechanical and/or chemical methods. Mechanical methods of removal, such as mowing, tilling, digging or pulling of vegetation is preferred over chemical methods.
- Monitoring areas where invasive species were removed the year following remediation. The effectiveness of measures will be modified or enhanced, as necessary through adaptive management.

It is anticipated that these measures will effectively mitigate any potential effects from invasive or noxious plants on wildlife habitat at the Project site. As a result, additional discussion about the potential effects of invasive plant species not been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.2.3 .4.2.3Alteration in Wildlife Movement

12.4.2.3.1 Construction

Loss of Connectivity

Wildlife movement patterns are expected to change as habitat conditions are altered. Equipment, installation of fencing, and berming of soil can create short-term physical barriers to wildlife movement. Barriers can cause habitat fragmentation (i.e., division of habitats into smaller, isolated patches), reduce gene flow between isolated populations, change behaviour and disrupt migration and/or movement routes (e.g., to avoid predators). Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.2** (Wildlife Habitat Alteration or Degradation) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. These measures include:

- Phasing construction to create segments of low or no activity to permit unimpeded wildlife passage through those areas.

- Minimizing the size of the construction footprint to the extent possible and restricting vegetation removal near sensitive habitats. (For more information, please refer to **Sections 12.4.3 – 12.4.7**: Moose, Furbearers, Bats, Birds, Amphibians and Reptiles, respectively).
- Progressively restoring areas that are no longer being actively used for construction. Progressive restoration or reclamation will minimize the effect of recontoured or cleared areas that are acting as a barrier to movement.
- Incorporating wildlife crossings and passages in the road design, where practicable, and installing these features as part of road construction.
- Removal of any windrowed (slash) materials that have been unintentionally piled in a manner that creates barriers.

It is anticipated that these measures will only partially mitigate potential effects from barriers to wildlife movement at the Project site. As a result, additional discussion about 'Loss of Connectivity' can be found in **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

Sensory disturbances from equipment, vehicles, and other aspects of construction can also cause certain species of wildlife to avoid the LSA in the short-term. Conversely, other wildlife species may be attracted to portions of the LSA that they may not previously have inhabited because such areas provide novel opportunities for feeding (foraging) or shelter (e.g., camps or areas that are converted to early successional habitat). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. These measures include:

- Designing and implementing plans to manage artificial light, noise and vibrations as Part of the CEMP (i.e., Light Management Plan, Noise and Vibration Management Plan).
- Designing and Implementing a Construction Waste Management Plan (including hazardous, contaminated and controlled materials) as part of the CEMP. The Waste Management Plan will include procedures to verify that wastes have been collected, stored, transported and disposed of in an environmentally responsible manner. It is recommended that:
    - Areas of human activity (e.g., camps, rest areas) be kept clear of refuse (e.g., gray water, sewage) to avoid attracting wildlife (particularly carnivores and omnivores).
    - Food wastes be collected on site, temporarily stored in wildlife-proof containers, and transported out of the Project Footprint to be recycled or deposed of at a licenced disposal facility.
    - Petroleum-based products and other materials that could attract wildlife be stored in a secure area that wildlife cannot access.
- Informing all personnel associated with the Project of the hazards of feeding wildlife and littering. Prohibiting such activities should reduce nuisance wildlife in and around work and camp sites.
- Avoiding activities that are likely to disturb wildlife during sensitive periods in their life cycle (e.g., activities such as blasting or heavy machinery use). Species specific and group specific timing windows are described in **Sections 12.4.3 – 12.4.7** (Moose, Furbearers, Bats, Birds, Reptiles and Amphibians).
- Lighting only those areas required for worker safety and angling or shielding lights so that they illuminate only targeted areas.

It is anticipated that these measures will only be partially effective in mitigating potential sensory effects on wildlife at the Project Site during the construction phase, net effects will remain in the LSA. As a result, this topic has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.2.3.2 Operations

Loss of Connectivity

Should appropriate mitigation measures not be incorporated, creation of the road could cause long-term effects to wildlife by fragmenting habitat and disrupting movement patterns. Efforts to mitigate these effects may include creating wildlife corridors, maintaining wildlife crossings, or implementing other infrastructural approaches that are more conducive to the movement and/or migration of wildlife. Recommendations include:

- Maintaining posted lower speed limits in sensitive habitats and identified crossing areas.
- Ensuring maintenance activities occur outside of sensitive life cycle periods (e.g., nesting season, calving season).
- Ensuring snow removal activities (i.e., plowing) do not create continuous barriers to wildlife movement.
- Maintaining any wildlife passes or corridors that were built during the construction phase. Where practicable, create new ones where a need is identified (e.g., areas identified during construction monitoring, or areas with high concentrations of roadkill).

It is anticipated that these measures will only partially mitigate against the potential loss of habitat connectivity at the Project site during the operations phase. As a result, the topic of 'Loss of Connectivity' has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.2.4 Wildlife Injury or Death

12.4.2.4.1 Construction

Increased Access

The construction of the Project provides more opportunities for humans to access the area, which could result in increased injury or death of wildlife. To address the potential effects of increased human access to the LSA, the following measures will be implemented:

- Restricting road access restrictions during the construction phase (i.e., so that only Project personnel are permitted to enter the Project Footprint).
- Personal firearms will be prohibited from construction camps.
- Developing and implementing a Construction Waste Management Plan for the construction phase. The plan will include procedures to check that the collection, storage, transportation and disposal of all wastes generated will be conducted in a safe, environmentally responsible manner that complies with federal and provincial legislation.
- Keeping camps and rest areas clean, with food waste being stored appropriately to avoid human-wildlife conflicts (i.e., that may occur because such waste may attract scavengers that are omnivorous).
- Storing petroleum-based products and other toxic materials that can attract wildlife in secured areas.
- Providing educational (informational) sessions to all Project personnel to make them aware wildlife have the right-of-way (barring circumstances in which there is imminent risk to the health and safety of workers and/or the public).
- Fencing, or otherwise blocking, temporary access roads, laydowns and construction areas until vegetation has re-established itself in disturbed areas.

It is anticipated that the potential effects of increased access will be reduced through these measures but not eliminated entirely; therefore, additional discussion has been carried forward to Predicted Net Effects (**Section 12.7**).

Changes to Predator-Prey Dynamics

Increased encounters with predators may occur because linear features are known to facilitate access, and increase travel speeds for predators (Stein, 2000; Dickie et al. 2022). During construction, predators will likely avoid the Project Footprint but nevertheless, measures that will be employed to minimize these encounters include:

- During detailed design, incorporating techniques that reduce the movement rates of large predators, such as curves or bends in temporary access roads.
- Where practicable, incorporating wildlife crossings or ecopasses into the road design and implementing them during construction.

It is anticipated that these measures will partially mitigate potential injury and/or death of wildlife during the construction phase but will not eliminate the effects completely. As a result, the pathway 'Changes to Predator-Prey Dynamics' has been carried forward to **Section 12.7** (Predicted Net Effects).

Collisions with Vehicles

To minimize the potential for wildlife injury or death from collisions with Project vehicles and equipment, during construction the following measures are recommended:

- Enforcing speed limits on the ROW and access roads.
- Enforcing restricted access to the road during the construction phase.
- Integrating safe road travel protocols in the Health and Safety Management Plan including wildlife awareness training and reporting protocols.
- If movement corridors are identified during monitoring, posting and enforcing reduced speeds at the locations of those corridors.

It is anticipated that these measures will partially mitigate potential injury and/or death of wildlife during the construction phase but will not eliminate the effects completely. As a result, the pathway 'Collisions with Vehicles' has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.2.4.2 Operations

Increased Access

The creation of the WSR provides increased opportunities for humans to access the area, which have the potential to result in increased wildlife mortality. To limit public access during the operations phase, the following measures will be implemented:

- Regular inspections of the road and rest areas during operations (e.g., 1-2 times per week), with litter being collected when found, and waste in receptacles being appropriately disposed of.
- Removal of roadkill from the ROW and appropriately disposal it (e, g., to brush areas adjacent to the Project Footprint) within 48 hours of detection.

- Limiting the number of rest areas and pull-off areas along road (i.e., to those required for the safety of WSR users). It is recommended that each of these rest areas contain a wildlife-proofed waste receptacle.
- Fencing maintenance turnaround areas (used by operations personnel only) to restrict public access.
- Fencing and/or gating access roads to aggregate areas and other operational infrastructure.
- As necessary, implementing other road access restrictions to reduce hunting, trapping or poaching opportunities in sensitive wildlife habitats and during sensitive periods throughout the operations phase.

It is anticipated that these measures will only partially mitigate potential effects from increased human access to the Project site. As a result, additional discussion about potential effects from 'Increased Access' is found in **Section 12.7** (Predicted Net Effects).

Changes to Predator-Prey Dynamics

Although predators will likely avoid the Project Footprint during the construction phase; however, during operations, they may use the WSR to gain access to previously unreachable areas. The WSR could also facilitate higher movement rates, which could lead to higher encounter rates. Measures that will be employed to mitigate these encounters include:

- Maintaining any wildlife corridors that were identified during construction. Adding signage or other markers when new corridors are identified that cross the ROW.
- Reclaiming temporarily disturbed areas, including access roads, and removing any barriers to wildlife movement (not intentionally placed).

It is anticipated that potential effects of the Project on predator-prey dynamics will be reduced through these measures but not eliminated entirely; therefore, additional discussion has been carried forward to Predicted Net Effects (**Section 12.7**).

Collisions with Vehicles

Mitigation measures that can be implemented during operations to minimize potential injury to or death of wildlife include:

- Ensuring maintenance activities take place away from sensitive habitats during critical life cycle periods (e.g., denning season, nesting season).
- Lowering the posted speed limit in known wildlife areas and movement corridors.
- Maintaining line of site for drivers.
- Control of roadside vegetation,
- Implementing wildlife sighting and incident reporting procedures.
- Maintaining any wildlife corridors or signage installed during the construction phase. Where practicable, installing new markers in areas where a need is identified (e.g., wildlife reporting procedures document an area where wildlife are regularly crossing).

It is anticipated that these measures will only partially mitigate potential wildlife injury and/or death during the operations phase. As a result, this topic has been carried forward to **Section 12.7** (Predicted Net Effects).

Table 12-41: Summary of Potential Effects, Mitigation Measures and Predicted Net Effects for Wildlife VC

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Wildlife	▪ Changes to the availability of Wildlife Habitat ▪ Changes to the distribution of Wildlife and Wildlife Habitat	Construction	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Construction and use of road and supportive infrastructure	Habitat Loss – Clearance Activities	▪ To the extent practicable, sensitive habitats that are important to wildlife were avoided during the route selection process. ▪ A Vegetation and Invasive Species Management Plan, Wildlife Management Plan (WMP) and Site Restoration and Monitoring Plan will be developed as part of the CEMP and implemented during the construction phase. ▪ These components of the CEMP will be updated, as necessary, for implementation during the operations phase as part of OEMP. ▪ Where practicable, existing roads and trails will be used for access to minimize removal of habitat. ▪ Qualified project personnel will identify Significant Wildlife Habitat features during the construction phase. Should candidate Significant Wildlife Habitat be found, it will be assessed by a qualified biologist or resource specialist and an appropriate course of action will be determined, in consultation with regulatory agencies (e.g., MECP, CWS-ECCC) as required. This may involve receiving approvals/agencies from appropriate regulatory agencies. ▪ The Project Footprint will be limited, where practicable, and the extent of clearing for the road minimized at quarries, pits, and other temporary areas. ▪ Where practicable, temporary work areas will be placed in strategic locations that avoid features identified either as being important or of high use to wildlife (e.g., large cavity trees). ▪ Construction fencing will be used to demarcate the boundaries of the work zone to prevent habitat loss beyond the limits of the work area. Suitable setbacks will be established based on the WMP. ▪ Vegetation removal during species-specific, or group-specific timing windows will be avoided. If construction is proposed to occur during these timing windows, specific mitigation and monitoring measures will be developed in cooperation with MECP, CWS-ECCC, or other appropriate regulatory agencies. ▪ Qualified personnel will carry out site visits and inspections to verify environmental protection measures have been correctly implemented and are maintained. ▪ Consultation will occur with, and approvals (authorizations) received from the appropriate regulatory agencies prior to removal of Significant Wildlife Habitat, high use areas, or other sensitive features. ▪ Compatible wildlife structures/features will be retained in situ to the extent possible, (e.g., wildlife trees, shrubs and CWD). ▪ Temporary areas of disturbance will be reclaimed during the construction phase and restored to a functional state as soon as possible following the completion of work. ▪ Restoration activities will include the removal of debris, soil decompaction and amendment, and other techniques to promote the re-establishment of self-sustaining vegetation native to the area. Where necessary, vegetation may be enhanced by transplanting from within the LSA or seeding and/or planting native species from approved stock and a reputable supplier. Species of importance to Indigenous communities will form part of the preferred list. ▪ Reclamation activities will be carried out under appropriate environmental conditions. ▪ Off-site restoration opportunities will be investigated and pursued, where appropriate, should insufficient area be available in the LSA. ▪ Ecological (effectiveness) monitoring will be conducted to verify reclamation and restoration efforts have been successful. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	Yes

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Wildlife	▪ Changes to the Availability of Wildlife Habitat (Altered Habitat Composition) ▪ Changes to the Distribution of Wildlife	Construction and Operations	**Construction Phase**: ▪ Vegetation clearing and grubbing ▪ Construction and use of supportive infrastructure ▪ Decommissioning and site restoration (reclamation) **Operations Phase**: ▪ Vegetation management	Wildlife Habitat Alteration or Degradation – Habitat Structural Change	▪ All conditions of approval, permits and authorizations, including any issued by MECP, MNR or CWS-ECCC will be followed. ▪ Where practicable, wildlife trees, shrubs, CWD and other habitat structures/features will be retained in situ. Key ecological features will be clearly marked and have associated setbacks to reduce habitat change in those areas. ▪ Construction footprints will be minimized to the extent possible, particularly in the vicinity of sensitive habitats (i.e., such habitat will be buffered from work areas). ▪ Temporary work areas will be progressively reclaimed/restored as soon as possible following construction with a goal of recreating habitats that resemble pre-construction conditions. ▪ Restoration approaches will prioritize natural regeneration of vegetation and/or the establishment of native self-sustaining species via transplants, or root or stem cuttings from within the LSA. ▪ Where appropriate, wildlife habitat may be enhanced via planting/seeding self-sustaining native species. ▪ Qualified staff will carry out ecological (effectiveness) monitoring to check that environmental protection measures have been correctly implemented. ▪ Qualified staff will complete ecological monitoring to evaluate the effectiveness of habitat retention, reclamation and restoration efforts. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control	Yes
Wildlife	▪ Changes to the Availability of Wildlife Habitat/Habitat Composition – Hydrological Changes ▪ Changes to the Distribution of Wildlife	Construction and Operations	**Construction Phase:** ▪ Temporary watercourse diversions ▪ Road construction ▪ Bridge and culvert installation ▪ Construction and use of supportive Infrastructure **Operations Phase:** ▪ Vegetation management ▪ Repair and/or rehabilitation of culverts and bridges at water crossings	Wildlife Habitat Alteration or Degradation – Hydrological Changes	▪ Develop a Surface and Stormwater Management and Monitoring Plan as part of the CEMP and implement during construction. Review and update plan as necessary for use during the operations phase. ▪ Prepare an Erosion and Sediment Control Plan as part of the CEMP and implement during construction. Update plan as necessary for implementation during Operations (and include in OEMP) ▪ Follow all conditions, permits and authorizations issued for the Project, including any from CWS-ECCC, or MNR. ▪ Carry out short-term water takings in accordance with O. Reg 387/04 as amended by O. Reg 64/16 under the Ontario *Water Resources Act* and industry best standards. Obtain appropriate permits and registrations prior to work commencing. ▪ Minimize areas of the construction footprint that require ground hardening and site grading. ▪ Use industry Best Management Practices to minimize dewatering. ▪ Employ soil decompaction, place similar native soils and plant self-sustaining native vegetation as part of site remediation efforts in areas disturbed by temporary support infrastructure. ▪ To the extent possible, design permanent waterbody crossings with bridges or culverts (single-span elements). Where not possible, temporary waterbody structures will be used. ▪ Permanent and temporary waterbody crossings will be designed and constructed to accommodate anticipated water flows during their lifespan. They will be installed during low-flow conditions to prevent water from ponding. ▪ Install cross-culverts (900 mm diameter) at regular intervals (i.e., every 50 m) in lowland areas to prevent water from ponding on either side of the roadway. ▪ Design the roadway and swales with Low Impact Development procedures in mind. These designs include permanent swales designed to convey, treat and attenuate stormwater runoff, and reducing consolidation and compression of peat layers. ▪ All mitigation measures implemented will comply with relevant federal and provincial regulations and guidelines regarding the collection and storage of explosives and solid waste (e.g., federal Explosives Act). ▪ Road maintenance activities will regularly check culverts and other crossings for blockages to flow. ▪ Discharge water quality to be regularly tested to verify that it meets Ontario Provincial Water Quality objectives. Plans for contingency measures and monitoring will be developed in the event objectives are not met. ▪ The use of herbicides will be minimized during construction, and neither road salt, nor sand will be used on the ROW for de-icing.	For some species, yes

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
					▪ Refer also to Section 7.4 (Mitigation Measures of Effects on Surface Water), Section 8.4 (Mitigation of Effects on Groundwater) and the following in Appendix E – Mitigation Measures: ▫ Section 5.7 – Temporary Watercourse Crossings ▫ Section 5.11 – Bridge and Culvert Installation ▫ Section 5.16 – Erosion and Sediment Control ▫ Section 5.22 – Water Quality Monitoring	
Wildlife	▪ Changes to the Availability of Wildlife Habitat/Habitat Composition – Dust and Other Airborne particles ▪ Changes to the Distribution of Wildlife	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure ▪ Bridge and culvert installation **Operations Phase:** ▪ Vegetation management ▪ Repair and/or rehabilitation of culverts and bridges at water crossings ▪ Road usage	Wildlife Habitat Alteration or Degradation – Dust and Other Airborne particles	▪ Develop an Air Quality and Dust Control Management Plan as part of the CEMP and OEMP that includes a procedure for documenting compliance. ▪ Integrate and Air Quality Monitoring Program as part of CEMP. Review, update (as necessary) and implement this program during the operations phase. ▪ Incorporate emission and pollution equipment on vehicles and machinery operating in the LSA. ▪ Regularly inspect vehicles, equipment and machinery to verify that emission and pollution mechanisms are functioning within expected parameters. (They will be maintained and repaired when necessary) ▪ Encourage carpooling/multi-passenger vehicle use when travelling to/from job site; minimize idling unless weather and/or safety requires vehicles or equipment to remain turned on. ▪ Best management practices will be followed regarding the deposit of acidifying compounds on plants. All federal and provincial thresholds will be met. ▪ Where practicable, retain compatible vegetation on steep slopes, and areas prone to wind erosion. ▪ Minimize dust-generating activities during periods of high wind. ▪ To the extent possible, use logs, branches and other biomass (not maintained in situ) in products that can be used by the Webequie community for landscaping, erosion control or construction. Burn no more than 10% of cleared living biomass. ▪ Use dust control procedures that can be applied to the road surface (e.g., dust control solutions) or to the air (e.g., water sprays). The use of chlorine-containing compounds will be minimized to the extent possible. If chemical dust suppressants are necessary, they will not be applied within 100m of any waterbody, or outside of the Project Footprint ▪ Incorporate a chip-seal treatment on the driving surface in the western half of the WSR. ▪ Incorporate a granular A-type gravel on the driving surface in the eastern half of the WSR. ▪ Use temporary cover on soil and fill stockpiles where necessary (e.g., wood chips) if they cannot be kept moist. ▪ Place a permanent Maintenance Storage Facility near the WSR for equipment and materials. ▪ Install dedicated diesel generator sets that include energy efficient measures. ▪ Conduct regular inspections and maintenance activities so roadway continues to meet standards. ▪ Have water-spraying truck readily available for use by maintenance crew as needed during operations. ▪ Education programs for members of the Webequie community involved in operations phase of the Project to encourage eco-driving. ▪ Check that equipment is well maintained to mitigate fuel usage. ▪ Refer also to Section 9.4 (Mitigation of Effects on Atmospheric Environment) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices ▫ Section 5.20 – Quarry Site Selection and Development Requirements	No

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Wildlife	▪ Changes to the Availability of Wildlife Habitat/Habitat Composition – Habitat Contamination (Spills) ▪ Changes to the Distribution of Wildlife	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Construction and use of supportive infrastructure ▪ Bridge and culvert installation **Operations Phase:** ▪ Repair and/or rehabilitation of culverts and bridges at water crossings ▪ Road usage	Wildlife Habitat Alteration or Degradation – Accidental Spills	▪ Develop a Petroleum Handing and Storage Plan, and a Spill Prevention and Emergency Response Plan as part of the CEMP. ▪ Use reasonable efforts to have all personnel adequately trained to execute these plans. ▪ Store and handle all petroleum according to Ontario *Technical Standards and Safety Act*. Transport all petroleum products according to *Transportation of Dangerous Goods Act* (Canada) and Ontario *Dangerous Goods Transportation Act* ▪ Train all personnel to appropriately handle and store all products in compliance with the above Acts. ▪ Maintain, store, transfer and dispense fuels or other hazardous materials in designated areas, a minimum of 50 m away from waterbodies. ▪ Use only approved containers and licenced vehicles to transport fuel or hazardous materials. Regularly inspect containers for leaks and repair or replace, as necessary. ▪ Verify that vehicles and equipment have pollution control mechanisms in good working order. ▪ Install signage to raise awareness about reduced speed limits within the LSA. ▪ Delay construction during heavy precipitation or run-off events. ▪ Have emergency cleanup equipment readily available (i.e., on-site spill kits) in all fuel and hazardous materials storage and handling facilities, at on-site work areas and/or in vehicles and equipment. The equipment shall always be maintained. ▪ Report major spills of petroleum or other hazardous products to MECP Spill Action Centre. ▪ Contain and immediately clean-up any spill that is ‘non-reportable’ according to O. Reg. 224/07. Subsequently, remove and replace any contaminated soil and/or vegetation as soon as possible. ▪ Refer also to Section 6.4 (Mitigation of Effects on Geology, Terrain and Soils), Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), Section 23.5 (Accidents and Malfunctions) and the following in Appendix E – Mitigation Measures: ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.17 – Concrete Washout Management Practices	No
Wildlife	▪ Changes to the Availability of Wildlife Habitat – Sensory Disturbance ▪ Changes to the Distribution of Wildlife	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Vegetation management ▪ Road usage	Wildlife Habitat Alteration or Degradation – Sensory Disturbance	▪ Develop a Noise and Vibration Management Plan and a Light Management Plan as part of the CEMP. Implement any measures identified in these plans. ▪ Prepare and Submit a Construction Blasting Management Plan for the Project to the Contractor prior to initiation of activity. ▪ All permits, conditions and authorizations relevant to the project will be adhered to. ▪ To the extent possible, minimize the extent of vegetation clearing beyond the Project Footprint. ▪ Maintain Vegetation Protection Zones (i.e., buffers/setbacks) to reduce sensory effects near sensitive habitats. ▪ Minimize the extent of vegetation cleared at all navigable waterbody crossings. ▪ To the extent practicable, maximize the retention of vegetation and landforms along the ROW, and reduce the extent of disturbed areas within the ROW. ▪ Require all vehicles and equipment supplied by the Contractor to be effectively ‘sound reduced’ (i.e., they should have appropriate noise abatement equipment correctly installed). ▪ Adhere to timing windows and restrictions to avoid sensitive life-cycle periods for wildlife (e.g., breeding, overwintering). If adherence to the timing windows and restrictions is not possible, the proponent’s contractor will develop site specific mitigation and monitoring in consultation with appropriate regulatory agencies (e.g., MNR, CWS-ECCC). ▪ To the extent possible, carry out construction activities during daylight hours, typically between 7:00 and 19:00, unless otherwise regulated by adjacent Indigenous communities or municipal authorities. In the latter case, a written exemption will be provided to the proponent upon request. ▪ Enforcing speed limits for vehicles and preventing the recreational use of ATVs within the LSA by personnel. ▪ Limit the use of artificial lights during the operations phase and consider using light shields in specific circumstances.	Yes

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
					▪ Carry out blasting operations in accordance with federal (DFO) guidelines and provincial specifications. ▪ Refer also to Section 9.4 (Mitigation of Effects on Atmospheric Environment), Section 18.4 (Mitigation of Effects on Visual Environment) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices	
Wildlife	▪ Changes to the Availability of Wildlife Habitat – Invasive Plant Species	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Decommissioning and site restoration (reclamation) **Operations Phase:** ▪ Vegetation management ▪ Road usage	Wildlife Habitat Alteration or Degradation – Invasive Plant Species	▪ Include the development of Invasive Species Management and Monitoring component as part of the Vegetation and Invasive Species Management Plan in the CEMP. Implement the plan during the construction phase. ▪ Review and, as necessary, update the invasive species monitoring plan for implementation during the operations phase (i.e., as part of the OEMP). ▪ All environmental approval conditions, authorizations or permits issued for the Project will be followed, including those from MECP and ECCC. ▪ Hold information sessions, provide educational materials and/or install signage to familiarize construction personnel with potential invasive species. ▪ Recreational use of motorized vehicles (e.g., snowmobiles, ATVs) will be prohibited from use during construction. ▪ Develop and implement reporting procedures for personnel should they encounter invasive exotic species in the Project Footprint. ▪ Incorporate visual inspections of vehicles and equipment (i.e., for invasive species, or their components) into standard operating procedures during construction. ▪ Should any invasive plant materials be found, they will be removed by scraping or washing all exterior surfaces in designated areas at least 30 m away from watercourses, waterbodies and native vegetation communities. ▪ These materials will be isolated and appropriately contained until they can safely be removed from the Project Footprint. ▪ Minimize soil disturbance to the extent possible. Allow disturbed areas to regenerate naturally, supplementing with self-sustaining native species where necessary. ▪ Confirm any imported fill (soil) is free of contaminants, including the seeds of exotic species. ▪ Use self-sustaining native species in all restoration activities, and, where practicable, use local soil banks from grading operations for revegetation treatments. ▪ Hold information sessions and/or circulate education materials to familiarize WSR users with best management practices to prevent the introduction or spread of invasive species in the LSA. ▪ Conduct visual inspections of vehicles, machinery and equipment that use the WSR and remove invasive species components by washing or scraping vehicles in a manner similar to that used during the construction phase. ▪ Target invasive species that establish themselves along the WSR for removal, with mechanical methods (e.g., mowing, digging, tiling) being preferred over chemical methods. ▪ Use herbicides only when other control methods have proven ineffective in managing invasive species. These would only be applied by a licenced applicator in accordance with Ontario regulations. ▪ Implement a reporting system for invasive species encountered during the operations phase. ▪ Areas where invasive species were removed shall be monitored the year following remediation. The effectiveness of measures will be modified or enhanced, as necessary through adaptive management. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E – Mitigation Measures: ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.19 – Aggregate Pit Decommissioning ▫ Section 5.21 – Site Decommissioning and Rehabilitation ▫ Section 5.23 – Prevention of the Transfer of Invasive Species	No

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Wildlife	▪ Changes to abundance and distribution of wildlife	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Road construction ▪ Blasting ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Road usage ▪ Road maintenance	Alteration in Wildlife Movement – Sensory Disturbance and Loss of Connectivity	▪ Design and implement plans to manage artificial light, noise and vibrations as part of the CEMP (e.g., Noise and Vibration Management Plan, Light Management Plan, Construction Blasting Management Plan). ▪ Minimize the construction footprint to the extent possible and restrict vegetation removal near sensitive habitats. ▪ Phase construction to create areas of inactivity that will permit wildlife to pass unimpeded through those sections during the construction phase. ▪ Maintain posted lower speed limits near sensitive habitats and identified wildlife crossing areas in the LSA. ▪ Avoid carrying out activities that are likely to disturb wildlife during sensitive periods in their life cycle (e.g., using heavy machinery or blasting in proximity to active nests or dens). ▪ Progressively restore or reclaim areas that are no longer being actively used for construction. ▪ Avoid or minimize the piling of logs, branches and other biomass in a manner that creates unintentional barriers to wildlife movement. When piling cannot be avoided, remove slash materials that are unintentionally acting as barriers as soon as practicable. ▪ Where practicable, incorporate wildlife crossings and passages in the road design. ▪ Design a Construction Waste Management Plan as part of the CEMP and implement during construction. Review and update this plan, as necessary for use during operations. ▪ Educate Project personnel about the dangers of feeding wildlife and the importance of keeping camps, rest areas and other locations free of materials that would attract wildlife. ▪ Maintain camps, rest areas and other locations in the Project Footprint free of refuse to avoid attracting wildlife. ▪ Food wastes will be collected on site, temporarily stored in wildlife-proof containers, and transported out of the Project Footprint to be recycled or deposed of at a licenced disposal facility. ▪ Petroleum-based products and other materials that could attract wildlife be stored in a secure area that wildlife cannot access. ▪ Use reasonable efforts to conduct required maintenance activities required during the operations phase are completed outside of sensitive life cycle periods (e.g., calving season for Moose). ▪ Use reasonable efforts to avoid creating continuous barriers to wildlife movement during snow removal activities. ▪ Use artificial lighting only where required for worker safety. Angle/shield lights to illuminate only targeted areas. ▪ Refer also to Section 11.4 (Mitigation and Enhancement of Vegetation and Wetlands) and the following sections in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.4 – Noise Control ▫ Section 5.5. – Materials Handling and Storage ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes

Component	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Wildlife	Changes to abundance and distribution of wildlife	Construction and Operations	**Construction Stage:** ▪ Road construction ▪ Construction and use of supportive infrastructure ▪ Delivery of materials and equipment ▪ Blasting ▪ Decommissioning and site restoration (reclamation) **Operations Stage:** ▪ Road usage	Wildlife Injury or Death – Increased Access	▪ Provide all Project personnel with information materials and education sessions so they are aware wildlife have the right-of-way if encountered during the construction phase (unless there is imminent risk to health and safety). ▪ Implement road access restrictions during construction to reduce hunting opportunities. ▪ Prohibit firearms from construction camps. ▪ Develop and implement a Construction Waste Management Plan for the construction phase. The plan will include procedures to check that the collection, storage, transportation and disposal of all wastes generated will be conducted in a safe, environmentally responsible manner that complies with federal and provincial legislation. ▪ Maintain camps, rest areas and other locations in the Project Footprint free of refuse, instead storing it appropriately to avoid attracting wildlife. ▪ Keep petroleum-based products and other materials that may attract wildlife in secured areas that are inaccessible to animals. ▪ Fence, or otherwise block temporary access roads, laydowns and construction areas until vegetation has reestablished itself. ▪ Limit the number of rest areas and pull-offs for road users during operations phase. ▪ All maintenance turnaround areas will be fenced to restrict public access. ▪ Regular inspections of the road and rest areas will be conducted during the operations phase. ▪ Refer also to Section 11.4 (Mitigation and Enhancement of Vegetation and Wetlands) and the following in Appendix E (Mitigation Measures) ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development Requirements	Yes
Wildlife	▪ Changes to abundance and distribution of wildlife	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Construction and use of supportive infrastructure ▪ Delivery of materials and equipment **Operations Phase:** ▪ Road usage	Wildlife Injury or Death – Collisions	▪ Speed limits will be enforced on the ROW and access roads during the construction phase. ▪ Implement (and enforce) restricted access to the Project Footprint during the construction phase. ▪ Integrate safe road travel protocols that include wildlife awareness training in the Health and Safety Management plan. ▪ Signage indicating reduced speeds will be posted in portions of the LSA where significant wildlife habitat or wildlife movement corridors have been identified. ▪ Maintenance activities will facilitate line of site for drivers. ▪ The ROW will be maintained with less palatable forage for herbivores to avoid attracting them to the area. ▪ Implement wildlife sighting and incident reporting procedures. ▪ Consider the construction of wildlife crossings or passages during road design, and implement, where practicable. ▪ Refer also to the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development Requirements	Yes
Wildlife	▪ Changes to abundance and distribution of wildlife	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Road usage ▪ Road maintenance	Wildlife Injury or Death – Changes to Predator-Prey Dynamics	▪ Avoid or minimize the piling of logs, branches and other biomass in a manner that creates barriers to wildlife movement (i.e., alters movement patterns of predators and prey). When piling cannot be prevented, remove slash materials that are unintentionally acting as barriers as soon as practicable. ▪ Progressively restore or reclaim areas that are no longer being actively used for construction. ▪ Roadkill will be removed promptly to avoid attracting additional predators to the area. ▪ Refer also to the following in Appendix E (Mitigation Measures) ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.9 – Fish Passage ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development Requirements	Yes

12.4.3 Moose-Specific Mitigation

The following section outlines key mitigation measures that will be implemented to mitigate potential effects of the Project on Moose and their habitat, including habitat loss, habitat alteration or degradation, changes to moose movement patterns and injury or death. A summary of the potential effects, mitigation measures, and predicted net effects for Moose are in **Table 12-42**. Detailed descriptions of proposed mitigations measures to prevent or limit the effect of construction and operations on moose can also be found by referring to the following sections in Appendix E (Mitigation Measures):

- Section 5.1 – Clearing and Grubbing;
- Section 5.2 – Petroleum Handling and Storage;
- Section 5.3 – Spill Prevention and Emergency Response;
- Section 5.4 – Noise Control;
- Section 5.7 – Temporary Watercourse Crossings;
- Section 5.11 – Bridge and Culvert Installation;
- Section 5.12 – Blasting Near a Watercourse;
- Section 5.14 – Wildlife and Wildlife Habitat;
- Section 5.16 – Erosion and Sediment Control;
- Section 5.18 – Dust Control Practices;
- Section 5.19 – Aggregate Pit Decommissioning;
- Section 5.20 – Quarry Site Selection and Development;
- Section 5.21 – Site Decommissioning and Rehabilitation, and
- Section 5.23 – Prevention of the Transfer of Invasive Species.

For descriptions of additional measures to mitigate the effects of the Project on the habitat of other specific species and groups, please refer to **Sections 12.4.4** (Furbearers), **12.4.5** (Bats), **12.4.6** (Birds) and **12.4.7** (Amphibians and Reptiles). **Section 12.4.2** discusses mitigation measures for wildlife and wildlife habitat more generally, and Section 13 includes additional information regarding the Species at Risk VC.

12.4.3.1 Loss of Moose Habitat

12.4.3.1.1 Construction

Clearance Activities

Vegetation clearing and ground disturbances during the construction phase will result in the loss of structures that provide shelter for moose, reduce sources of foraging material, and change other environmental attributes that they depend on for survival and reproduction. Mitigation measures designed to eliminate or minimize the potential effect of the Project on vegetation communities and plant species are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures).

Aquatic feeding, calving and winter habitat areas are considered the most important habitat features for moose as they are critical for foraging and protection. During the existing conditions study, biologists looked for evidence of such key areas. Based on the results of habitat modelling, to the extent possible, the Project design team avoided areas likely to be of high use to moose (i.e., they evaluated alternative routes for the WSR and its supportive infrastructure).

Aquatic feeding and calving areas were not identified during existing conditions studies because of the complexity in finding such features; however, should any be found, they will be flagged, and a vegetation protection zone (or buffer) will be implemented between the feature and construction footprint. In addition to the mitigation measures in **Section 12.4.2.1.1** (Removal of Habitat from Vegetation Clearing and Ground Disturbance), loss of moose habitat will be minimized by implementing the following:

- Where practicable, placing construction camps, laydown yards and other temporary construction areas in strategic locations that avoid habitat identified as of high use for moose.
- No clearing within any established buffers unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.
- Should it be necessary, clearing of vegetation adjacent to aquatic feeding, calving and wintering areas (including buffers) will occur outside of species-specific timing windows. For example, vegetation adjacent to aquatic feeding areas will be removed in winter when moose are less likely to be using those habitats. Conversely, vegetation adjacent to wintering habitats would not be removed during the winter months.
- If adherence to these windows is not possible, specific mitigation measures will be implemented based on the Wildlife Management Plan, and in consultation with relevant regulatory agencies, as required.
- Additional surveys will be conducted by qualified individuals to identify and confirm sensitive sites prior to the initiation of construction.
- Should additional habitat be found, additional mitigation measures may be recommended, such as:
  - Temporary work stoppage to delineate the habitat;
  - Minimizing fill placement and grading in, or adjacent to moose aquatic feeding and calving areas; and
  - Using construction fencing to clearly mark the boundaries of the work areas to prevent damage and loss of moose habitat beyond the limits of the work area.

The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary; however, it is anticipated that these measures will only partially mitigate the potential effects of vegetation clearance on moose habitat. As a result, the pathway 'Clearance Activities' has been carried forward to **Section 12.7.1**.

12.4.3.2 Habitat Alteration of Degradation (Moose)

12.4.3.2.1 Construction

Habitat Structural Change

Vegetation clearing and ground disturbances during the construction phase may alter the composition of moose habitat and increase the availability of early successional species. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary (i.e., through adaptive management). In addition to the measures described in **Section 12.4.2** (Mitigation and Enhancement Measures for the Effects of Habitat Structural Change on Wildlife and Wildlife Habitat) the alteration or degradation of moose habitat will be minimized by:

- Following all approval conditions for the Project, including any issued by MNR, MECP or CWS-ECCC;
- Limiting the Project Footprint to the extent possible; and

- Minimizing or restricting vegetation clearing in areas that have been identified as being sensitive for moose.

The creation of early successional habitat may encourage moose to use the ROW as such areas can include species appropriate for forage. However, the incorporation of less palatable species in groundcover reclamation plans could discourage moose using the ROW, instead continuing to browse in areas used prior to construction.

Even though these measures will be implemented to mitigate effects from habitat structural change on moose during construction, it is anticipated that net effects will remain; therefore, additional discussion about the potential effects from habitat structural change during construction has been carried forward to Predicted Net Effects (**Section 12.7**).

Hydrological Changes

Changes in the quantity or quality of surface and/or groundwater can cause alteration or degradation of moose aquatic habitat. During development, the Project Team considered consolidation and compression processes of the peat layers associated with placement of fill for road construction, which could reduce the permeability of the peatlands and thus alter groundwater directions and pathway. Mitigation measures to reduce changes to hydrology and drainage patterns are provided in Section 7.4 (Mitigation Measures for the Effects on Surface Water Resources), Section 8.4 (Mitigation Measures for the Effects on Groundwater Resources) and Appendix E (Mitigation Measures). In addition to the measures described in **Section 12.4.2.2.2** (Mitigation Measures for the Effects of Hydrological Changes on Wildlife and Wildlife Habitat), potential effects from hydrological change during construction will be minimized by:

- Designing bridges and culverts at temporary and permanent waterbody crossings to accommodate anticipated water flows during their lifespan.
- Installing localized drainage cross-culverts (900 mm diameter) at regular intervals in low-lying areas to prevent water from ponding on either side of the roadway, instead maintaining existing hydrological flow paths. In wetland habitat, crossing structures should be spaced no more than 50 m apart (Schmidt and Zumbach, 2008; OMNRF, 2016)
- Avoiding the use of road salt to manage winter road conditions.

The effectiveness of mitigation will be evaluated during construction, with measures being modified or enhanced as necessary. Although these measures will be implemented to mitigate against the effects of hydrological changes to moose habitat during the construction phase, it is anticipated that effects may remain in the LSA; therefore, the pathway of 'Hydrological Changes' has been carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

Loud noises, lights, smells, dust, and human activity could potentially cause displacement of individuals and loss of foraging and resting habitat. In particular, noise during construction of the road and supportive infrastructure from blasting, grading, and vegetation clearing may cause moose to avoid the ROW. Mitigation measures designed to minimize sensory disturbances in the project area are discussed in Section 9.4 (Mitigation Measures for Effects on Atmospheric Environment), 18.4 (Mitigation Measures for Effects on Visual Environment), and Appendix E (Mitigation Measures). Additional measures will be provided in the CEMP and OEMP for the Project. In addition to the measures described in **Section 12.4.2.2.1** (Mitigation Measures for the Effects of Sensory Disturbance on Wildlife and Wildlife Habitat), potential effects from sensory disturbance during construction will be mitigated by:

- Implementing the procedures and practices identified in the Noise and Vibration Management Plan, the Light Management Plan and the Construction Blasting Plan (all of which form parts of the CEMP).
- Enforcing speed limits and prohibiting the recreational use of motorized vehicles by Project personnel.
- Adhering to recommended construction timing “windows” for the protection of moose.
- If adherence to timing windows or restrictions is not possible, the Contractor will develop site-specific mitigation and monitoring plans in consultation with biologists and the appropriate regulatory agencies (as necessary).
- The Contractor will be responsible for obtaining any permits or authorizations required to implement the plans.

It is anticipated that these measures will only partially mitigate potential short-term changes to the movement of moose caused by sensory disturbance at the Project site (i.e., during the construction phase). As a result, the topic of ‘Sensory Disturbance’ has been carried forward to **Section 12.7** (Predicted Net Effects).

Invasive Plant Species

The construction of roads produces edge environments that can influence adjacent habitat by changing abiotic conditions (e.g., increased light, chemical changes in the soil or water), and introducing noxious or exotic species to an area, thereby changing habitat structure. Mitigation measures designed to minimize the introduction and/or spread of invasive plant species are discussed in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). Mitigation measures to minimize the effect of invasive plant species on wildlife and wildlife habitat are also described in **Section 12.4.2.2.1.** These measures include the implementation of a Vegetation and Invasive Species Management Plan as part of the CEMP.

There is little indication that invasive plants have negative effect on moose in Ontario. It is anticipated that the measures described in **Section 12.4.2.1.1** (Mitigation Measures for the Effects of Invasive Plant Species on Wildlife and Wildlife Habitat) will effectively limit any potential effects from invasive or noxious plants during construction on moose habitat at the Project site. As a result, this topic has not been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.3.2.2 Operations

Sensory Disturbance

Sensory disturbance during operation of the road is expected to be minimal. While moose have been found to avoid roads and cross more often at night (Laurian et al., 2008; Seilers and Helldin, 2005) this behaviour relates to traffic volume. With the predicted low volume of vehicular traffic on the road (i.e., less than 500 vehicles per day), operational sensory disturbance is expected to have little effect on moose usage of the area around the roadway. Nevertheless, additional measures are recommended, including:

- Ensuring all maintenance activities take place outside of critical life cycle periods for moose.
- Limiting the use of lighting to areas required for health and safety, and incorporating light shields to reduce the likelihood of light trespass beyond the ROW.

Although it is anticipated that these measures, along with those described for wildlife more generally in **Section 12.4.2.2**, and those in Appendix E (Mitigation Measures) will alleviate potential changes to the

movement of moose because of sensory disturbance during the operations phase, negative effects will likely remain. This pathway has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.3.3 Alteration in the Movement of Moose

In addition to the mitigation measures identified in **Section 12.4.2.3** (Alteration in Wildlife Movement), changes in moose movement patterns will be minimized by implementing the mitigation measures that follow.

12.4.3.3.1 Construction

Loss of Connectivity

To minimize potential effects from barriers being developed by equipment, recontouring and berming of soil, installation of fencing, etc., the construction zone (work area) will be developed in phases to provide breaks that permit ungulates and other wildlife to pass through the Project Footprint undisturbed. To minimize potential effects from cleared areas acting as a barrier, progressive restoration of disturbed areas is proposed to occur as soon as the area is no longer required for construction activities. The Project Team will consider incorporating wildlife corridors and passages (e.g., overpasses) during road design, and implement them, if practicable. Windrowed and slash material will not be piled in a manner that creates unintentional barriers to wildlife movement.

The effectiveness of mitigation will be evaluated during the construction phase, with measures being modified or enhanced as necessary. Although these measures will be implemented, and it is anticipated that they will reduce effects, potentially negative effects (on moose from Project-related changes to habitat connectivity) remain. As such, this pathway has been carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

To minimize the potential effects of sensory disturbance during construction on moose movement patterns, the following measures will be implemented:

- Incorporating noise abatement equipment on machinery and making sure such equipment is correctly installed and maintained.
- Where practicable, turning vehicles and equipment off when not in use (i.e., to minimize unnecessary noise).
- Using artificial lighting only where necessary for worker health and safety.
- Maintaining vegetation protection zones (buffer or setback) to reduce sensory effects.
- Directing light, and/or utilizing light shields to reduce the likelihood of light trespass beyond the ROW.

It is anticipated that these measures, along with those described in **Section 12.4.2.2** (Measures to Mitigate Against Alteration in Wildlife Movement) and those in Appendix E (Mitigation Measures) will reduce changes to the **movement** of moose resulting from sensory disturbance during the construction phase. It is unlikely that these risks will be eliminated entirely so this pathway has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.3.3.2 Operations

Sensory Disturbance

To minimize the potential effects of sensory disturbance on moose during the operations phase, the following will supplement the measures described in **Section 12.4.2.3.2** (Measures to Mitigate Against Alteration in Wildlife Movement):

- Speed limits will be posted in areas where high use is known, or key habitat for moose has been identified.
- Maintenance activities will occur outside of critical life cycle periods, such as calving season for Moose.

It is anticipated that these measures, along with those described for Wildlife and Wildlife Habitat in **Section 12.4.2.3.2**, and those in Appendix E (Mitigation Measures) will minimize any changes to the movement of moose caused by sensory disturbance during the operations phase. Nevertheless, negative effects are predicted to remain so this pathway has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.3.4 Injury or Death of Moose

12.4.3.4.1 Construction

Increased Access

The construction of the Project provides increased opportunities for humans to access the area, which could result in increased injury or death of moose. Conversely, traffic along the road may cause avoidance by moose, which could decrease the potential for increased hunting or poaching in the Project Footprint. The measures described in **Section 12.4.2** (Mitigation of Effects on Wildlife and Wildlife Habitat) will be implemented to reduce the risk or injury or death of moose because of construction. The effectiveness of mitigation will be evaluated during the construction phase, with measures being modified or enhanced as necessary. Although measures designed to limit access to the Project Footprint during construction will be implemented, potentially negative effects remain. As such, the topic of increased access has been carried forward to Predicted Net Effects (**Section 12.7**).

Collisions with Vehicles

WSR traffic volumes are expected to be relatively low (less than 500 vehicles per day) reducing the likelihood of moose-vehicle collisions. Nevertheless, additional mitigation measures are recommended for moose beyond those described in **Section 12.4.2.4.1** (All Wildlife and Wildlife Habitat – Collisions with Project Vehicles and Equipment) and Appendix E (Mitigation Measures). These are:

- The use of road salt will be avoided during winter maintenance activities to reduce attracting moose to the WSR.
- During the growing season, the ROW will be maintained in a manner that reduces forage attractive to moose and other ungulates.
- Lower speed limits will be enforced in sensitive habitats that moose depend upon.
- Signage will indicate that reduced speed limits are required in any areas where movement corridors were identified during monitoring (i.e., moose crossing areas.

- Safe travel protocols will be implemented in the Health and Safety Management Plan.

The effectiveness of mitigation will be evaluated during the construction phase, with measures being modified or enhanced as necessary. Although mitigation measures will be implemented, and are expected to reduce effects, there remain potentially negative effects on moose from increased human access to the Project Footprint during construction. As a result, the pathway has been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.3.4.2 Operations

Introduction of Disease

Increased access may also introduce disease through the spread of new species into the area. For moose, the potential spread of white-tailed deer (*Odocoileus virginianus*) is important because they could introduce brain worm (*P. tenuis*). While white-tailed deer are expected to spread north in Ontario (Kennedy-Slaney et al. 2018) and have been found to use linear features to expand in boreal forests (Darlington et al. 2022), there are currently no confirmed records of deer north of Lake Nipigon and deer are not expected to move into the RSA at densities which would transmit the disease to the moose population in the foreseeable future.

Changes to Predator-Prey Dynamics

Increased encounters with predators may occur as linear features are known to facilitate access for both predators and prey as well as increased travel speeds (Stein, 2000; Dickie et al. 2022). During construction, it is likely that large predators (wolves) will avoid the Project area; however, during operations predators could use the ROW to enter areas that were previously less accessible. Further, the WSR will facilitate higher movement rates which, could lead to higher encounter rates between predators and prey. As described in **Section 12.4.2.4** (Injury or Death of Wildlife), to reduce these encounters, mitigation may include:

- Blocking off any temporarily disturbed areas (including temporary access roads) until they have been successfully revegetated and resemble pre-construction conditions.
- Maintaining ROWs in a manner that reduces forage attractive to moose and other ungulates.
- Maintaining any wildlife corridors that were identified during construction. As practicable, install new passages where a need is identified (i.e., during monitoring programs, or through reporting procedures for WSR users).

The effectiveness of mitigation will be evaluated during the operations phase, with measures being modified or enhanced as necessary. Despite implementation of the proposed mitigation measures, there is a predicted negative effect from changes to predator-prey dynamics on moose. This topic has been carried forward to Predicted Net Effects (**Section 12.7**).

Collisions with Vehicles

Mitigation measures to reduce the likelihood of wildlife-vehicle collisions during the operations phase will involve:

- Lowering the posted speed limit in known moose crossing areas.
- Controlling roadside vegetation that may attract moose (e.g., discouraging the growth of forage).
- Maintaining line of site for drivers (i.e., road design, control of vegetation).

- Ensuring all road maintenance activities take place away from sensitive habitats during critical life cycle periods such as calving season.
- Developing wildlife sighting and incident reporting procedures.
- Avoiding the use of road salt during winter operation activities, instead snowplowing to maintain safe driving conditions on the road during the winter.
- Maintaining and advertising (i.e., signage) any wildlife corridors identified or built during construction.

The effectiveness of mitigation will be evaluated during the operations phase, with measures being modified or enhanced as necessary. Nevertheless, there is a predicted negative effect of the Project on moose because of collisions with vehicles. This topic has been carried forward to Predicted Net Effects (**Section 12.7**).

Table 12-42: Summary of Potential Effects, Mitigation Measures and Predicted Net Effects for Moose Sub VC

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Moose	▪ Changes to Moose habitat availability (quality and size) ▪ Changes to abundance and distribution of Moose and Moose habitat	Construction	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Construction and Use of Supportive Infrastructure	Habitat Loss – Clearance Activities	▪ The locations of key moose habitat (SWH) were identified during existing conditions studies (e.g., winter habitat areas) and considered during the evaluation of alternative routes. To the extent possible, areas of high use were also avoided as part of the route selection process. ▪ Prior to the initiation of construction, surveys will be used to identify and confirm SWH for moose (e.g., aquatic feeding areas, calving areas) and a vegetation protection zone (buffer/setback) will be established between the Project Footprint and these habitats (e.g., 120 m around mineral licks). ▪ Road development will not occur within the SWH unless it can be shown that there would be no negative impacts on the feature (OMNRF, 2014) ▪ The boundaries of the Project Footprint will be clearly delineated to prevent the loss of moose habitat beyond the limits of the work area (e.g., with construction fencing). ▪ Species-specific timing windows will be identified in which vegetation removal will not occur adjacent to critical moose habitats (e.g., habitat disturbance will occur well away from calving areas between early May and mid-July) ▪ Refer also to the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	Yes
Moose	▪ Changes to Moose habitat availability (quality) ▪ Changes to abundance and distribution of Moose and Moose habitat	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing. ▪ Decommissioning and Site Restoration/Reclamation **Operations Phase:** ▪ Vegetation management	Habitat Alteration or Degradation – Habitat Structural Change	▪ Construction footprints to be kept as small as possible and minimize or restrict clearing near sensitive areas. ▪ Progressively reclaim areas in a timely manner with native vegetation using plantings and seeding. ▪ Refer also to **Section 12.4.2.2** (Alteration and Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control	Yes
Moose	▪ Changes to Moose habitat availability (quality) ▪ Changes to abundance and distribution of Moose and Moose habitat	Construction and Operations	**Construction Phase:** ▪ Temporary Watercourse Diversions ▪ Road Construction ▪ Bridge and Culvert Installation **Operations Phase:** ▪ Repair and/or rehabilitation of culverts and bridges at water crossings	Habitat Alteration or Degradation – Hydrological Changes	▪ Road design has considered consolidation and compression processes of peat layers. ▪ Temporary and permanent waterbody crossings will be designed and constructed to accommodate anticipated water flows during their lifespan. ▪ Localized drainage cross-culverts (900 mm diameter) will be installed at regular intervals (i.e., every 50 m) in lowland areas to prevent water from ponding on either side of the roadway. ▪ Road maintenance activities will regularly check culverts and other crossings for blockages to flow. ▪ Refer also to Section 7.4 (Surface Water), Section 8.4 (Groundwater), **Section 12.4.2.2** (Alteration and Degradation of Wildlife Habitat) and the following in Appendix E (Mitigation Measures) for additional guidance. ▫ Section 5.7 – Temporary Watercourse Crossings ▫ Section 5.11 – Bridge and Culvert Installation	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Moose	▪ Changes to abundance and distribution of Moose and Moose	Construction and Operations	**Construction Phase:** ▪ Road Construction ▪ Vegetation Clearing and Grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Vegetation management ▪ Road Usage	Habitat Alteration or Degradation – Sensory Disturbance	▪ A Noise and Vibration Management Plan and Light Management Plan will be prepared and implemented prior to the commencement of work. ▪ A Construction Blasting Management Plan will be prepared and submitted prior to the initiation of work. ▪ Speed limits will be enforced in the Project Footprint and recreational use of motorized vehicles by personnel will be prohibited. ▪ 500 m buffers will be established around any identified Moose related SWH . Blasting will be restricted in theses buffers during high periods of moose use of these areas. (Moose Calving areas: May 1 to July 15; Aquatic Feeding Habitat: June 1 to July 31; Mineral Licks: May 1 to June 30; Moose Late Winter Habitat: Feb 1 to April 15). ▪ If adherence to the restrictions is not possible, the proponent's contractor will develop site specific mitigation and monitoring in consultation with qualified biologists and the appropriate regulatory agencies (e.g., MNR, CWS-ECCC). Obtaining any required permits or authorizations is the responsibility of the contractor. ▪ Maintain Vegetation Protection Zones (i.e., buffers or setbacks) to reduce sensory effects. ▪ All maintenance activities will occur outside of sensitive life cycle periods (i.e., species-specific timing windows will be followed). ▪ The use of light will be limited to areas required for health and safety. ▪ Refer also to **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and to the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices	No
Moose	▪ Changes to abundance and distribution of Moose	Construction and Operations	**Construction Phase:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Road Usage	Alteration in Movement – Loss of Connectivity	▪ Construction zone to be developed in phases that leave breaks to allow wildlife passage. ▪ Windrowed or slash material will not be piled in a manner that would prohibit moose from moving across the WSR at known crossing areas. ▪ Use reasonable efforts to maintain breaks for moose to cross the WSR during snow removal activities. ▪ Refer also to **Section 12.4.2.3** (Alteration in Wildlife Movement) and to the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.4 – Noise ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Moose	▪ Changes to abundance and distribution of Moose	Construction and Operations	**Construction Phase:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Road Usage ▪ Vegetation management	Alteration in Movement – Sensory Disturbance	▪ Implement mitigation measures outlined in management plans for noise and vibration, light, and construction blasting. ▪ Noise abatement equipment to be installed and maintained. ▪ Artificial lighting only to be used where necessary for health and safety (i.e., of Project personnel and the public). ▪ Where lighting is used, light shields and directed lighting will be used to reduce the amount of light outside of the ROW. ▪ Vegetation buffers (protection zones) to be retained to the extend practicable to reduce sensory effects. ▪ Lowered speed limits to be posted in areas where key habitat has been identified, or high use by moose is known. ▪ Complete maintenance activities outside of critical life cycle periods for moose. ▪ Refer also to **Section 12.4.2.3** (Alteration in Wildlife Movement) and to the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spills ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices	No
Moose	▪ Changes to Moose survival and reproduction	Construction and Operations	**Construction Phase:** ▪ All Construction Stages **Operations Phase:** ▪ Road Usage	Injury or Death – Increased Access	▪ Public access to ROW to be restricted during construction, and access to maintenance areas controlled (e.g., with gates) during operations. ▪ Firearms to be prohibited from camps and construction areas. ▪ In accordance with a Construction Waste Management Plan, camps to be kept free of food waste and other refuse that could attract predators to the Project Footprint. ▪ Petroleum-based products and other toxic materials that can attract predators will be appropriately stored in wildlife-proof containers and/or in areas not easily accessed by wildlife. ▪ Temporary areas of disturbance will be blocked until the vegetation has been re-established. Areas will be reclaimed as soon as practicable with procedures that encourage natural regeneration, occasionally augmented by transplanting, planting and seeding native self-sustaining species. ▪ A Construction Blasting Management Plan will be developed and implemented. It will include measures to reduce the risk of moose being struck by fly rock. ▪ Open excavations and blasting areas will be fenced off when left unattended. ▪ The number of rest-areas and pull-offs will be limited during the operations phase. ▪ Refer also to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Moose	▪ Changes to Moose survival and reproduction (quantity) ▪ Changes to predator access, habitat use and population	Construction and Operations	**Operations Phase:** ▪ Road Usage ▪ Vegetation management	Injury or Death – Changes to Predator-Prey Dynamics	▪ During detailed design, measures that reduce the effectiveness of travel by predators (e.g., wolves) will be incorporated, such as incorporating switchbacks or bends in temporary access routes. ▪ Where practicable, wildlife crossings or passages will be incorporated in the road design. ▪ Areas that are no longer being actively used for construction will be blocked until they are progressively restored or reclaimed. Restoration will occur as soon as practicable following the completion of work with processes that encourage natural regeneration. ▪ To avoid attracting moose predators, the WSR will be regularly monitored, with waste and roadkill being removed promptly. ▪ Refer also to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes
Moose	▪ Changes to Moose survival and reproduction (quantity)	Construction and Operations	**Construction Phase:** ▪ Construction and Use of Supportive Infrastructure ▪ Materials and Equipment Delivery **Operations Phase:** ▪ Road Usage	Injury or Death – Collisions	▪ Access to the ROW to be restricted during construction to Project personnel (i.e., to minimize the volume of vehicles). ▪ Speed limits for construction vehicles will be enforced near sensitive habitats and identified crossing areas for moose (i.e., along the ROW and access roads and within camps) ▪ Safe travel protocols will be integrated in the Health and Safety Management Plan. ▪ During the growing season, the ROW will be maintained in a manner that reduces forage attractive to moose or other ungulates. ▪ Road maintenance activities will not occur during sensitive life cycle periods, such as calving season. ▪ The use of road salt will be avoided during winter maintenance activities to reduce attracting moose and other ungulates to the Project Footprint. ▪ Line of sight (for drivers) to be maintained along roadways. ▪ Moose crossing areas to be identified. Signage and reduced speeds will also be posted during operations phase. ▪ Use reasonable effort to have maintenance activities occur outside of sensitive habitats during critical life cycle periods. ▪ Develop and implement wildlife sighting and incident reporting procedures. ▪ Avoid use of road salt during winter operations activities. ▪ Refer also to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes

12.4.4 Furbearers

The following Section outlines key mitigation measures that will be implemented to mitigate potential effects of the Project on furbearers and their habitats, particularly the indicator species American marten and North American beaver. A summary of the potential effects, mitigation measures, and predicted net effects for Furbearers can be found in **Table 12-43**. Detailed descriptions of proposed mitigation measures to prevent or limit the effect of construction and operations on furbearers can also be found by referring to the following sections in Appendix E (Mitigation Measures):

- Section 5.1 – Clearing and Grubbing;
- Section 5.3 – Spill Prevention and Emergency Response;
- Section 5.4 – Noise Control;
- Section 5.7 – Temporary Watercourse Crossings;
- Section 5.8 – Temporary Watercourse Diversions;
- Section 5.11 – Bridge and Culvert Installation;
- Section 5.12 – Blasting Near a Watercourse;
- Section 5.14 – Wildlife and Wildlife Habitat;
- Section 5.16 – Erosion and Sediment Control;
- Section 5.18 – Dust Control Practices;
- Section 5.19 – Aggregate Pit Decommissioning;
- Section 5.20 – Quarry Site Selection and Development;
- Section 5.21 – Site Decommissioning and Rehabilitation, and
- Section 5.23 – Prevention of the Transfer of Invasive Species.

For descriptions of additional mitigation measures to prevent or limit the effects of the Project on other wildlife and wildlife habitat, please refer to **Sections 12.4.3** (Moose), **12.4.5** (Bats), **12.4.6** (Birds) and **12.4.7** (Reptiles and Amphibians). A summary of mitigation measures applicable to wildlife and wildlife habitat, more generally, can be found in **Section 12.4.2.1** and **Appendix E** (Mitigation Measures). Section 13.4 includes additional information regarding Species at Risk.

12.4.4.1 Loss of Furbearer Habitat

12.4.4.1.1 Construction

Clearance Activities

Vegetation clearing, grubbing and the placement of materials during the construction phase may result in a loss of habitat that furbearers use to survive (i.e., habitat that provides shelter, food, water and space). Mitigation measures designed to eliminate or minimize the potential effect of the Project on vegetation communities and plant species are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures).

Avoiding the loss of furbearer habitat began with the identification of key furbearer habitats during the existing conditions study. Based on RSF habitat modeling, areas of high use by American marten and North American beaver were avoided during route selection where practicable. Additional RSF modelling for furbearers, such as otter and fox, were also used in the route selection process.

American Marten

High quality American marten habitats are primarily associated with mature coniferous and mixed forests that provide denning and foraging habitat (Chapin et al. 1998; Potvin et al. 2000). Other forested areas can also provide foraging habitat for American marten. Habitat identified as Late Winter Cover for moose (i.e., dense coniferous forest) has similar characteristics to high-quality American marten habitat. These areas were identified during the existing conditions study and were considered in the evaluation of alternatives. Mature mixed forests are rare in the LSA, except in the far western portion. These forests, which are also recognized as important areas for bats, were avoided during route selection where practicable.

The measures described in **Section 12.4.2.1** (Mitigation of Potential Effects on Wildlife and Wildlife Habitat) will also minimize the loss of American marten habitat during construction. These include:

- Following approval conditions, authorizations and permits issued for the Project, including any issued by MNR.
- Maintaining protective vegetation buffers (or setbacks) of at least 30 m around waterbodies and avoiding the clearance of riparian vegetation to the extent practicable.
- Where practicable, avoiding the placement of temporary camps, laydown areas and other temporary infrastructure within mature coniferous and mixed forests.
- Minimizing the Project Footprint and limiting vegetation clearing to the extent necessary for construction (i.e., a phased approach that would be accompanied by progressive restoration).
- Maintaining a cleared ROW of 35 m to the extent practicable, unless a specific area is required for construction.
- Having qualified project personnel identify sensitive habitats that are important to American marten prior to and during construction (e.g., areas of high use, marten dens). Should any be found, they will be assessed by a qualified biologist or resource specialist and an appropriate course of action will be determined, in consultation with regulatory agencies (e.g., MECP, MNR) as required. This may involve acquiring authorizations or permits from those agencies.
- Qualified personnel will also verify that environmental protection measures have been correctly implemented. If not, corrections and adjustments will be made prior to the resumption of work.
- To the extent practicable, reclaiming disturbed areas using processes that facilitate natural regeneration. When necessary, reclamation may involve the use of locally sourced transplants, and/or planting or seeding native self-sustaining species from approved stock and a reputable supplier, with the goal of restoring habitats to pre-construction conditions. Species of importance to Indigenous communities will be incorporated, as appropriate.
- Placing piles of coarse woody debris in restored areas to promote use by American marten and other furbearers. Efforts will be made to avoid having these piles act as a barrier to wildlife movement.
- Completing restoration activities under the appropriate environmental conditions.

The effectiveness of mitigation will be evaluated during the construction phase, with measures being modified or enhanced as necessary. Despite implementation of the proposed mitigation measures, there is a predicted negative effect from vegetation clearance on American marten, and this topic has been carried forward to Predicted Net Effects (**Section 12.7**).

North American Beaver

North American beaver dams and lodges were identified throughout the LSA during field surveys; however, occupancy of these lodges and dams was not confirmed in the field. If occupancy is verified during monitoring for construction, the following measures will be employed:

- Boundaries will be delineated so that construction is well set back from beaver lodges.
- The location of any lodge will be communicated to all Project personnel.
- Beavers and their lodges are regulated under provincial and federal acts. Therefore, the appropriate regulatory agency will need to be contacted if an active lodge is confirmed during construction and there are plans to disturb it. Authorizations, permits or approvals may be required.
- Any clearing of dams will occur outside of sensitive periods for the species.
    - Dam removal in late fall or winter could endanger overwintering North American beavers as they typically rely on deep water to store and access food caches.
    - Additionally, dam removal during the spring and early summer months could endanger young North American beaver kits.

Additional measures described in **Section 12.4.2.1** (Mitigation of Potential Effects on Wildlife and Wildlife Habitat) will minimize the loss of North American Beaver habitat during construction. These include:

- Maintaining buffer zones of 30 m around waterbodies and avoiding the clearance of vegetation in riparian areas to the extent practicable.
- Using construction fencing to demark the boundaries of work areas and prevent damage to habitat beyond the Project Footprint.
- Minimizing the extent of vegetation clearing at quarries, borrow pits and other temporary work areas.
- Only clearing vegetation to the extent necessary for construction (i.e., an approach where work areas would be phased temporally) and maintaining a cleared ROW no larger than 35 m in size, to the extent practicable.
- Reclaiming temporary areas of disturbance with processes that encourage natural regeneration of vegetation. (When necessary, restoration approaches may involve supplementing natural regeneration with locally sourced native self-sustaining transplants, seeds or plugs from approved lists and reputable suppliers).

The effectiveness of mitigation will be evaluated during the construction phase, with measures being modified or enhanced as necessary. Despite implementation of the proposed mitigation measures, there is a predicted negative effect from vegetation clearance on North American beaver, and this topic has been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.4.1.2 Operations

Clearance Activities

Repairs and maintenance activities for the roadway, associated ROW and crossing structures will be required over time, but these activities are not expected to cause disturbance beyond the area of the construction footprint. As such, maintenance activities are unlikely to cause additional loss of furbearer habitat.

American Marten

For American marten, specifically, the following measures will be implemented during operations, to accompany those described in **Section 12.4.2.1** (Measures to Mitigate the Effects of Vegetation Clearance on Wildlife and Wildlife Habitat).

- A 35 m ROW will be maintained throughout the operations phase.
- Ecological monitoring will be completed to verify that reclamation efforts have been successful (i.e., appropriate vegetation composition and structure has regenerated in previous areas of temporary disturbance such as former construction camps and laydown areas), with adaptive management occurring as necessary.

The effectiveness of mitigation will be evaluated during the operations phase, with measures being modified or enhanced as necessary. Nevertheless, there is a predicted negative effect of vegetation clearing on American marten that has been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.4.2 Alteration or Degradation of Furbearer Habitat

12.4.4.2.1 Construction and Operations

Habitat Structural Change

Vegetation clearing and ground disturbances during the construction phase may alter the structure of furbearer habitat and increase the short-term availability of early successional species. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary (through adaptive management).

In addition to the measures discussed in **Section 12.4.2** (Mitigation of Effects of Habitat Structural Change on Wildlife and Wildlife Habitat), alteration or degradation of furbearer habitat will be minimized by:

All Furbearers

- To the extent practicable, keeping the construction development footprint as small as practicable.
- Minimizing and restricting vegetation clearing near sensitive habitat areas.
- Retaining wildlife trees and CWD in locations where it is safe to do so.
- Reclaiming areas with restoration techniques that facilitate natural regeneration. Where necessary, regeneration may be augmented with the assistance of transplants from within the LSA, or planting and seeding self-sustaining native species from approved stock and a reputable supplier. The goal of reclamation is to restore habitats to pre-construction conditions.
- Completing restoration and reclamation activities under appropriate environmental conditions.

It will take time for reclamation efforts to be successful, meaning areas that were temporarily disturbed during construction will remain altered or degraded while successional processes are occurring. The ROW associated with the WSR itself would be considered a loss of high-quality denning habitat while it is operational.

North American Beaver

The creation of early successional habitats near waterbodies and watercourses may benefit North American beavers by increasing the availability of browse during construction and operations. Nevertheless, to the extent practicable, measures will be implemented to restore areas to pre-construction conditions and avoid attracting beavers to the ROW.

American Marten

While American marten prefer older coniferous forests, they will use younger forests when CWD is present. Restoration techniques that incorporate the rollback of slash and placement of large CWD will be used to enhance restored areas for American marten and other terrestrial furbearers.

The effectiveness of mitigation measures in reducing habitat structural change will be evaluated during the construction phase, with measures being modified or enhanced as necessary. There is a predicted negative effect of the Project on furbearer habitat structure, which has been carried forward to Predicted Net Effects (**Section 12.7**).

Hydrological Changes

Aquatic Furbearers

Hydrological changes in the amount of surface water and/or groundwater could affect furbearers, particularly those that use aquatic habitats. During planning, the Project Team considered the consolidation and compression processes of the peat layers, as the placement of fill for road construction could reduce the permeability of the peatlands and alter groundwater pathways. Mitigation measures designed to reduce changes to hydrology and drainage patterns are provided in Section 7.4 (Mitigation Measures for the Effects on Surface Water Resources), Section 8.4 (Mitigation Measures for the Effects on Groundwater Resources), and **Appendix E** (Mitigation Measures). Mitigation measures designed to reduce the effects of hydrological changes on Wildlife and Wildlife Habitat, more generally, are listed in **Section 12.4.2.3.2**.

The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. Potentially, there will be net effects of the Project on North American beaver habitat because of hydrological changes so the pathway of hydrological change has been carried forward to Predicted Net Effects (**Section 12.7**).

Accidental Spills

Aquatic Furbearers

Spills can have an effect on aquatic furbearers because hazardous materials often disperse more widely and quickly in water; however, the spill prevention measures that were described in **Section 12.4.2.2.1** (Measures to Mitigate the Effects of Accidental Spills on Wildlife and Wildlife Habitat) are applicable to North American beaver and the habitat of other aquatic furbearers. These measures include:

- Storing, transferring, and dispensing hazardous materials at least 50 m from waterbodies; and
- Ensuring that spill mitigation measures (spill kits) are present on-site near aquatic environments.

Additional details about spill prevention and emergency response procedures are contained in Appendix E (Mitigation Measures). There is no predicted negative effect of the Project on furbearer habitat from accidental spills.

Sensory Disturbance

All Furbearers

Artificial light, loud noises, vibrations and other sensory disturbance have the potential to cause furbearers to be displaced, reduce their use of certain habitats, and change their relationship with predators. During construction, the measures described in **Section 12.4.2.2.1** (Mitigation for the Effects of Sensory Disturbance on Wildlife) will be implemented to minimize potential sensory effects on furbearers. Examples include:

- Restricting construction traffic to designated areas, where practicable;
- Restricting access to the ROW to Project personnel during construction;
- Avoiding active construction or maintenance activities in furbearer habitat during sensitive periods;
- Following the requirements of the Noise and Vibration Management Plan, Light Management Plan, the Wildlife Management Plan and the Construction Blasting Plan, where appropriate; and
- Posting and enforcing speed limits in sensitive areas.

The effectiveness of mitigation measures will be monitored during construction and modified as necessary. Since it is anticipated that negative effects on furbearers will remain, sensory disturbance has been carried forward to Predicted Net Effects (**Section 12.7**).

Invasive Plant Species

All Furbearers

There is little indication that invasive plants will have a negative effect on American marten in Ontario. Some aquatic invasive plants such as purple loosestrife (Lythrum salicaria) and European common reed (Phragmites australis) can affect North American beaver habitat, but their existing range is south of Lake Nipigon and no Net Effect is predicted.

It is anticipated that the measures described in **Section 12.4.2.2.1** (Mitigation Measures for the Effects of Invasive Plant Species on Wildlife and Wildlife Habitat) will effectively mitigate any potential effects from noxious or exotic species during on other furbearers. As such, invasive plant species are not discussed in relation to furbearers in **Section 12.7** (Predicted Net Effects).

12.4.4.3 Alteration in Furbearer Movement

12.4.4.3.1 Construction and Operations

Loss of Connectivity

All Furbearers

The presence of the WSR and associated ROW could act as a movement barrier for furbearers. Furbearers may avoid the ROW because the road itself may create open inhospitable conditions (Jaeger et al. 2004). Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.2** (Wildlife Habitat). and Appendix E (Mitigation Measures).

Road avoidance by furbearers has been linked to the volume of vehicles on the road (i.e., road usage). Between the relatively low WSR traffic levels that are anticipated (i.e., less than 500 vehicles per day), and the implementation of mitigation measures outlined in other sections of this report (e.g., **Section 12.4.2** Loss of Connectivity – All Wildlife), potential effects of the road on furbearer movements are expected to be low for American marten and negligible for North American beaver.

Aquatic Furbearers

In water construction activities, such as dewatering and cofferdam installations can also act as a barrier for aquatic furbearers. Such activities can make it difficult for aquatic furbearers to move between different parts of their habitat (e.g., from foraging habitat to shelter), and/or can increase the risk of predation. Scheduling dewatering activities outside of critical periods for wildlife can help to minimize potential negative effects. Other recommended mitigation measures include:

- Maintaining minimum water levels;
- As necessary, creating temporary water channels, installing temporary bridges or culverts to permit aquatic furbearers to move between habitats, and
- Completing in-water works during periods when aquatic furbearers are less active, including their breeding (denning) season.

The effectiveness of these measures will be evaluated during the construction phase and modified or updated as necessary. Although it is anticipated that these measures will reduce effects on furbearers, they will not eliminate the effects entirely. As a result, the pathway 'Loss of Connectivity' has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.4.3.2 Operations

Sensory Disturbance

All Furbearers

During operations, furbearers may alter their movement to avoid sensory disturbance from traffic and other activities. Mitigation methods for sensory disturbance are similar to those used for maintaining habitat connectivity and include maintaining posted lower speed limits in sensitive habitats and identified crossing areas and ensuring maintenance activities take place outside critical periods such as breeding season, and/or outside of sensitive habitats.

Sensory disturbance during operations from road use is expected to be minimal. While some furbearers have been found to avoid roads and cross more often at night this has a relation to traffic volume and is species dependant. North American beavers show little avoidance of roads or noise with North American beavers often incorporating roads into dam structures with road size and traffic levels having little influence on North American beaver presence.

With the low volume of vehicular traffic on the road, operational sensory disturbance is expected to have only a small effect on furbearer usage of the area around the roadway and no effect on North American beaver.

12.4.4.4 Furbearer Injury or Death

12.4.4.4.1 Construction and Operations

Increased Access

All Furbearers

The injury or death of furbearers could increase with the development of the WSR as the ROW will provide additional opportunities for humans to access the LSA. Harvest, both legal and illegal, could increase during both construction and operations phases. Unplanned human-wildlife encounters could also lead to furbearer injury and death; however, the measures outlined in **Section 12.4.2** (Injury or Death – All Wildlife) and Appendix E (Mitigation Measures) are designed to mitigate these potential effects. Additionally, the following measures are recommended:

American Beaver

- Screen culverts to prevent access by beavers.
- Use reasonable efforts to confirm Project personnel have received training that includes how to identify a beaver lodge, and what to do if one is encountered during construction.
- That is, Project personnel should know to stop work and contact the proponent, local Indigenous communities, the Project biologist and regulatory agencies (e.g., MNR) prior to resuming construction. A permit or other authorization may be required.
- Regularly monitor water crossings for signs of beaver activity. When found, reporting procedures will be followed.
- Remove blockages (i.e., caused by branches, logs) from water crossings, waterbodies and culverts.

The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary; however, it is anticipated that effects will remain. As a result, discussion of the pathway 'Increased Access' has been carried forward to Predicted Net Effects (**Section 12.7**).

Changes to Predator-Prey Dynamics

All Furbearers

Increased encounters with predators may occur because linear features have been shown to facilitate access by predators and increase their travel speeds. While during the construction phase most furbearer predators (including wolves) will avoid the LSA, during the operations phase predators could use the ROW to reach previously inaccessible areas. In addition, higher movement rates could lead to higher encounter rates between predators and prey. Mitigation measures described in **Section 12.4.2** (Mitigation of Effects of Altered Predator-Prey Relationships on Wildlife and Wildlife Habitat) will be implemented to reduce injury or death of furbearer. These include:

- Maintaining camps, the construction footprint and other areas free of garbage, sewage or other materials that may attract predators.
- Appropriately storing petroleum products and other materials toxic to furbearers in wildlife-proof containers prior to having them appropriately removed from the LSA.
- Blocking any temporarily disturbed areas and access roads until reclamation efforts have been successfully completed.

Additional measures, specific to American marten and North American beaver include:

- Focusing or grouping temporary construction activities spatially.
- To the extent possible, retaining vegetation under 2 m along the ROW to decrease predator movement rates.
- Maintaining culverts and water crossings to limit North American beaver use of road structures.
- Including bends in temporary road construction and employing other measures to reduce predator mobility, where practicable.
- Minimizing the likelihood that predators will be attracted to inactive areas by strategically placing or maintaining vegetation barriers, contouring the ground, rollback and other physical control measures.

The effectiveness of mitigation measures will be evaluated during construction and operations, with measures being modified or enhanced as necessary through adaptive management. Although measures will be implemented to mitigate against potential changes to predator-prey dynamics, it is anticipated that net effects will remain in the LSA. As a result, additional discussion about potential effects from altered predator-prey dynamics has been carried forward to **Section 12.7** (Predicted Net Effects).

Collisions with Vehicles

In general, excess mortality has not been found to be a major factor for furbearers, although mortality rates can vary since furbearer species do not react to roads in the same way. Some species will avoid roads all together, while others will use them only during periods of low traffic, and still others will be attracted to roads because they provide opportunities for feeding (foraging) and travel (Baigas et al., 2017; Scrafford et al., 2018; Ericksen et al., 2019).

All Furbearers

To minimize the potential of furbearer injury or death from vehicle collisions, the following measures will supplement those found in **Section 12.4.2 (**Mitigation Measures for Wildlife Injury of Death) and Appendix E (Mitigation Measures). These include:

- Lowering posted speed limits in areas where furbearer travel corridors are identified during construction, or roadkill is found to be abundant during operations.
- Restricting the use of personal motorized vehicles (e.g., ATVs, snowmobiles) during the construction phase.
- During operations, restricting traffic to approved access routes.
- Controlling roadside vegetation in a manner that maintains line of sight for drivers.
- Conducting road maintenance activities outside of critical life cycle periods for furbearers.
- Developing and implementing wildlife sighting and incident reporting procedures.

North American Beavers

Road mortality is likely to occur because North American beavers do not avoid roads. In fact, they may use roadsides as part of their dam structures. Nuisance beavers will be managed through:

- The implementation of all conditions of environmental permitting, authorization or approval.
- The use of restrictive fencing or screening at culverts and/or watercourse crossings.
- The clearing of any woody debris at culvert and bridge sites.

- Designing crossings that minimize narrowing of a watercourse (which may promote North American beaver use).

The effectiveness of mitigation will be evaluated during the construction and operations phases, with measures being modified or enhanced as necessary. Despite these measures, there remain negative effects on furbearers because of collisions. As such the pathway 'Collisions' has been carried forward to Predicted Net Effects (**Section 12.7**).

Incidental Take

American marten dens and North American beaver lodges and dams could be destroyed or damaged during construction activities including vegetation clearing, bridge construction or culvert installation. Vegetation and water crossing maintenance activities also have the potential to destroy or damage these wildlife structures.

American Marten

In northern and central Ontario, the breeding season for American marten typically occurs in late July or early August. After mating, the gestation period is approximately 8.5 months, meaning females are generally in their dens between late March and early April. As such, mitigation measures will include:

- Avoiding the disturbance of dens during sensitive periods for the species.
- Restricting public access to the Project Footprint during the construction phase by installing signage, gates or other measures.
- Training Project personnel to identify dens and implementing procedures for personnel to follow when a den is encountered.
    - If a den is deemed active, stopping construction work immediately, and contacting the appropriate Project personnel, Indigenous communities and regulatory agencies.
    - Marking the den and establishing a buffer (100 m). No work will take place within the buffer until authorization has been obtained from the MNR.
- Following the conditions of environmental authorizations, permits or other approvals.

North American Beaver

For North American beaver, mitigation measures to supplement those described in **Section 12.4.2** (Mitigation of Effects on Wildlife and Wildlife Habitat) are:

- Restricting public access to the Project Footprint by installing signage, gates or other measures.
- Ensuring environmental training for personnel includes information about lodge identification and procedures to follow if a lodge/dam is identified.
    - Should an active lodge be found during construction, work will stop immediately, and the appropriate Project personnel, Indigenous communities and regulatory agencies will be contacted.
    - Local MNR will be contacted.
- If development of the road requires the removal of a lodge or dam, then appropriate permits and applications will be obtained.

- Lodges are of high importance for North American beavers as they are used for parturition and kit rearing, and dam removal during the winter months can lead to mortality (associated with falling water levels). As such, the removal of lodges or dams will not be permitted to occur during sensitive periods for the species.

The effectiveness of mitigation measures will be evaluated during construction and operations, with measures being modified or enhanced as necessary through adaptive management. There is a predicted negative effect on furbearers from incidental take. Additional discussion of this issue has been carried forward to Predicted Net Effects (**Section 12.7**).

Table 12-43: Summary of Potential Effects, Mitigation Measures, and Predicted Net Effects for Furbearers Sub VC

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Furbearers	▪ Changes to American marten habitat availability (quantity) ▪ Changes to North American beaver habitat availability (quantity)	Construction and Operations	**Construction Phase**: ▪ Vegetation clearing and grubbing. ▪ Road Construction ▪ Construction and Use of Supportive Infrastructure ▪ Construction of permanent waterbody crossings. **Operations Phase**: ▪ Aggregate Extraction and Processing	Habitat Loss – Clearance Activities	▪ Prior to project design, RSF habitat models were used to identify areas of high use to American marten, North American beaver and other furbearers. These areas were avoided during route selection, where practicable. ▫ For American marten, the habitats were mainly associated with mature coniferous and mixed forests. ▫ For North American beaver, lodges and dams were identified throughout the LSA, but occupancy was not confirmed. ▪ All conditions of environmental permits, authorizations and approvals will be followed. ▪ Buffer zones of at least 30 m will be maintained around waterbodies. ▪ Vegetation in riparian areas will be retained to the extent possible. ▪ Where practicable, the placement of camps, laydowns and other areas of temporary disturbance will avoid mature coniferous and mixed forests, in which American marten live. ▪ The placement of construction camps, laydown yards and other temporary construction areas will be placed in locations that were previously disturbed, to the extent practicable. ▪ The Project Footprint shall be minimized, and the extent of vegetation clearing limited at quarries, borrow pits and other temporary areas (i.e., to the extent required for construction and/or operations). ▪ The boundaries of the work areas will be clearly delineated (e.g., with fencing) to prevent habitat loss beyond their limits. ▪ Qualified personnel will verify that environmental protection measures have been correctly implemented. If not, corrections and adjustments will be made prior to the resumption of work. ▪ Prior to, and during construction, Project personnel will look for signs of habitats that are important to American marten (e.g., den sites). Should any be found, they will be assessed by a qualified biologist and an appropriate course of action will be determined, in consultation with regulatory agencies as required. ▪ As part of restoration activities, constructed piles of CWD will be strategically placed to promote habitat use by American marten. ▪ Prior to and during construction, qualified personnel will determine the occupancy of lodges and dams. The location of such structures will be communicated to Project personnel. ▪ Vegetation protection zones (setbacks or buffers) will be established between occupied structures and the Project Footprint. ▪ Removal of dams will occur between mid and late summer to avoid sensitive periods for North American beaver. ▪ Removal of beaver lodges will require communication with relevant regulatory agencies. Permits, authorizations or approvals may be required. ▪ Temporary areas of disturbance will be reclaimed as soon as practicable with processes that encourage natural regeneration. When necessary, reclamation may involve the use of locally sourced transplants, and/or planting or seeding native self-sustaining species from approved stock and a reputable supplier, with the goal of restoring habitats to pre-construction conditions. Species of importance to Indigenous communities will be incorporated, as appropriate. ▪ A 35 m ROW will be maintained during operations. ▪ Ecological effectiveness monitoring will be completed.	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
					▪ Refer also to **Section 12.4.2.1** (Mitigation of Effects on Wildlife and Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	
Furbearers	▪ Changes to American marten habitat availability (quality) ▪ Changes to North American beaver habitat availability (quality) ▪ Changes to abundance and distribution of American marten and American marten habitat ▪ Changes to abundance and distribution of North American beaver and North American beaver habitat	Construction and Operations	**Construction Stage**: ▪ Vegetation clearing and grubbing. ▪ Decommissioning and Site Restoration/Reclamation **Operations Stage**: ▪ Vegetation management	Habitat Alteration or Degradation – Changes to Habitat Composition	▪ Construction footprints will be minimized to the extent possible and clearing will be restricted near sensitive areas (e.g., dens, lodges). ▪ Where it is safe to do so, wildlife trees and CWD will be retained on site. ▪ Areas will be quickly reclaimed, with techniques that encourage natural regeneration. Occasionally, natural vegetation will be augmented by planting and/or seeding native species from approved lists and reputable vendors or using transplants from within the LSA. Restoration and reclamation activities will be completed under appropriate environmental conditions. ▪ Restoration techniques will incorporate the rollback of slash and strategic placement of CWD to encourage habitat use by American marten. ▪ Ecological monitoring will be completed to evaluate the effectiveness of mitigation measures. Measures will be adjusted as necessary. ▪ refer also to **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control	Yes
Furbearers	▪ Changes to North American beaver habitat availability (quality) ▪ Changes to abundance and distribution of North American beaver and North American beaver habitat	Construction and Operations	**Construction Stage**: ▪ Temporary Watercourse Diversions ▪ Road Construction ▪ Bridge and Culvert Installation **Operations Stage**: ▪ Repair and/or rehabilitation of culverts and bridges at water crossings	Habitat Alteration or Degradation – Hydrological Changes	▪ During development, the Project team considered the consolidation and compression processes of peat layers associated with the placement of fill. ▪ Refer to Section 7.4 (Mitigation Measures – Surface Water) and Section 8.4 (Mitigation Measures – Groundwater) for guidance relating to Hydrology. ▪ Refer also to **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.7 – Temporary Watercourse Crossings ▫ Section 5.11 – Bridge and Culvert Installation ▫ Section 5.16 – Erosion and Sediment Control	North American Beaver: yes, but minor
Furbearers	▪ Changes to abundance and distribution of American marten and American marten habitat ▪ Changes to abundance and distribution of North American beaver and North American beaver habitat ▪ Changes to furbearer species richness	Construction and Operations	**Construction Phase**: ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Construction and Use of Supportive Infrastructure ▪ Bridge and Culvert Installation **Operations Phase**: ▪ Repair and/or rehabilitation of culverts and bridges at water crossings; ▪ Road Usage	Habitat Alteration or Degradation – Accidental Spills	▪ Refer to **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.17 – Concrete Washout Management Practices ▫ Section 5.18 – Dust Control Practices Examples include: Preparing a Spill Prevention and Emergency Response Management Plan prior to the start of the construction phase. Reviewing and updating the plan (as necessary) for application during Operations. Implementing material storage setbacks (i.e., at least50 m from waterbodies)	No

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Furbearers	▪ Changes to abundance and distribution of American marten and American marten habitat ▪ Changes to abundance and distribution of North American beaver and North American beaver habitat	Construction and Operations	**Construction Phase**: ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Phase**: ▪ Vegetation management ▪ Road Usage	Habitat Alteration or Degradation – Sensory Disturbance	▪ Blasting and other activities likely to cause sensory disturbances to wildlife will occur outside of sensitive 'timing' windows, including the breeding and denning seasons for American marten (late July to early August for breeding and late March-early May for denning), and North American beaver (breeding: January-March, followed by a gestation period of approximately 100 days). ▪ Refer also to **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat <u>Examples include</u>: Preparing and Implementing a Light Management Plan, Noise and Vibration Management Plan, and Construction Blasting Management Plan prior to the onset of Construction. These plans will be reviewed and adjusted as necessary for use during the operations phase. Restricting construction traffic to designated areas. Restricting access to the ROW to Project Personnel during construction. Setting and enforcing speed limits for vehicles and prohibiting the use of recreational vehicles by Project personnel during the construction phase (e.g., snowmobiles, ATVs).	American marten: Yes
Furbearers	▪ Changes to abundance and distribution of North American beaver and North American beaver habitat	Construction and Operations	**Construction Phase**: ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Phase**: ▪ Vegetation management ▪ Road Usage	Habitat Alteration or Degradation – Invasive Plant Species	▪ Refer to **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat	No
Furbearers	▪ Changes to distribution of American marten ▪ Changes to distribution of North American beaver	Construction	**Construction Phase**: ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Phase**: ▪ Vegetation management ▪ Road Usage	Alterations in Movement – Loss of Connectivity	▪ Phase construction (spatially and temporally) to maintain uninterrupted passage between habitats for furbearers. ▪ Where practicable, maintain vegetation to limit width of ROW. ▪ Limit pullout areas along road. ▪ As necessary, install temporary bridges or culverts, maintain water levels, and/or create temporary water channels to retain habitat connectivity for aquatic furbearers. ▪ Dewatering activities and in-water works to be scheduled during non-critical periods for aquatic furbearers (e.g., North American beaver breeding season: January-March, followed by a gestation period of approximately 100 days). ▪ Refer also to **Section 12.4.2.3** (Alteration in the Movement of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.7 – Temporary Watercourse Crossings	American marten: Yes North American beaver: no in winter, negligible otherwise

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
					▫ Section 5.8 – Temporary Watercourse Diversions ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	
Furbearers	▪ Changes to abundance and distribution of American marten ▪ Changes to abundance and distribution of North American beaver	Construction and Operations	**Construction Phase**: ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Phase**: ▪ Vegetation management ▪ Road Usage	Alterations in Movement – Sensory Disturbance	▪ Measures outlined in mitigation plans for noise, light and vibration are to be implemented. ▪ Activities likely to cause sensory disturbances (e.g., blasting, road maintenance) will be conducted outside sensitive windows for aquatic furbearers. ▪ Lower speed limits will be posted near sensitive habitats and identified crossing areas for furbearers. ▪ Refer also to **Section 12.4.2.3** (Alteration in the Movement of Wildlife), **Section 12.4.4.2** (Alteration or Degradation of Furbearer Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat	American marten: Yes North American beaver: No
Furbearers	▪ Changes to North American beaver survival and reproduction ▪ Changes to American marten survival and reproduction	Construction and Operations	**Construction Phase**: ▪ All Construction Stages **Operations Phase**: ▪ Road Usage	Injury or Death – Increased Access	▪ Screen culverts or use restrictive fencing to discourage beavers using the road or supportive infrastructure. ▪ Use reasonable efforts to train Project personnel to identify a beaver lodges and make them aware of what to do in the event a lodge is located during construction. ▪ Use reasonable efforts to teach Project personnel to identify potential American marten dens and make them aware of what to do in the event one is located during construction. ▪ Develop and implement wildlife sighting and reporting procedures and regularly monitor water crossings for signs of beaver activity. ▪ Restrict public access to Project Footprint during the construction phase. ▪ Prohibited firearms from camps and construction areas. ▪ Limit pullout areas along road. ▪ Conduct road maintenance activities outside of critical life cycle periods, such as denning. ▪ Refer also to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	Both species: Yes
Furbearer	▪ Changes to North American beaver survival and reproduction ▪ Changes to American marten survival and reproduction ▪ Changes to predator access, habitat use and population	Operations	**Construction Stage**: ▪ Road Construction ▪ Vegetation clearing and grubbing. ▪ Construction and Use of Supportive Infrastructure **Operations Stage**: ▪ Road Usage ▪ Vegetation management	Injury or Death – Predator-Prey Dynamics	▪ Areas within the construction footprint will be kept free of garbage, sewage and other materials that may attract predators. Petroleum and other substances toxic to furbearers will be kept in wildlife-proof containers prior to removal from the site. ▪ Disturbed areas to be blocked and reclaimed quickly with natural vegetation (and occasionally augmented by planting and seeding native species). ▪ Roadkill to be quickly and appropriately removed to reduce attracting predators to the LSA. ▪ To the extent possible, vegetation under 2 m will be retained along the ROW. ▪ To the extent practicable, bends will be included in temporary roads to reduce predator mobility along them. ▪ Culverts will be screened appropriately. Water crossings and culverts will be maintained to limit their use by North American beaver.	For American marten: Yes, but negligible For North American beaver: Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
					▪ Vegetation barriers will be strategically placed, the ground will be contoured, rollbacks will be created along with other physical control measures to limit increased predator movement. ▪ Refer to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	
Furbearers	▪ Changes to North American beaver survival and reproduction ▪ Changes to American marten survival and reproduction	Construction and Operations	**Construction Stage**: ▪ All Construction Stages **Operations Stage**: ▪ Road Usage	Injury or Death – Collisions with Vehicles	▪ Lower posted speed limits in areas where furbearer travel corridors have been identified during construction, and/or roadkill is found to be abundant during operations. ▪ Use reasonable efforts to have Project personnel receive environmental training including how to identify beaver lodges and American marten dens and which protocols to follow if either are encountered. ▪ Develop and implement wildlife sighting and reporting procedures. ▪ Restrict the use of personal motorized vehicles during construction. ▪ Restrict traffic to approved access routes during operations. ▪ Control roadside vegetation to maintain line of sight for drivers. ▪ Screen culverts or use restrictive fencing to discourage beavers from using the ROW. ▪ Design crossings that minimize narrowing of watercourses (which may promote use by beaver). ▪ Monitor culverts and water crossings for blockages, and appropriately clear any debris found. ▪ Refer also to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	Both species: Yes
Furbearers	▪ Changes to North American beaver survival and reproduction ▪ Changes to American marten survival and reproduction	Construction and Operations	**Construction Stage**: ▪ All Construction Stages **Operations Stage**: ▪ Road Usage	Injury or Death – Incidental Take	▪ Construction and road maintenance activities shall be completed outside of critical life cycle periods for furbearers, such as denning. ▪ Restrict public access to the Project Footprint during construction using signage, gates, or other control measures. ▪ Train Project personnel to identify American marten dens and North American beaver lodges. Develop and implement a protocol to follow is any are identified during construction (i.e., work stoppage, individuals, groups and agencies to be contacted, temporary protection zone from feature, etc.). ▪ Refer also to **Section 12.4.2.4** (Injury or Death of Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	Both species: Yes

12.4.5 Bats-Specific Mitigation

This subsection outlines key mitigation measures that will be implemented to mitigate potential effects of the Project on bats and their habitats. A summary of the potential effects, mitigation measures, and predicted net effects for bats can be found in Table 12-44. Detailed descriptions of proposed mitigation measures to prevent or limit potential effects of construction and operations on bats can also be found by referring to the following sections in Appendix E (Mitigation Measures):

- Section 5.1 – Clearing and Grubbing;
- Section 5.3 – Spill Prevention and Emergency Response;
- Section 5.4 – Noise Control;
- Section 5.11 – Bridge and Culvert Installation;
- Section 5.12 – Blasting Near a Watercourse;
- Section 5.14 – Wildlife and Wildlife Habitat;
- Section 5.16 – Erosion and Sediment Control;
- Section 5.18 – Dust Control Practices;
- Section 5.19 – Aggregate Pit Decommissioning;
- Section 5.20 – Quarry Site Selection and Development;
- Section 5.21 – Site Decommissioning and Rehabilitation; and
- Section 5.23 – Prevention of the Transfer of Invasive Species

For descriptions of proposed mitigation measures to prevent or limit the effect of the Project on other groups of wildlife, please refer to **Sections 12.4.3** (Moose), **12.4.4** (Furbearers), **12.4.6** (Birds) and **12.4.7** (Reptiles and Amphibians). A summary of mitigation measures applicable to all wildlife and wildlife habitat can be found in **Section 12.4.2** and Appendix E (Mitigation Measures). Section 13 includes additional information regarding Species at Risk.

12.4.5.1 Habitat Loss

12.4.5.1.1 Construction

Clearance Activities

Existing conditions studies did not confirm any Significant Wildlife Habitat for bats (i.e., hibernacula, maternity roost colonies) and there were no high-use areas identified during acoustic surveys; however, bats are known to occur at low densities and areas of suitable maternity roosting habitat have been identified in the LSA (i.e., candidate habitat). As a result, Project components were sited to provide an avoidance buffer of upland area to minimize effects to potential roosting areas (where practicable).

Measures designed to mitigate against the effects of clearance activities on wildlife were described in **Section 12.4.2.1** (Wildlife and Wildlife Habitat, Habitat Loss, Construction). Other mitigation measures to minimize the potential effects of vegetation clearing on SAR bats during the construction phase include:

- Developing a CEMP that includes a Site Restoration and Monitoring Plan, Vegetation and Invasive Species Management Plan and Wildlife Management Plan.
- Implementing the CEMP during the construction phase.

- Following all environmental conditions of approval for the Project, including those issued by CWS-ECCC, and MECP.
- Maintaining vegetation buffers (setbacks) a minimum of 30 m from waterbodies and reducing vegetation clearing to the extent practicable along riparian areas.
- Having qualified biologists or resource specialists delineate (using flagging, fencing or other appropriate markers) a vegetation setback (i.e., buffer or protection zone) of 120 m from the outer extent of any maternity roosting habitat identified that is during pre-clearing surveys (construction monitoring).
- Avoiding vegetation removal within this protection zone, to the extent practicable, until there has been engagement with and approval from the appropriate regulatory agencies (e.g., MECP, CWS-ECCC).
- Training Project personnel to identify potential maternity roosting habitat and having construction monitoring carried out by individuals experienced with recognizing such features.
- Should any previously unidentified maternity roosting habitat be identified during construction, work will immediately cease, the feature will be documented (e.g., photographs, records), and a qualified biologist or resource specialist shall delineate a setback of 120 m from the outer extent of the feature (e.g., with flagging or another appropriate marker).
    - Vegetation removal within this buffer will be avoided to the extent practicable.
    - The proponent and local Indigenous communities will be notified.
    - Project activity will not resume in that location until the feature has been assessed and a suitable course of action has been determined, in consultation with appropriate regulatory agencies (e.g., MECP-Species at Risk Branch, CWS-ECCC), as necessary. Authorizations or permits may be required.
- Minimizing permanent habitat loss during the construction phase by reducing the extent of vegetation clearing in areas required temporarily for construction (e.g., construction camps).
- Delineating the boundaries of each work area by installing construction fencing. This will prevent habitat damage and loss beyond the limits of the work area.
- Reclaiming areas of temporary disturbance (e.g., access roads, construction camps, laydown areas) as soon as practicable following completion of work, in a progressive or phased approach. Habitat will be restored to a functional stage, with approaches that facilitate natural regeneration. Where necessary, natural regeneration may be supplemented with transplants or seeds from the LSA, or self-sustaining native plants and seeds from an approved list and reputable supplier.

12.4.5.1.2 Operations

Clearance Activities

Measures to mitigate against the effects of clearance activities on bats during the operations phase include:

- Reviewing and updating, as necessary, the Site Restoration and Monitoring Plan, Vegetation and Invasive Species Management Plan and Wildlife Management Plan as part of the OEMP prior to being implemented.
- Continuing to follow conditions of environmental approval issued by regulatory agencies that are applicable to the operations phase.
- Maintaining vegetation buffers (setbacks) of at least 30 m around waterbodies throughout the operations phase, and minimizing the clearing of riparian vegetation, to the extent practicable.
- Minimizing the extent of clearings at quarries, pits and other temporary areas.

- Restricting access to restored areas (i.e., that were formerly disturbed) until such a time as habitat has been returned to a functional stage, ideally resembling pre-construction conditions.

The effectiveness of mitigation will be evaluated during construction, with measures being modified or enhanced as necessary (i.e., adaptive management). Although these measures will be implemented to mitigate against the effects of habitat loss on bats, it is anticipated that net effects will remain in the LSA. As a result, additional discussion about potential effects from 'Clearance Activities' can be found in Predicted Net Effects (**Section 12.7**).

12.4.5.2 Alteration or Degradation of Bat Habitat

12.4.5.2.1 Construction

Habitat Structural Change

Vegetation clearing during the construction phase may alter the structure and composition of bat habitat. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary (through adaptive management). In addition to the measures discussed in **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat), alteration or degradation of bat habitat will be minimized by:

- To the extent practicable, minimizing construction footprints and maintaining vegetation in upland habitats containing features that appear suitable for maternity roosting (e.g., large snags and cavity trees).
- To the extent practicable, maintain vegetation structure and composition in other sensitive habitats that bats utilize (e.g., wetland foraging habitat).
- Progressively reclaiming any areas of temporary disturbance from construction activities (e.g., access roads, construction camps, laydown areas), and restoring them to a functional stage, with natural regeneration expected over time. Where necessary, natural revegetation will be supplemented by transplanting species from within the LSA, and/or planting or seeding self-sustaining species native to the area from approved lists and a reputable supplier.

Although these measures will be implemented to mitigate against potential effects on bats during the construction phase, net effects will likely remain in the LSA, so the pathway 'Habitat Structural Change' has been carried forward to Predicted Net Effects (**Section 12.7**).

Hydrological Changes

The existing conditions studies did not confirm the presence of maternity roosting habitat in the LSA; however, suitable habitat appeared to be present. Measures will be implemented to sustain hydrological conditions in groundwater recharge zones associated with potential maternity roosting areas. During Project planning, the design team factored in the consolidation and compression processes of the peat layers often associated with road construction (loading), which may result in reduced permeability of the peat, and thus alter natural groundwater flow directions and pathways.

Mitigation measures designed to reduce changes to hydrology and drainage patterns are provided in Section 7.4 (Mitigation Measures – Surface Water Resources), Section 8.4 (Mitigation Measures - Groundwater Resources), and Appendix E (Mitigation Measures). Mitigation measures designed to

reduce the effects of hydrological changes on Wildlife and Wildlife Habitat, more generally, are listed in **Section 12.4.2.2**.

The effectiveness of mitigation will be evaluated during construction, with measures being modified or enhanced as necessary. Although these measures will be implemented to mitigate against potential effects to bat habitat during the construction phase, net effects will likely remain in the LSA, so the pathway 'Hydrological Changes' has been carried forward to the Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

Artificial light, loud noises, vibrations and other sensory disturbances have the potential to cause bats to be displaced and/or reduce their use of habitats subject to the disturbance. Mitigation measures designed to minimize sensory disturbances in the LSA are discussed in Section 9.4 (Mitigation Measures – Effects on Atmospheric Environment), Section 18.4 (Mitigation Measures – Effects on Visual Environment), and Appendix E (Mitigation Measures). During construction, measures to mitigate sensory disturbance from activities such as blasting, traffic, and lighting will include:

- Preparing and following the requirements of the Noise and Vibration Management Plan, Light Management Plan, Wildlife Management Plan and the Construction Blasting Management Plan.
- Following all environmental conditions of approval for the Project, including any issued by MNR, CWS-ECCC or MECP.
- Prohibiting the use of personal recreational vehicles within the LSA during the construction phase.
- Progressively reclaiming areas of temporary disturbance using restoration approaches that facilitate natural regeneration, supplemented with self-sustaining species native to the LSA, as necessary.

In addition, measures specific to bats include:

- Conducting all blasting activity outside of sensitive timing windows for bats (i.e., from just before breeding begins in the late spring until after pups have matured and left the roost in the late summer or fall) unless specific approvals have been granted by regulatory agencies. The active season for bats in Northern Ontario extends from May 1 to August 31.
    - If it is determined that there is a need to conduct blasting within 500 m of suitable maternity roosting habitat during the previously mentioned window, qualified biologists will carry out pre-blasting sweeps to assess whether the habitat is occupied.
    - Should habitat use be confirmed, a 500 m setback from the habitat will be flagged, or otherwise appropriately marked. A vegetation barrier will be maintained within that setback.
    - The proponent and local Indigenous communities will be informed.
    - The activity (blasting) will likely be subject to federal or provincial authorizations for significant wildlife habitat or species at risk (e.g., MNR, CWS-ECCC, MECP). To proceed, the contractor will likely need to implement site-specific mitigation measures and may need to adhere to SAR permitting requirements.
- Avoiding other construction activities that may cause sensory disturbance within 120 m of bat maternity roosting habitat during sensitive periods (i.e., the active season, May 1 – August 31) unless approval is received from the appropriate regulatory agency.
    - If there is a proposal to disturb potential maternity roosting habitat or the 120 m vegetation protection zone around it, qualified biologists will carry out pre-clearance sweeps to determine whether the habitat is occupied.

- Should habitat use be confirmed, a minimum 120 m vegetation buffer (barrier) will be maintained between the Project Footprint and key bat habitats. This buffer will be flagged or otherwise marked.
- The activity (e.g., vegetation clearance) will likely be subject to federal or provincial authorizations for significant wildlife habitat or species at risk (e.g., MNR, CWS-ECCC, MECP). To proceed, the contractor will likely need to implement site-specific mitigation measures and may need to adhere to SAR permitting requirements.

- If any other previously unidentified bat maternity roosting habitat is encountered during construction:
  - The contractor will immediately halt work in that location and notify the proponent.
  - They will also clearly flag or otherwise mark a setback 120 m from the feature and document its location.
  - The incident may need to be reported to the appropriate regulatory agencies.
  - Local Indigenous communities will be informed.
  - Activity will not resume in that location until qualified personnel have assessed the feature (i.e., for occupancy) and determined a suitable course of action, after consulting the appropriate regulatory agencies, as necessary.
- Posting and enforcing speed limits in sensitive areas.
- Minimizing the use of nighttime lighting in the vicinity of suitable maternity roosting areas during construction, to the extent practicable. Incorporating light shields or angling light to reduce affecting habitat beyond the ROW.

These, and other mitigation measures described in **Section 12.4.2.2** (Mitigation of the Alteration or Degradation of Wildlife Habitat) are expected to minimize potential impacts from sensory disturbances on bats; however, the effectiveness of these measures will be monitored during construction and modified as necessary. Since negative effects may remain even after these measures have been implemented, the pathway ‘Sensory disturbance’ have been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.5.2.2 Operations

Habitat Structural Change

Repairs to the roadway and clearing of the ROW will periodically be required during the operations phase of the Project; however, it is expected that these activities will not result in disturbance beyond the area affected during construction, and will therefore cause no, or negligible, additional changes to the structure of wildlife habitat. In addition to the measures discussed in **Section 12.4.2.2** (Mitigation of the Alteration or Degradation of Wildlife Habitat), during operations, alteration or degradation of bat habitat will be minimized by:

- Reviewing and updating, as necessary, the Site Restoration and Monitoring Plan, Vegetation and Invasive Species Management Plan and Wildlife Management Plan for incorporation into the OEMP and implementing this plan.
- Maintaining vegetation buffers (setbacks) of at least 30 m around waterbodies throughout the operations phase and minimizing the clearing of riparian vegetation, to the extent practicable.
- Minimizing the extent of clearings at quarries, pits and other temporary areas.
- Progressively reclaiming areas of temporary disturbance from operation of the WSR (including quarries and access roads) restoring them to a functional stage, with natural regeneration expected over time. Occasionally, restoration efforts may be supplemented with transplants from within the LSA

and/or seeding and planting of native self-sustaining species from approved lists and reputable suppliers.

- Reclamation will occur as soon as practicable following the decommission of quarries, pits or other work areas during the operations phase.
- To the extent practicable, maintaining vegetation structure and composition in other sensitive habitats that bat utilize (e.g., wetland foraging habitat) around pits, quarries and other work areas during the operations phase.

The effectiveness of mitigation will be evaluated throughout operations, with measures being modified or enhanced as necessary. Although these measures will be implemented to mitigate against potential effects to bat habitat, it is anticipated that net effects will remain in the LSA. Therefore, the topic 'Habitat Structural Change' has been carried forward to the Predicted Net Effects (**Section 12.7**).

Hydrological Changes

It is not anticipated that the operations phase of the Project will result in hydrological changes beyond the area affected during the construction phase. As a result, the mitigation measures that have been described in **Section 12.4.5.2.1** (Construction) will serve to ameliorate habitat degradation (from hydrological change) in the long term. In addition to these, mitigation measures described in **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) and the following will be implemented during operations:

- Reviewing, and updating (as necessary) Surface and Stormwater Management and Monitoring Plans, and Erosion and Sediment Control Plans developed as part of the CEMP. Implementing these measures throughout operations.
- Continuing to adhere to any conditions, permits or authorizations relating to environmental approvals, including those from ECCC, MNR and MECP, during the operations phase of the Project.
- Maintaining localized drainage cross-culverts (900 mm diameter) at regular intervals along the WSR in lowland areas, to permit overland flow to follow pre-construction hydrological flow paths. In wetland habitat, crossing structures should be spaced no more than 50 m apart (Schmidt and Zumbach, 2008; OMNRF, 2016).
- Continuing to implement Best Management Practices that minimize soil compaction and retain permeability.
- Continuing to implement BMPs that minimize dewatering during operations.

The effectiveness of mitigation will be evaluated during operations, with measures being modified or enhanced as necessary. Although these measures will be implemented to mitigate against potential effects to bat habitat during the operations phase, net effects will likely remain in the LSA, so the pathway 'Hydrological Changes' has been carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

In addition to the measures described in **Section 12.4.2.2** (Alteration or Degradation of Wildlife Habitat) the following will be implemented to minimize potential effects on bats from sensory disturbances from quarries, vehicular traffic, and lighting during operations:

- Reviewing the Noise and Vibration Management Plan, Light Management Plan, Wildlife Management Plan and the Construction Blasting Plan developed as part of the CEMP. Updating these plans, as necessary, prior to implementation during the operations phase.

- Continuing to follow any environmental conditions of approval that are applicable to the operations phase.
- Restricting public access to quarries and other work areas during operations phase.
- Maintaining reduced speed limits in sensitive areas.
- Completing operations activities, such as blasting, that are likely to cause sensory disturbance outside of the period of May 1 to August 31:
    - If it is determined that there is a need to conduct blasting within 500 m of probable maternity roosting habitat for bats during the previously mentioned window, the procedures outlined for the construction phase will be applicable (e.g., complete pre-blasting surveys, contact regulatory agencies and notify local Indigenous communities).
    - If it is determined that there is a need to conduct other (non-blasting) activities that may cause sensory disturbance withing 120m of probable maternity roosting habitat for SAR bats, procedures established during the construction phase will be followed.
    - Removal of bat maternity roosting habitat, or the associated buffer may be subject to federal or provincial species at risk permitting requirements and site-specific mitigation measures that would be developed in consultation with CWS-ECCC, MECP, or other regulatory agencies. Local Indigenous communities would be notified.
- Using nighttime lighting only where necessary for health and safety reasons during operations, thereby minimizing light trespass in the vicinity of suitable maternity roosting areas for SAR bats during their active seasons.
- Restricting access to areas of reclamation until the habitat has returned to a functional state.

Effects from other sources of sensory disturbance are expected to be minimal during the operations phase of the Project. With the predicted low volume of vehicular traffic on the road, operational sensory disturbance is expected to have little effect on bat habitat beyond what occurred during the construction phase. The effectiveness of mitigation measures will be monitored and modified as necessary. Since negative effects may remain even after these measures have been implemented, the pathway of 'Sensory Disturbance' has been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.5.3 Alteration in Bat Movement

12.4.5.3.1 Construction and Operations

Loss of Connectivity

The construction of the WSR and associated access roads could act as a temporary movement barrier for bats. On the A83 highway near Niort, France, bat overpasses consisting of a gantry with a diamond mesh metal grate were used to mitigate alterations in bat movement patterns by increasing connectivity in former high-use areas, where habitat fragmentation had occurred (refer to Claireau et al., 2019). Similar overpasses may be useful for the Project if high use areas are identified; however, their effectiveness has not appropriately been monitored, and the measure has been primarily used in Europe (Berthinussen and Altringham, 2012). As a result, it is anticipated that a loss of habitat connectivity will still impact bat populations in the LSA even if mitigation measures are implemented. As such, the pathway 'Loss of Connectivity' has been carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

During construction and operations, SAR bats could alter their movement in response to sensory disturbances such as road construction, blasting at quarries, and traffic on the WSR. Mitigation methods for sensory disturbance are similar to those used to reduce habitat alteration and degradation for bats (**Section 12.4.5.1**) and include:

- Maintaining posted lower speed limits in sensitive habitats and identified foraging areas.
- Ensuring construction and operations activities take place outside critical periods for bats, such as the maternity roosting season.
- Ensuring construction and operations activities do not occur within 120 m of maternity roosting habitats.

These, and other mitigation measures described in Section 9.4 (Mitigation Measures – Effects on Atmospheric Environment), **Section 12.4.2.2** (Mitigation Measures – Wildlife Habitat Alteration and Degradation), Section 18.4 (Mitigation Measures – Effects on Visual Environment), and Appendix E (Mitigation Measures) are expected to minimize potential impacts of sensory disturbance on bats; however, the effectiveness of mitigation measures will be monitored during operations and modified as necessary. It is anticipated that negative effects to bats may continue even after these measures have been implemented. As such, the pathway 'Sensory Disturbance' has been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.5.4 Injury or Death of Bats

12.4.5.4.1 Construction and Operations

Incidental Take

The following mitigation measures will minimize construction-related bat injury and death during the construction and operations phases.

- Preparing a Wildlife Management Plan and Construction Blasting Plan prior to construction. These plans, which will form part of the CEMP, will be reviewed and updated as necessary (i.e., adaptive management) before being incorporated into the OEMP.
- Following all environmental conditions of approval for the Project, including any issued by MNR, CWS-ECCC or MECP.
- To the extent practicable, avoiding all construction or maintenance-related activities other than blasting within 120 m of suitable maternity roost habitat during the roosting period (May 1 – August 31).
    - If it is thought there is a need to remove candidate maternity roosting habitat between May 1 and August 31, qualified biologists will carry out pre-clearance ground sweeps in any suitable habitat to determine whether the habitat is being utilized by bats.
    - Should use of maternity roosting habitat be confirmed, a 120 m setback from the habitat will be flagged or otherwise marked and the proponent will be contacted.
    - Removal of habitat may be subject to federal or provincial permitting requirements (depending on the species of bat encountered) and site-specific mitigation measures. The latter would be developed in consultation with MNR, MECP Species at Risk Branch, and CWS-ECCC, as appropriate. Local Indigenous communities will be notified.

- Blasting will not take place within 500 m of suitable maternity roosting habitat during the maternity roosting period for bats (May 1 – August 31).
    - If it is determined that there is a need to conduct blasting within 500 m of candidate maternity roosting habitat between May 1 and August 31, the activity will be subject to pre-blasting ground sweeps to determine whether the habitat is occupied.
    - Should the use of maternity roosting habitat be confirmed, a 500 m setback from the habitat will be flagged, or otherwise appropriately marked. The proponent and local Indigenous communities will be notified.
    - The activity (blasting) may subject to federal or provincial authorizations, depending on jurisdiction. The activity will also likely require site-specific mitigation measures developed in cooperation with the relevant regulatory agency (e.g., CWS-ECCC, MECP).
- Blasting, regardless of location, shall have control measures for fly-rock generated so there is no danger from projectiles.
- If any other previously unidentified bat maternity roosting habitat is encountered during construction:
    - The contractor will immediately halt work in that location and notify the proponent.
    - They will also clearly flag or otherwise mark a 120 m setback from the feature and document its location.
    - The proponent and local Indigenous communities will be notified.
    - The incident may need to be reported to the appropriate regulatory agencies.
    - Activity will not resume in that location until qualified personnel have assessed the feature (i.e., for occupancy) and determined a suitable course of action. This may require consultation with the MNR, MECP and/or CWS-ECCC.
- If any previously unidentified bat hibernacula habitat is encountered during construction:
    - The contractor will immediately halt work in that location and notify the proponent.
    - They will also clearly flag or otherwise mark a 1000 m setback from the feature and document its location.
    - The proponent and local Indigenous communities will be notified.
    - The hibernacula will be reported to the appropriate regulatory agencies (MNR, MECP and/or CWS ECCC) and activity will not resume in that location until qualified personnel have assessed the feature (i.e., for occupancy) and determined a suitable course of action.
- Restricting access to ROW to Project personnel during construction.
- Restricting construction traffic to designated areas, and limit pullout areas along the road.
- Prohibiting use of personal motorized vehicles during construction.
- Restricting traffic to approved access routes during operations.
- Blocking temporary areas of disturbance and quickly reclaiming them with natural vegetation. Restoration approaches will encourage natural regeneration, but may be supplemented, when necessary, by transplanting, planting or seeding self-sustaining species indigenous to the LSA.

These, and other mitigation measures described in **Section 12.4.2.2** (Mitigation – Effects of Habitat Alteration and Degradation on Wildlife and Wildlife Habitat) and Appendix E (Mitigation Measures) are expected to minimize potential effects on bats within the LSA. It is anticipated that these effects will not be removed entirely so potential effects associated with 'Incidental Take' has been carried forward to the **Section 12.7** (Predicted Net Effects).

Table 12-44: Summary of Potential Effects, Mitigation Measures, and Predicted Net Effects for Bat Sub VC

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to bat habitat availability (quantity) ▪ Changes to abundance and distribution of bats and bat habitat	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Construction and Use of Supportive Infrastructure **Operations Phase:** ▪ Vegetation management	Habitat Loss – Clearance Activities	▪ Where practicable, Project components were sited to avoid suitable maternity roosting habitat (upland forests) during routing. ▪ Prior to construction, a CEMP will be developed and implemented. The CEMP will include plans for vegetation management, site restoration and monitoring and wildlife management. ▪ These plans will be reviewed, updated as necessary, and implemented during operations. ▪ All environmental conditions of approval will be followed. ▪ Minimum 30 m vegetation buffers will be implemented around waterbodies. ▪ Riparian vegetation will be retained to the extent practicable. ▪ Unless there has been prior consultation with and approval from the appropriate regulatory agencies: ▫ Protective forest cover will be maintained leading to and for 120 m surrounding confirmed maternity roosting habitat, to the extent practicable. ▫ Blasting activity will not occur within 500 m of confirmed maternity roosting habitat. ▪ Personnel will be trained to recognize potential maternity roosting habitat and appropriate protocol to follow if any is found (i.e., delineation, confirmation, reporting). ▪ If any previously unidentified occupied bat maternity roosting habitat is encountered during construction, work will immediately cease, the feature will be documented, and relevant individuals/agencies contacted (i.e., the proponent, local Indigenous communities, MNR, MECP, CWS-ECCC). ▪ Activity will not resume within 500 m of the feature until a qualified biologist has conducted an assessment and determined an appropriate course of action in consultation with regulatory agencies. (A 500 m setback is associated with blasting and other activities that create loud noise and vibrations, while 120m may be used for other construction-related activities that cause sensory disturbance). ▪ Boundaries of work areas will be clearly delineated with construction fencing to prevent habitat loss beyond the limits of the Project Footprint. ▪ The extent of clearings at quarries/pits and other temporary areas to be minimized. ▪ Progressive reclamation will occur in areas of temporary disturbance and will occur as soon as practicable following the completion of work. ▪ Restoration approaches will facilitate natural regeneration, occasionally supplemented by transplanting, seeding or planting self-sustaining species indigenous to the area. ▪ Access to restoration areas will be restricted until the habitat has been functionally restored. ▪ Refer also to **Section 12.4.2.2** (Mitigation – Effects of Habitat Alteration or Degradation – Wildlife and Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	Yes
▪ Changes to bat habitat availability (quality) ▪ Changes to abundance and distribution of bats and bat habitat (number/ha)	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing **Operations Phase:** ▪ Vegetation management	Habitat Alteration or Degradation – Habitat Structural Change	▪ CEMPs and OEMPs to be prepared that include plans for vegetation management, wildlife management and site restoration and monitoring. These plans will be implemented during construction and operations, respectively. ▪ All conditions of environmental approval will be followed. ▪ Construction footprints to be kept as small as possible and clearing to be minimized in upland habitats that contain suitable maternity roosting habitat. ▪ Minimum 30 m vegetation protection zones (buffers) to be maintained around waterbodies. ▪ Riparian vegetation to be retained, where practicable. ▪ To the extent practicable, maintain vegetation structure and composition in other sensitive habitats that bats utilize. ▪ Vegetation clearing in habitat that appears suitable for maternity use or roosting will be conducted outside the maternity roosting period (May 1 – August 31) unless authorized in	Yes

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				advance by the appropriate federal or provincial agency (MECP, CWS-ECCC). Species at risk permits and site-specific measures may be required. ▪ Areas of temporary disturbance to be reclaimed as soon as practicable. Restoration approaches will facilitate natural regeneration and may be enhanced with self-sustaining species native to the LSA via transplant, seeding and/or planting from approved lists and reputable suppliers. ▪ Effectiveness monitoring will be completed. ▪ Refer also to **Section 12.4.4.2** (Mitigation – Effects of Habitat Alteration or Degradation – Wildlife and Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat	
▪ Changes to bat habitat availability (quality) ▪ Changes to abundance of bats and distribution of bat habitat (number/ha)	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Construction and use of Supportive Infrastructure ▪ Bridge and Culvert Installation **Operations Phase:** ▪ Vegetation management	Habitat Alteration or Degradation – Hydrological Changes	▪ Road design has taken into consideration consolidation/compression processes of peat layers from road construction. ▪ Refer also to Section 7.4 (Mitigation – Effects on Surface Water Resources), Section 8.4 (Mitigation of Effects – Groundwater Resources), **Section 12.4.4.2** (Mitigation – Effects of Habitat Alteration or Degradation – Wildlife and Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.7 – Temporary Watercourse Crossings ▫ Section 5.11 – Bridge and Culvert Installation ▫ Section 5.14 – Wildlife and Wildlife Habitat <u>Examples include:</u> CEMPs and OEMPs that include plans for surface and stormwater management and erosion and sediment control will be prepared and implemented. Environmental conditions of approval will be followed. Groundwater moisture regimes to be maintained in areas where maternity roosting habitat is confirmed. Hydrological flow paths (i.e., surface water) to be addressed by designing and installing temporary watercourse crossings and cross-culverts. Implementing BMPs to minimize soil compaction and minimize dewatering. Effectiveness monitoring will be completed.	Yes
▪ Changes to the availability of bat habitat (quality) ▪ Changes to abundance and distribution of bats (number/ha)	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing **Operations Phase:** ▪ Vegetation management	Habitat Alteration or Degradation – Sensory Disturbance	▪ Vegetation barriers will be maintained to reduce sensory effects around known bat maternity roosting habitat. ▪ Noise disturbance from construction activities will be limited during timing windows for bats (i.e., May 1 to August 31 in Northern Ontario). Blasting shall not occur in the vicinity of suitable maternity roosting habitat (i.e., no closer than 500 m). Other activities likely to cause loud noise or vibrations to occur no closer than 120 m from suitable habitat. ▪ If adherence to this timing window is not practicable, ground sweeps will be conducted by qualified personnel prior to the initiation of activity Where maternity roosting habitat is confirmed, site-specific mitigation and monitoring plans will be developed in consultation with the appropriate regulatory agencies. ▪ Contractor shall be responsible for obtaining any authorizations, including permits, from regulatory agencies. ▪ If occupied bat maternity roosting habitat is encountered during construction, which was previously not identified, work will immediately cease, and the appropriate reporting processes followed (e.g., proponent, local Indigenous groups, regulatory agencies). Activity will not resume within 500 m of the feature until a qualified biologist has conducted an assessment and determined an appropriate course of action (in consultation with regulatory agencies when necessary). Such action may include permitting or other authorizations, and vegetation protection zones (buffers).	Yes

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				▪ Temporary areas of disturbance to be blocked off and progressively reclaimed as soon as practicable following the completion of work. ▪ Refer also to Section 9.4 (Mitigation – Effects on Atmospheric Environment), Section 18.4 (Mitigation Measures – Effect on Visual Environment), **Section 12.4.4.2** (Mitigation – Habitat Alteration and Degradation – Wildlife and Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spills ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices Examples include: Light Management Plan, Noise and Vibration Management Plan, and Construction Blasting Management Plan will be prepared and implemented prior to the onset of construction. These plans will be reviewed and adjusted as necessary for use during the operations phase. The recreational use of personal motorized vehicles by Project personnel will be prohibited during construction. Access to LSA will be limited to Project personnel during construction. Construction traffic to be retained in designated areas. Nighttime lighting to be used only where necessary for health and safety reasons.	
▪ Changes to abundance and distribution of bats and bat habitat (number/ha)	Construction and Operations	**Construction Phase:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Phase:** ▪ Vegetation management ▪ Road Usage	Alterations in Movement – Loss of Connectivity	▪ Construction footprint to be kept as small as practicable with clearing avoided near maternity roosting sites and other sensitive areas (to the extent practicable) ▪ Consider the installation of bat crossings in high-use forested areas that would be fragmented by construction of road. ▪ Refer also to **Section 12.4.2.3** (Mitigation – Alteration in Wildlife Movement) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat For example, areas adjacent to the ROW will be quickly restored with native vegetation (i.e., natural regeneration, augmented by transplants, planting and seeding/or when required).	Yes
▪ Changes to abundance and distribution of bats and bat habitat (number/ha)	Construction and Operations	**Construction Phase:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Phase:** ▪ Vegetation management ▪ Road Usage	Alterations in Movement – Sensory Disturbance	▪ Refer also to Section 9.4 (Mitigation – Effects on Atmospheric Environment), Section 18.4 (Mitigation Measures – Effect on Visual Environment), **Section 12.4.4.2** (Mitigation – Habitat Alteration and Degradation – Wildlife and Wildlife Habitat), **Section 12.4.5.2.1** (Mitigation – Habitat Alteration and Degradation – Bats) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spills ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices Examples include: Maintaining lower posted speed limits in sensitive habitats and identified foraging areas for bats. Construction and operations activities to occur outside of critical periods for bats (e.g., roosting between May 1 and August 31).	

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to abundance and distribution of bats	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing **Operations Phase:** ▪ Vegetation management	Injury or Death – Incidental Take)	▪ Wildlife Management Plan and Construction Blasting Plan to be developed prior to construction as part of the CEMP and subsequently implemented. These plans will be reviewed and updated, as necessary, prior to implementation as part of the operations phase. ▪ All environmental conditions of approval for the Project will be followed. ▪ To the extent practicable, vegetation clearing within 120 m of suitable roosting habitat will be conducted outside the maternity roosting period (May 1 and August 31) unless authorized by the appropriate federal and/or provincial agency. Species at risk permits and site-specific measures may be required for this activity. ▪ Blasting will be conducted greater than 500 m from suitable roosting habitat between May 1 and August 31 unless approved by the appropriate federal and/or provincial agency. ▪ Blasting will have control measures for fly-rock. ▪ Access to the WSR ROW will be restricted to Project personnel during construction. ▪ Construction traffic will be restricted to designated areas (i.e., where work is occurring), and pullout areas along road will be limited. ▪ The use of personal motorized vehicles will be prohibited during the construction phase. ▪ During operations, traffic to be restricted to approved access routes. ▪ Temporary areas of disturbance to be blocked off and progressively reclaimed as soon as practicable following the completion of work. ▪ Refer also to **Section 12.4.4.4** (Mitigation – Injury or Death – Wildlife) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes

12.4.6 Birds-Specific Mitigation

The following subsection outlines key mitigation measures that will be implemented to mitigate potential effects of the Project on birds and their habitats. These include measures to address habitat loss, habitat alteration or degradation, movement patterns and injury or death. Some measures are common to all bird groups and are discussed as such. Where mitigation measures are tailored to individual groups, they are discussed separately.

A summary of the potential effects, mitigation measures, and predicted net effects of the Project on birds can be found in Table 12-45. Detailed descriptions of proposed mitigation measures to prevent or limit the effect of construction and operations can also be found by referring to the following sections in Appendix E (Mitigation Measures):

- Section 5.1 – Clearing and Grubbing;
- Section 5.3 – Spill Prevention and Emergency Response;
- Section 5.4 – Noise Control;
- Section 5.7 – Temporary Watercourse Crossings;
- Section 5.11 – Bridge and Culvert Installation;
- Section 5.12 – Blasting Near a Watercourse;
- Section 5.14 – Wildlife and Wildlife Habitat;
- Section 5.16 – Erosion and Sediment Control;
- Section 5.17 – Concrete Washout Management Practices;
- Section 5.18 – Dust Control Practices;
- Section 5.19 – Aggregate Pit Decommissioning;
- Section 5.20 – Quarry Site Selection and Development;
- Section 5.21 – Site Decommissioning and Rehabilitation; and
- Section 5.23 – Prevention of the Transfer of Invasive Species.

A summary of mitigation measures applicable to all wildlife and wildlife habitat can be found in **Section 12.4.2** and Appendix E (Mitigation Measures). Section 13 includes additional information regarding Species at Risk.

12.4.6.1 Loss of Bird Habitat

12.4.6.1.1 Construction

Clearance Activities

Measures to mitigate against permanent habitat loss for birds began during the planning stage, when the Project team evaluated alternative routes for WSR and associated supportive infrastructure. To the extent practicable, during route selection, the team made use of existing roads and trails while minimizing the creation of new access points. Measures designed to mitigate against the effect of clearance activities on wildlife were described in **Section 12.4.2.1**. Other mitigation measures to be implemented during the construction phase to reduce habitat loss for birds include the following.

Migratory Birds

- Development and implementation of a Vegetation and Invasive Species Management Plan, including measures to protect rare vegetation communities, as part of the CEMP.
- Minimizing the extent of clearings at temporary areas, including access roads and construction camps.
- Installing construction fencing to clearly delineate the boundaries of the work areas and prevent habitat loss beyond the limits of the Project Footprint.
- Maintaining vegetation buffers (setbacks or protection zones) of at least 30 m around waterbodies. Minimizing the clearing of riparian vegetation to the extent practicable.
- Informing personnel there is a requirement to protect migratory birds, active nests and eggs, and training them in the appropriate protocols to follow should an active nest be located during construction (e.g., stoppage of work, notification and reporting procedures, documentation).
- Having qualified biologists or resource specialists conduct ground sweeps prior to the onset of construction to confirm that the nests of migratory birds, and other key habitats have been identified.
- Having qualified Project personnel carry out site visits to verify that environmental protection measures have been correctly implemented.
- To the extent practicable, avoiding vegetation clearance and activities that disturb the ground between April 25 and August 29 of the calendar year, which is the active season for migratory birds in Northern Ontario.
- Progressively reclaiming disturbed areas that have caused temporary habitat loss for migratory birds (e.g., access roads, construction camps, laydown areas, etc.) and restoring them to a functional stage, with natural vegetation regeneration expected over time. When necessary, natural regeneration may be supplemented by transplanting species from within the RSA, or planting and/or seeding self sustaining species native to the area from a reputable supplier.
- Qualified biologists or resource specialists will monitor the site to determine the effectiveness of mitigation measures.

Forest Songbirds (Tennessee Warbler and Orange-crowned Warbler)

Mature mixed and deciduous forests are rare in the LSA, except on the far west side. During the route-selection process, these areas, which were also recognized as being important areas for bats, were avoided if possible. The effect of habitat removal on forest songbirds will also be mitigated by developing and implementing a Vegetation and Invasive Species Management Plan during the construction phase. Please also refer to the measures outlined in **Section 12.4.2.1** (Mitigation – Wildlife Habitat Loss).

Raptors (Red-tailed Hawk and Great Grey Owl)

Raptor nests that were identified during the existing conditions were avoided during road design where practicable. These nests will be surveyed by qualified personnel prior to construction to establish whether they are in active use. Additional measures aimed at minimizing effects on raptors are:

- Having qualified project personnel identify nesting locations prior to and during construction.
  - Should an active raptor nest be identified during construction, stopping work, documenting the nest(s), and contacting relevant individuals/agencies (e.g., the proponent, local Indigenous communities).

- Flagging, or otherwise delineating an appropriate setback from the nest so that suitable mitigation measures can implemented. This setback will be determined based on guidance from regulatory agencies.
- Buffer areas (of protective vegetation) will not be removed without engagement with and approval from the appropriate regulatory agencies (e.g., MECP, MNR, CWS-ECCC).

- Installing nest platforms to replace or enhance habitat as a part of restoration activities.

Waterfowl (Canada Goose and Mallard)

During the planning stage, the road ROW was routed to avoid aquatic habitat where practicable. No terrestrial stopover or staging areas, waterfowl nesting areas, or colonial nesting areas were confirmed during existing conditions studies. If any Significant Wildlife Habitat related to waterfowl is identified, either prior to or during construction, a setback from the SWH will be flagged or otherwise delineated so that appropriate mitigation measures can be implemented, which may include the establishment of vegetation buffers. The finding of potential SWH during construction will involve work stoppage until a qualified biologist has conducted an assessment and determined an appropriate course of action in consultation with regulatory agencies (e.g., MNR, CWS-ECCC).

Shorebirds (Greater Yellowlegs)

No confirmed shorebird stopover or staging areas were identified during existing conditions studies. Should SWH related to shorebirds be identified prior to or during construction, it will be flagged or otherwise delineated until specific mitigation measures can be implemented, which may include the establishment of vegetation buffers.

12.4.6.1.2 Operations

Clearance Activities

It is anticipated that the amount of bird habitat destroyed during the operations phase will be less than that affected during construction; however, it will take time for reclamation efforts to be successful, meaning that areas of temporary disturbance (from construction) may not be fully functional until successional processes are complete. The ROW associated with the WSR itself would be considered ‘lost’ habitat while the road is operational. To reduce effects, the following measures will be implemented:

- All environmental conditions of approval for the Project will be followed.
- The CEMP will be reviewed, and updated as necessary, for implementation during the operations phase. The OEMP will include direction relating to vegetation management, wildlife management and effectiveness monitoring.
- To the extent practicable, habitat loss for birds will be mitigated by reducing the extent of clearings at quarries, borrow pits, and other temporary work areas.
- Areas of temporary disturbance will be reclaimed as soon as practicable following completion of work in each area (e.g., shortly after a quarry site is decommissioned).
- Reclamation approaches will facilitate the natural regeneration of vegetation; however, these approaches may be augmented via transplants from within the RSA, or planting and seeding self-sustaining species indigenous to the RSA from approved stock and a reputable supplier.

There is a predicted negative effect of clearance activities on birds, even after implementation of the measures outlined in **Section 12.4.6.1.1** and **12.4.6.1.2** (above). As such, additional discussion about the potential effects of vegetation clearing has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.6.2 Alteration or Degradation of Bird Habitat

The Project may result in changes to the structure, composition and/or hydrology of habitat that is used by birds. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands). Approaches designed to mitigate against hydrological changes are provided in Section 7.4 (Mitigation Measures – Effects on Surface Water Resources) and Section 8.4 (Mitigation Measures – Effects on Groundwater Resources). Techniques that may assist with minimizing sensory disturbances are described in Section 9.4 (Mitigation Measures – Effects on Atmospheric Environment), and Section 18.4 (Mitigation Measures – Effects on Visual Environment). The effectiveness of mitigation will be evaluated during the construction and operations phases, with measures being modified or enhanced as necessary (through adaptive management).

In addition to those made in **Section 12.4.2.2** (Mitigation Measures – Alteration or Degradation of Wildlife Habitat), the following measures will be implemented to minimize negative effects on birds.

12.4.6.2.1 Construction

Habitat Structural Change

All Birds

During the planning stage, to the extent possible, the Project team incorporated existing areas of disturbance in the preliminary preferred route; however, few exist in the RSA except near the community of Webequie. Other measures designed to reduce edge effects in the LSA include:

- Developing and implementing a CEMP that includes detailed plans for vegetation management, wildlife management and site restoration and monitoring.
- Maintaining vegetation buffers (protection zones) of at least 30 m around waterbodies.
- Limiting vegetation clearance in riparian areas to the extent practicable.
- Minimizing (restricting) clearance activities near other sensitive habitats in a manner that keeps the ROW as narrow as possible, and using construction fencing, or other appropriate markers to delineate the boundary of the work area.
- Having qualified Project personnel conduct site visits to verify that environmental protection measures have been appropriately installed, and that any required modifications or corrections are made in a timely manner.
- Keeping work areas (construction footprints) as small as practicable, phasing work so that only the necessary amount of vegetation is cleared at any one time and using progressive restoration to reclaim areas as soon as each work area is no longer required for construction or operations:
    - Reclamation approaches will facilitate natural regeneration (i.e., succession), and will occasionally be augmented by planting or seeding self-sustaining species native to the RSA or transplanting self-sustaining species from within the LSA.

Early successional habitat will be created along the ROW and in other locations including temporary access roads, camps and laydowns areas. Although such habitat will be beneficial for some bird species, it may be detrimental for others, particularly forest songbirds and raptors that use mature forests. Implementation of control measures, including progressive restoration of habitat with native self-sustaining species, is expected to minimize the effect of seral changes on bird habitat, but not eliminate

the effect completely. There is a predicted negative effect for forest birds and raptors which is carried forward to Predicted Net Effects (**Section 12.7)**.

Hydrological Changes

All Birds

Hydrological changes would primarily affect birds that use wetlands or aquatic habitats such as waterfowl and shorebirds. These changes could also affect ground-nesting species. Numerous measures will be implemented to minimize impacts from hydrological change. These measures are described in Section 7.4 (Mitigation – Effects on Surface Water Resources), Section 8.4 (Mitigation – Effects on Groundwater Resources), **Section 12.4.2.2.1** (Mitigation – Effects of Hydrological Changes on Wildlife and Wildlife Habitat) and Appendix E (Mitigation Measures). Among those measures, the following will be implemented during the construction phase:

- During Project Planning, the Study Team considered consolidation and compression processes of the peat layers that would be associated with road construction (i.e., reduced permeability from placement of fill, thereby altering groundwater flow directions and pathways).
- Surface Water, Stormwater and Erosion and Sediment Control Plans will be developed as part of the CEMP and implemented during the construction phase.
- The extent of site grading or ground hardening will be limited, where practicable, by efficiently designing access road, storage yards and other areas of temporary infrastructure.
- Coarse materials (i.e., with the same or higher permeability compared to surrounding native soils) will be used in the base of permanent roads to permit infiltration and groundwater recharge.
- Temporary crossings will be designed to accommodate anticipated water flows during their lifespan.
- Cross-culverts (900 mm diameter) will be installed at regular intervals in lowland areas to prevent water from ponding on either side of the roadway and allow overland flow to follow existing hydrological flow paths. In wetland habitat, crossing structures should be spaced no more than 50 m apart (Schmidt and Zumbach, 2008; OMNRF, 2016).

Implementation of these control measures is expected to minimize the effect of hydrological changes on bird habitat but not eliminate the effect completely. There is a predicted negative effect for waterfowl, shorebirds and wetland birds which is carried forward to Predicted Net Effects (**Section 12.7**).

Accidental Spills

All Birds

Birds that inhabit aquatic environments and wetlands (e.g., waterfowl, shorebirds and wetland birds) have the potential to be particularly affected by spills because hazardous materials are often transported more rapidly and over greater distances in an aquatic environment. As such, bird habitat will benefit from the spill prevention measures that were described in Section 6.4 (Mitigation – Effects on Geology, Terrain and Soils), **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Accidental Spills), Section 23.5 (Accidents and Malfunctions) and Appendix E (Mitigation Measures). Strategies include:

- Developing and implementing a Spill Prevention and Emergency Response Management Plan as Part of the CEMP.
- Storing, transferring and dispensing hazardous materials at least 50 m from waterbodies.

- Ensuring spill kits are well-maintained and readily available on-site for quick deployment near aquatic environments.

Implementation of these control measures is expected to minimize the effect of spills on birds and their habitats. As a result, the pathway Accidental Spills has not been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

Measures to mitigate potential effects from sensory disturbance on wildlife are described in **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Sensory Disturbance) and are similar for both the construction and operations phases. Implementation of these control measures is expected to minimize the effect of sensory disturbance on bird habitat but not eliminate the effect completely. There is a predicted negative effect for all bird groups which is carried forward to **Section 12.7** (Predicted Net Effects).

12.4.6.2.2 Operations

Habitat Structural Change

It is not anticipated that the amount of habitat altered during operations will exceed the area disturbed during the construction phase; however, since it will take time for restoration efforts to be successful, areas that were temporarily disturbed by construction will continue to be altered or degraded while successional processes are occurring. The ROW itself would be considered a loss of late successional habitat for birds until the WSR has been decommissioned and reclamation activities have been completed. In addition to the measures described in **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Habitat Structural Change), the following are recommended to reduce effects of habitat structural change (edge effects) during the operations phase:

- Avoid re-opening access roads and laydown areas during maintenance activities.
- Restrict brushing and clearing of vegetation within the original limits of clearance of the ROW.

Implementation of control measures during construction and operations is expected to minimize potential effects of structural changes on bird habitat but not eliminate them entirely. There is a predicted negative effect of the Project on all birds, which is carried forward to Predicted Net Effects (**Section 12.7**).

Hydrological Changes

It is not anticipated that the operations phase of the Project will result in hydrological changes beyond the area that was affected during the construction phase. As a result, the mitigation measures that have been described in Section 7.4 (Measures to Mitigate Effects on Surface Water Resources), Section 8.4 (Measures to Mitigate Effects on Groundwater Resources), **Section 12.4.2.2** (Mitigation – Alteration and Degradation of Wildlife Habitat – Construction) and Appendix E (Mitigation Measures) will serve to ameliorate habitat degradation (from hydrological change) in the long-term.

Implementation of mitigation measures is expected to minimize potential effects from hydrological changes on birds and their habitat but not eliminate the effects completely. Please refer to Predicted Net Effects (**Section 12.7**) for additional information.

Accidental Spills

It is not anticipated that the operations phase of the Project will result in hydrological changes beyond the area that was affected during the construction phase. As such, potential effects on birds and their habitat will be mitigated in the same manner that was described in **Section 12.4.6.2.1** (Mitigation – Alteration or Degradation of Bird Habitat – Construction), **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Accidental Spills), Section 23.5 (Accidents and Malfunctions) and Appendix E (Mitigation Measures). The Spill Prevention and Emergency Response Management Plan (developed as part of the CEMP) will be reviewed and adapted prior to being implemented during the operations phase of the Project (i.e., as part of the OEMP).

Implementation of control measures during construction and operations is expected to minimize the likelihood that accidental spills would affect birds and/or bird habitat. As such, the pathway of 'Accidental Spills' has not been carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

All Birds

Sensory disturbance during operations from road use is expected to be minimal. While some bird groups have been found to avoid roads because of noise, this has a relationship to traffic volume and is species dependant. With the low volume of vehicular traffic on the road, operational sensory disturbance including noise and light is expected to have only a small effect on bird usage of the area around the roadway.

Control measures relating to Sensory Disturbance are described in Section 9.4 (Mitigation Measures – Effects on Atmospheric Environment), Section 18.4 (Mitigation Measures – Effects on Visual Environment), and Appendix E (Mitigation Measures). Implementation of these measures, along with those described in Section **12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Sensory Disturbance) are expected to minimize the effect of sensory disturbance on birds but not eliminate the effect completely. There is a predicted negative effect for all bird groups which is carried forward to Predicted Net Effects (**Section 12.7**).

12.4.6.3 Alteration in Movement

12.4.6.3.1 Construction

Loss of Connectivity

All Birds

For many bird species, the presence of the road and ROW itself can act as a barrier, this avoidance can be related to sensory disturbance like traffic noise and the presence of vehicles but also avoidance of the road itself due to open conditions (Tremblay and St. Clair, 2009). During construction, birds may avoid crossing the road or using the adjacent areas. This is particularly true for smaller species who may avoid open conditions along the ROW, which can facilitate predation. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wildlife Management), **Section 12.4.2.3** (Alteration in Movement of Wildlife) and Appendix E (Mitigation Measures). Addition measures include:

- Developing a CEMP that includes detailed plans for vegetation management, wildlife management, site restoration and effectiveness monitoring. Reviewing and updating these plans, as necessary, for implementation during the operations phase.

- Following all conditions of approval for the Project.
- Constructing the WSR in phases, with work areas having physical breaks in between (i.e., where habitat connectivity is maintained).
- Maintaining a minimum 30 m vegetation buffer (protection zone) around waterbodies.
- Incorporating bridge designs instead of causeways at larger water crossings, reducing the creation of barriers and allowing waterfowl to cross under road
- Retaining as much vegetation as is practicable in riparian areas and adjacent to sensitive habitats.
- Using progressive restoration in areas of temporary disturbance and conducting reclamation activities as soon as practicable following the completion of work.

Implementation of these control measures is expected to minimize potential effects from a loss of habitat connectivity on bird movement. The effectiveness of mitigation will be evaluated during construction, and measures will be modified or enhanced as necessary. Nevertheless, it is anticipated that a net negative effect will remain for forest birds and wetland birds, which is carried forward to Predicted Net Effects (**Section 12.7**).

Sensory Disturbance

All Birds

Sensory disturbances from equipment, vehicles, and other aspects of construction can cause certain birds to avoid the LSA in the short-term. To mitigate against sensory effects, the following measures are recommended:

- Construction activities that may cause sensory disturbance, such as blasting, excavation, and lighting should avoid sensitive periods for birds. In Northern Ontario, the active period for migratory birds extends from April 25 to August 29.
- Construction activities will follow the requirements of the Noise and Vibration Management Plan, Light Management Plan, Construction Waste Management Plan and Wildlife Management Plan.
- Construction will be phased temporally, such that work is completed in a few work areas prior to initiating construction in other areas (i.e., to maintain areas free of sensory disturbance at all times).
- Construction will be completed as quickly as possible to minimize the length of disturbance.
- Artificial lighting will be used only as required for worker safety. Lights will be angled or shielded so that they only illuminate targeted areas.
- Logs, CWD and/or other physical control measures will be used to block human access to (and therefore disturbance of) areas where reclamation efforts have been focused until successful revegetation has occurred.

Mitigation measures are expected to minimize the effect of sensory barriers on bird movement; however, their effectiveness will be monitored during construction and modified as necessary. Implementation of these control measures is expected to minimize potential effects on bird movement patterns but will not eliminate them entirely. As a result, the topic of ‘Sensory Disturbance’ has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.6.3.2 Operations

Loss of Connectivity

Should appropriate mitigation measures not be incorporated, creation of the road could cause substantial long-term effects to birds by fragmenting habitat and disrupting their movement patterns. During operations, it is not anticipated that fragmentation (or connection loss) would exceed the area disturbed by the construction phase; however, since it will take time for restoration efforts to be successful, habitat fragmentation may continue until successional processes have returned vegetation in the Project Footprint relative to pre-construction conditions. The ROW itself would be considered a permanent break in habitat connectivity until WSR has been decommissioned and reclamation activities have been completed

Mitigation measures designed to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.3** (Alteration in Movement of Wildlife) and Appendix E (Mitigation Measures). Approaches to minimize loss of connectivity on birds are also discussed in **Section 12.4.6.3.1** (Mitigation – Alteration in Movement of Birds – Loss of Connectivity). The effectiveness of control measures will be evaluated during operations and modified or updated as necessary. Nevertheless, it is anticipated that a net negative effect will remain for certain birds. As such, the topic 'Loss of Connectivity' has been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

During operations, birds may alter their movement in response to sensory disturbances from vehicles. While WSR traffic levels are expected to be relatively low (500 per day), to minimize the potential traffic barrier effect, mitigation measures will be implemented. In addition to those mentioned in **Section 12.4.6.3.1** (for the construction phase), such measures include:

- Reviewing, updating as necessary, portions of the Noise and Vibration Management Plan, Light Management Plan, Construction Waste Management Plan and Wildlife Management Plan applicable to the operations phase.
- Maintaining posted lower speed limits in sensitive habitats and ensuring maintenance activities take place outside critical periods, including breeding season, near those habitats.

Between the expected low traffic levels and implementation of mitigation measures, the potential effect of sensory disturbance on bird movement is expected to be low for all bird species. As potential effects may not be eliminated entirely, however, the pathway 'Sensory Disturbance' has been carried forward to Predicted Net Effects (**Section 12.7**).

12.4.6.4 Injury or Death of Birds

12.4.6.4.1 Construction

Increased Access

All Birds

For bird communities, harvest, both legal and illegal, could increase during the construction and operation phases of the WSR. During construction, the measures outlined in **Section 12.4.2.4** (Mitigation – Wildlife Injury or Death) will minimize potential effects to birds. Additional measures to mitigate the effects of increased access include:

- Preparing and implementing a Wildlife Management Plan as part of the CEMP.

- Limiting road access to Project personnel to reduce hunting opportunities during the construction phase.

While other bird groups may experience harvest, waterfowl are the primary focus for hunting activities. As such, vegetation barriers near waterfowl nesting and stopover features should be maintained whenever possible. It is anticipated that the potential effects of increased access will be reduced through these measures but not eliminated entirely, so the pathway of 'Increased Access' has been carried forward to Predicted Net Effects (**Section 12.7**).

Changes to Predator-Prey Dynamics

During construction, there may be increases in predator-prey encounters (i.e., involving birds) as linear features have been shown to cause edge effects, facilitate predator access and increase nest parasitism. The measures described in **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife – Changes to Predator-Prey Dynamics) will minimize potential effects. In addition:

- The boundaries of construction areas will be clearly delineated to reduce disturbance beyond the limits of the working footprint, which could facilitate predator access. Construction fencing or other appropriate markers will be used.
- Keeping construction camps and other work areas clear of debris, with waste being stored appropriately to avoid attracting corvids and other scavengers that can prey upon young birds and eggs.
- Incorporating measures that reduce the efficiency of land predators (such as red fox) during Construction. For example, maintaining vegetation along the ROW that is 2 m in height or less and avoiding the snow removal unless it is required for site access.

Forest Birds

- Maintaining a feathered multi-layer edge in forested ecosites during vegetation removal, to the extent practicable to reduce edge effects.

Implementation of these control measures is expected to minimize potential changes to the predator-prey relationships of birds during construction but not eliminate them. There is a predicted negative effect for all SAR bird species, which is carried forward to **Section 12.7** (Predicted Net Effects).

Collisions with Vehicles

All Birds

In general, for bird communities, road mortality has not been found to be a major factor although mortality rates will vary because different bird communities and species react differently to roads. To lower the potential for bird injury or death, the measures described in **Section 12.4.2.4** (Mitigation – Wildlife Injury or Death) will be implemented. These measures include:

- Establishing speed limits for construction vehicles within the Project Footprint.
- Prohibiting the use of personal motorized vehicles by Project personnel during construction.
- Restricting public access to the WSR during construction.
- Integrating wildlife awareness training as part of the Health and Safety Plans.
- Implementing a collision reporting and tracking system.

Waterfowl and Shorebirds

While not identified during existing conditions studies, SWH for shorebirds and waterfowl may be identified prior to or during construction. If waterfowl nesting areas, waterbird staging and stopover areas, or shorebird staging and stopover areas are identified, signage and reduced speed limits will be posted specifically in these areas.

Raptors

Some raptors, including Red-tailed Hawks, are opportunistic scavengers which can be attracted to roadsides where they can be hit by vehicles. Raptors that feed on roadkill are more susceptible to vehicle collisions (Bullock et al., 2024). Measures to mitigate against potential injury or death from raptor-vehicle collisions involve removal of roadkill from ROW, thereby avoiding attracting them to the road edge.

Incidental Take

All Birds

Bird nests, eggs and juveniles could be disturbed or destroyed during construction of the WSR. Mitigation measures include:

- Developing plans for wildlife management and construction blasting as part of the CEMP and implementing them during construction.
- Implementing control measures for fly-rock so there is no danger posed by projectiles.
- Having qualified Project personnel identify and establish buffers around existing sensitive features such as raptor nests, cavity nests and waterfowl nesting areas.
- Vegetation removal will be scheduled to occur outside the migratory bird nesting period (April 25 to August 29) to the extent reasonably possible.
- Making Project personnel aware of the requirements of the *Migratory Bird Convention Act* and Regulations and establishing a process for staff to follow should any active bird nests be found during construction.
- Providing environmental education as part of health and safety training for all Project personnel to raise their awareness of breeding bird behaviour that may signal the presence of an active nest.
- If an active nest is found during construction, work will stop immediately, and the appropriate individuals and groups will be informed (e.g., proponent, Project biologist, potentially local Indigenous groups). The nest will be marked, and a protective vegetation buffer established based on species requirements:
    - No work will take place within the buffer until there has been consultation with appropriate agencies (e.g., CWS-ECCC, MNR) and site-specific measures have been implemented. Permits or authorizations may be required prior to the resumption of work.
- Blasting should be limited to areas where other methods, such as drilling and standard excavation, are not possible.
- Blasting should occur outside of any established vegetation protection zones (buffers) that have been determined.
- Blasting, regardless of location, shall have control measures for fly-rock generated so there is no danger from projectiles.
- Site-specific blasting plans should be developed when blasting is likely to be required.

Implementation of these control measures are expected to minimize the effect of incidental take on birds during the construction phase but not eliminate effects completely. There is a predicted negative effect for all birds, which is carried forward to **Section 12.7** (Predicted Net Effects).

12.4.6.4.2 Operations

Increased Access

To limit public access during operations, thereby reducing opportunities for increased injury or death of birds, the measures described in **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife – Operations) are applicable and will be implemented. Additional measures include:

- Reviewing the CEMP and updating it as necessary prior to implementation during operations.
- Following all environmental conditions of approval for the Project, including any issued by CWS-ECCC or MECP.
- Blocking, fencing and/or gating access to aggregate areas, maintenance turnaround areas and other operational infrastructure, with strategic locations accessible to Project personnel only.
- Blocking off temporary areas of disturbance, such as access roads and decommissioned quarry sites until vegetation has successfully been re-established.

Implementation of these control measures are expected to minimize potential effects of increased access on birds during Operations. There is a predicted negative effect for waterfowl, which is carried forward to **Section 12.7** (Predicted Net Effects).

Collisions with Vehicles

During operations, to lower the potential for the injury or death of birds from collisions, the measures described in **Section 12.4.2.4** (Mitigation – Wildlife Injury or Death – Collisions) and **Section 12.4.6.4** (Mitigation – Injury or Death of Birds – Collisions – Construction) are applicable and will be implemented. These measures are expected to minimize the effect of vehicle collisions on birds but will not eliminate the risk of injury or death. There is a predicted negative effect, which is carried forward to **Section 12.7** (Predicted Net Effects).

Incidental Take

Birds, their nests and/or eggs could be destroyed during operation of the WSR. Measures designed to ameliorate this effect compliment those discussed in **Section 12.4.6.4** (Mitigation – Injury of Death of Birds – Incidental Take – Construction) and include:

- Reviewing the CEMP and updating it as necessary as part of the OEMP, which will be implemented during operations.
- Maintenance activities that would involve vegetation removal or ground disturbance will be scheduled to occur outside the migratory bird nesting period (April 25 to August 29) to the extent reasonably possible.
- All hazard trees will be assessed for potential use by raptors or cavity nesting species prior to removal.
- If an active nest is found, which may be affected by operations activities, work will stop immediately, and the appropriate individuals and groups will be contacted. The nest will be marked, and a protective vegetation buffer established based on species requirements:

- No work will take place within the buffer until there has been consultation with appropriate agencies
  (e.g., CWS-ECCC, MNR) and site-specific measures have been implemented. Permits or authorizations may be required prior to the resumption of work.
- Blasting should be limited to areas where other methods, such as drilling and standard excavation, are not possible.
- Site-specific blasting plans should be developed when blasting is likely to be required.
- Blasting should occur outside of any established vegetation protection zones (buffers).
- Blasting, regardless of location, shall have control measures for fly-rock generated so there is no danger from projectiles.

Implementation of these control measures are expected to minimize the potential of incidental take affecting birds during the operations phase but will not eliminate the risk completely. There is a predicted negative effect for all birds, which has been carried forward to **Section 12.7** (Predicted Net Effects).

Changes to Predator-Prey Dynamics

All Birds

The measures described in Section **12.4.2.4** (Mitigation – Injury or Death of Wildlife – Changes to Predator-Prey Dynamics) will minimize potential effects on birds during operations. Additional measures designed to reduce changes to predator-prey relationships include:

- Minimizing vegetation clearance along the ROW.
- Avoiding the creation of abrupt edges between the ROW and natural vegetation.
- Removal of roadkill as quickly as possible to reduce predator attractants.

Implementation of these control measures is expected to minimize potential changes to predator-prey relationships but not eliminate them. There is a predicted negative effect for all birds, which is carried forward to **Section 12.7** (Predicted Net Effects).

Table 12-45: Summary of Potential Effects, Mitigation Measures for Wildlife and Wildlife Habitat VC – Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to bird habitat availability (quantity)	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing. ▪ Road construction ▪ Construction and use of supportive infrastructure ▪ Construction of permanent waterbody crossings. **Operations Phase:** ▪ Aggregate extraction and processing	Habitat Loss – Clearance Activities	▪ To the extent practicable, during route selection, the Project Team made use of exiting roads and trails and minimized the creation of new access routes. Additional key habitats and features were also avoided during the route selection process, where practicable. As examples, mature mixed and deciduous forests, which are rare in the LSA were considered, as were trees/snags containing raptor nests and aquatic habitat. ▪ Prior to construction, a Vegetation and Invasive Species Management Plan will be developed as part of the CEMP and implemented during the construction phase. The plan will be reviewed and updated as necessary prior to Operations. ▪ All environmental conditions of approval for the Project will be followed. ▪ To the extent practicable, the extent of clearings at temporary work areas, including access roads, construction camps and quarries, will be minimized. ▪ Construction fencing will be used to clearly delineate the boundaries of the work area. ▪ Minimum 30 m protective vegetation buffers will be maintained around waterbodies. Riparian vegetation will be retained to the extent practicable. ▪ Qualified Project personnel will conduct site visits to verify that environmental protection measures have been correctly implemented. As required, adjustments or corrections will be made. ▪ Temporary areas of disturbance (e.g., access roads, construction camps, laydown areas, etc.) will be reclaimed and restored them to a functional stage, with natural vegetation regeneration expected over time. When necessary, natural regeneration may be supplemented by transplanting species from within the RSA, or planting and/or seeding self sustaining species native to the area from a reputable supplier. ▪ Habitat restoration activities will be conducted under appropriate weather conditions. ▪ Qualified biologists or resource specialists will conduct monitoring to evaluate the effectiveness of mitigation measures. ***Migratory Birds*** ▪ Qualified biologists or resource specialists will conduct ground sweeps prior to the onset of construction to look for the nests of migratory birds and identify other key bird habitats. ▪ To the extent practicable, vegetation clearing and activities that cause ground disturbance will be avoided between April 25 and August 29 of the calendar year, which is the active season for migratory birds in the RSA. ▪ Where vegetation clearing or ground disturbance is required within this time, qualified biologists or resource specialists will conduct sweeps prior to the onset of construction to verify that no birds, eggs, or active nests are located within the work area. ▪ A protocol will be developed for Project personnel to follow should they encounter eggs, nests of young of migratory birds during construction.	**Yes** Forest Birds Raptors Waterfowl Shorebirds Wetland Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				▪ Project personnel will be made aware of the requirement to protect migratory birds, eggs and active nests. They will be trained in the appropriate protocols to follow if any are located (e.g., stoppage of work, documentation of nest, reporting procedures). ▪ Qualified biologists or resource specialists will carry out monitoring to determine the effectiveness of mitigation measures. ***Raptors*** ▪ During the route selection process, the Project Team considered the location of raptor nests identified during the existing conditions and avoided their locations to the extent practicable. These nests will be surveyed prior to construction to confirm use. ▪ To the extent practicable, used or potentially used large trees or snags will be preserved. ▪ Should an active raptor nest be identified during construction, work in the immediate area will cease, the nest will be documented, and the proponent and relevant individuals and agencies will be contacted (e.g., local Indigenous groups, Project biologist, MNR, CWS-ECCC). ▪ Species-specific measures will be implemented, potentially including vegetation buffers (setbacks) around active nests, based on the direction of regulatory agencies. ▪ Nest platforms will be installed, where feasible, to replace or enhance habitat during active or passive reclamation. *Raptors/Waterfowl/Shorebirds/Colonial-Nesting Species* ▪ Qualified project personnel will identify Significant Wildlife Habitat (SWH) features prior to the onset of construction. Should candidate Significant Wildlife Habitat be found, it will be assessed by a qualified biologist/resource specialist and an appropriate course of action will be determined in consultation with regulatory agencies (e.g., MECP, CWS-ECCC) as required. ▪ Should any candidate SWH be found during construction, work will stop in that area and a setback from the feature will be delineated. The potential SWH will be assessed by a qualified biologist or resource specialist, and appropriate mitigation measures will be implemented prior to the resumption of work. Consultation with the appropriate regulatory agencies (e.g., MECP, CWS-ECCC) may be required. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	
▪ Changes to bird habitat availability (quantity) ▪ Changes to abundance and distribution of birds and bird habitat	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing. ▪ Decommissioning and Site Restoration/Reclamation **Operations Phase:** ▪ Vegetation management	Habitat Alteration or Degradation – Habitat Structural Change (and Edge Effects)	**Construction** *All Birds* ▪ When selecting the preliminary preferred route, existing areas of disturbance were used, where practicable. ▪ All environmental conditions of approval will be followed. ▪ A CEMP will be developed that includes detailed plans for vegetation management, wildlife management, site restoration and monitoring. ▪ Minimum vegetation buffers (protection zones) of 30 m will be maintained around waterbodies. The clearing of vegetation near	**Yes** Raptors Forest Birds Waterfowl Shorebirds Wetland Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				riparian areas and other sensitive habitats will be limited to the extent practicable. ▪ Construction fencing will be used to delineate the boundaries of work areas. ▪ Qualified Project personnel will verify that environmental protection measures have been correctly installed. Any necessary adjustments or modifications will be made promptly. ▪ The ROW will be kept as narrow as practicable, and work will be phased such that only the necessary amount of vegetation is disturbed at any one time. ▪ Areas will be quickly reclaimed with natural vegetation in a phased approach, such that shortly after a work area becomes inactive, disturbed habitats shall be restored using approaches that facilitate natural regeneration. ▪ When necessary, restoration will involve transplanting species from within the RSA or planting and seeding self-sustaining species native to the area from approved stock and a reputable supplier. ▪ All restoration activities will be conducted under appropriate environmental conditions. **Operations** *All birds* ▪ Avoid re-opening access roads and laydown areas during road maintenance activities. ▪ Brushing and clearing of ROW shall not extend past limits of original clearance. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control	
▪ Changes to bird habitat availability ▪ Changes to abundance and distribution of birds and bird habitat	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Construction and use of supportive Infrastructure ▪ Construction of road, including earth excavation, grading and hauling operations ▪ Construction of permanent waterbody crossing **Operations Phase**: ▪ Road drainage system maintenance and repairs ▪ Road maintenance	Habitat Alteration or Degradation – Hydrological Changes	**Construction** ▪ Ground nesting species, and species that inhabit wetlands ▪ During Project planning, the study team considered how the consolidation and compression of peat layers may have reduced permeability after fill has been placed. ▪ Surface water, Stormwater and Sediment and Erosion Control Plans will be developed as part of the CEMP and implemented during construction. ▪ Construction footprints will be kept as small as possible. The extent of site grading or ground hardening will be limited, where practicable, using efficient design. ▪ Temporary crossings will be designed to accommodate anticipated water flows during their lifespan. ▪ Cross-culverts (900 mm diaemeter) will be installed at regular intervals (i.e., every 50 m) in lowland areas to prevent water from ponding on either side of the roadway. ▪ Areas of temporary disturbance will be quickly reclaimed with approaches that facilitate natural regeneration of vegetation, occasionally augmented by transplants from within the RSA, or planting and seeding native self-sustaining species.	**No** Raptors **Yes** Waterfowl Shorebirds Wetland Birds some Forest Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				Operations ▪ Avoid re-opening access roads and laydown areas during maintenance activities. ▪ Brushing and clearing of ROW should not extend past limits of original clearance. ▪ Culverts and other crossings should be regularly checked for accumulated debris and blockages. Accumulated debris will be appropriately removed. ▪ Refer also to Section 7.4 (Surface Water Resources), Section 8.4 (Groundwater Resources), Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat) and the following in Appendix E – Mitigation Measures: ▫ Section 5.7 – Temporary Watercourse Crossings ▫ Section 5.11 – Bridge and Culvert Installation ▫ Section 5.16 – Erosion and Sediment Control ▫ Section 5.22 – Water Quality Monitoring	
▪ Changes to abundance and distribution of birds	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing. ▪ Construction and use of supportive Infrastructure ▪ Construction of road, including earth excavation, grading and hauling operations ▪ Construction of permanent waterbody crossing **Operations Phase:** • Road usage • Access road maintenance • Vegetation management	Alterations in Movement – Loss of Connectivity	**Construction** ▪ When selecting the preliminary preferred route, existing areas of disturbance were used where practicable. ▪ A CEMP will be developed that includes detailed plans for vegetation management, wildlife management, site restoration and monitoring. ▪ All conditions of approval for the Project will be followed. ▪ Minimum 30 m vegetation buffers will be maintained around waterbodies. Riparian vegetation will be retained to the extent practicable. ▪ The ROW will be kept as narrow as practicable. ▪ Construction of the ROW will be phased, so that areas of connected habitat remain available. ▪ Construction footprints will be kept as small as practicable. ▪ Clearing will be minimized near sensitive areas. ▪ Temporary area(s) of disturbance will be reclaimed as soon as practicable following the completion of work in that area. ▪ Restoration approaches will encourage natural regeneration. Occasionally, these will be augmented by planting and seeding self sustaining species indigenous to the RSA (i.e., as necessary). ▪ All restoration will be conducted under the appropriate environmental conditions. ▪ The effectiveness of restoration will be evaluated throughout construction, with modifications made as necessary prior to operations. *Waterfowl* ▪ Stream crossings will use oversized culverts or bridge designs instead of causeways, reducing the creation of barriers which will allow waterfowl to cross under road. **Operations** ▪ The CEMP will be reviewed and updated as necessary to prepare an OEMP. The OEMP will be implemented during the operations phase. ▪ During maintenance activities, vegetation will be retained to the extent practicable, and the width of the ROW will be limited.	**Yes** Forest Birds Wetland Birds Raptors Waterfowl Shorebirds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				▪ The effectiveness of mitigation measures and restoration efforts will be evaluated. ▪ Refer also to Section 11.4 (Mitigation and Enhancement for Vegetation and Wetlands), **Section 12.4.2.3** (Mitigation – Alteration in Wildlife movement) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.21 – Site Decommissioning and Rehabilitation ▫ Section 5.14 – Wildlife and Wildlife Habitat	
▪ Changes to abundance and distribution of birds	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure ▪ Materials and equipment delivery **Operations Phase:** ▪ Vegetation management ▪ Road usage	Alterations in Movement – Sensory Disturbance	**Construction** ▪ Construction activities will follow the requirements of the Noise and Vibration Management Plan, Light Management Plan, Construction Waste Management Plan and Wildlife Management Plan. ▪ Construction will be phased temporally, such that work is completed in one area prior to initiating construction in another (i.e., to maintain areas free of sensory disturbance at all times). ▪ Construction will be completed as quickly as possible to minimize the length of disturbance. ▪ Blasting will be conducted outside sensitive windows. ▪ Artificial lighting will only be used when required for worker safety. It will be angled or shielded to illuminate target areas. ▪ Vegetation barriers will be retained to reduce sensory effects. ▪ Access to the road will be restricted during construction. ▪ Reduced speed limits will be posted and enforced in sensitive areas *Migratory Birds* ▪ Construction activities that may cause sensory disturbance shall avoid sensitive periods for birds (i.e., April 25 to August 29). **Operations** ▪ The CEMP will be reviewed and updated as necessary to prepare an OEMP. The OEMP will be implemented during operations. ▪ To the extent practicable, vegetation barriers will be retained to reduce sensory effects. ▪ Posted speed limits will continue to be enforced in sensitive areas. ▪ Maintenance activities will take place outside of critical periods, including breeding season. ▪ The effectiveness of mitigation measures and restoration efforts will be evaluated. ▪ Refer also to **Section 12.4.2.3** (Mitigation – Alteration in Wildlife Movement) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.4 – Noise ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices	**Yes** Waterfowl Raptors Forest Birds Shorebirds Wetland Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to bird survival and reproduction ▪ Changes to bird species richness	Construction and Operations	**Construction Phase:** ▪ All Construction Stages **Operations Phase:** ▪ Road usage	Injury or Death – Increased Access	**Construction** ▪ As part of the CEMP, a Wildlife Management Plan will be prepared. ▪ Access to the Project Footprint will be restricted to Project personnel during construction. *Waterfowl* ▪ Vegetation barriers will be maintained near sensitive features such as waterfowl stopover and stagging areas, or waterfowl nesting areas. **Operations** ▪ The CEMP will be reviewed and updated, as necessary, during OEMP development. ▪ All environmental conditions of approval for the Project will be followed. ▪ Access to aggregate areas, maintenance turnaround areas and other operational infrastructure will be controlled via fencing, gates, or other measures. Strategic locations will be available to Project personnel. ▪ Pullout areas along the road will be limited. ▪ Access to areas of temporary disturbance will be blocked until vegetation has been reestablished. ▪ Refer also to **Section 12.4.2.4** (Mitigation – Wildlife Injury or Death) and the following in Appendix E – Mitigation Measures: ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Decommissioning ▫ Section 5.21 – Site Decommissioning and Rehabilitation	**Yes** Waterfowl **No** Raptors Forest Birds Shorebirds Wetland Birds
▪ Changes to bird survival and reproduction	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure ▪ Materials and equipment delivery **Operations Phase:** ▪ Road usage	Injury or Death – Collisions	**Construction** *All Birds* ▪ Speed limits for construction vehicles will be enforced on the ROW, in camps and along access roads. ▪ Access to the road will be restricted during construction. Personal motorized vehicles will be prohibited from use during the construction phase. ▪ Wildlife awareness training and safe travel protocols will be integrated in the Health and Safety Plans. ▪ A collision reporting and tracking system will be implemented. *Waterfowl and Shorebirds* ▪ Should waterfowl nesting areas, waterbird staging and stopover areas, or shorebird staging and stopover areas be identified, reduced speed limits will be posted and enforced in those areas. *Raptors* ▪ Roadkill that may act as an attractant to raptors and other predators will be removed shortly after detection. **Operations** *All Birds* ▪ Line of sight to be maintained along roadways. ▪ Post and enforce speed limits on proponent-controlled sections of road. ▪ Movement corridors will be identified, signage and reduced speeds limits will be posted in such areas. *Raptors*	**Yes** Waterfowl Raptors Forest Birds Shorebirds Wetland Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				▪ Removal of any roadkill that may function as an attractant to raptors and other predators. ▪ Refer also to Section 11.4 (Mitigation and Enhancement for Vegetation and Wetlands), **Section 12.4.2.4** (Mitigation – Wildlife Injury or Death) and the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat	
▪ Changes to bird survival and reproduction	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and use of supportive infrastructure ▪ Construction of permanent waterbody crossing **Operations Phase:** ▪ Vegetation management	Injury or Death – Incidental Take	**Construction** *All Birds* ▪ Plans for Wildlife Management and Construction Blasting will form parts of the CEMP and be implemented during construction. ▪ Qualified personnel will identify sensitive features during pre-construction (e.g., cavity nests) and establish vegetation buffers around them based on guidance from regulatory agencies. ▪ The boundaries of the vegetation protection areas will be clearly delineated (e.g., with fencing) to prevent habitat loss beyond the limits of the work area. ▪ Limiting blasting to areas where other methods, such as drilling and standard excavation, are not possible. *Migratory Birds* ▪ Environmental orientation will be provided as part of health and safety training and will include information about applicable legislation and provides direction regarding what to do in the event of encounters with migratory birds. ▪ Vegetation removal in suitable nesting habitat should be conducted outside of nesting periods. For migratory birds the nesting period starts April 25 to August 29. ▪ If removal of vegetation, or blasting activity is required inside these windows, and birds in the work area are displaying breeding behaviour, targeted nest sweeps will be conducted by qualified biologists or resource specialists within 48 hours of construction. ▪ Active nests may require a work stoppage while the proponent and local Indigenous groups are contacted, and species-specific vegetation buffers implemented. Regulatory agencies may need to be consulted for authorization or permits prior to the resumption of work. ▪ Blasting will be limited to areas where other methods, such as drilling and standard excavation, are not possible. ▪ Site specific blasting plans will be developed, including control measures for fly-rock to reduce the possibility of injury from projectiles. *Wetland birds, Waterfowl, Shorebirds* ▪ For temporary water crossings existing stream flows will be maintained without interruption or diminishment during construction, where practicable. **Operations** *All Birds* ▪ The CEMP will be reviewed and updated for development of an OEMP. It will be implemented during operations. ▪ The boundaries of the vegetation management areas will be clearly delineated to prevent habitat loss beyond the limits of the work area.	**Yes** Waterfowl Raptors Forest Birds Shorebirds Wetland Birds

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				▪ Mowing and brushing shall be timed to occur outside of nesting periods for SAR birds. ▪ Prior to removal, hazard trees will be assessed for potential use by SAR. ▪ If birds within the work area (e.g., vicinity of quarries or aggregate pits) are displaying breeding behavior, appropriate mitigation measures will be applied. ▪ Blasting should be limited to areas where other methods, such as drilling and standard excavation, are not possible. ▪ Site-specific blasting plans should be developed when blasting is likely to be required. ▪ Blasting should occur outside of any established vegetation protection zones (buffers). ▪ Blasting, regardless of location, shall have control measures for fly-rock generated so there is no danger from projectiles. ▪ Refer also to the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	
▪ Changes to bird survival and reproduction ▪ Changes to predator access, habitat use and population	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing. ▪ Construction and use of supportive infrastructure **Operations Phase:** ▪ Road usage ▪ Vegetation management	Injury or Death – Changes to Predator-Prey Relationships	**Construction** *All Birds* ▪ The boundaries of the work areas will be clearly delineated to prevent habitat damage and loss beyond the construction footprint. ▪ Temporarily disturbed areas and access roads will be blocked off until reclamation has been completed. ▪ Camps and other temporary work areas will be kept clear of debris, with waste being stored appropriately to avoid attracting corvids and other scavengers that can prey upon eggs and young birds. *Forest Birds* ▪ A multilayer vegetation edge will be maintained where practicable. ▪ *Ground-nesting species* ▪ Measures that discourage the hunting efficiency of red fox and other land predators will be incorporated as part of restoration activities. **Operations** *All Birds* ▪ Vegetation removal along ROW should stay within original boundaries and not create abrupt edges. ▪ Operations activities that clear vegetation or disturb the ground along the ROW will be minimized to the extent practicable. ▪ Roadkill will be removed as quickly as possible to minimize attraction of predators to the ROW. ▪ Refer also to the following in Appendix E – Mitigation Measures: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.21 – Site Decommissioning and Rehabilitation	**Yes** Waterfowl Raptors Forest Birds Shorebirds Wetland Birds

12.4.7 Reptiles and Amphibians

The following subsection outlines key mitigation measures that will be implemented to minimize potential effects of the Project on reptiles, amphibians and their habitats. These measures are grouped according to whether they address habitat loss, habitat alteration or degradation, movement patterns and injury or death.

A summary of the potential effects, mitigation measures, and predicted net effects of the Project on amphibians and reptiles can be found in **Table 12-46**. Detailed descriptions of proposed mitigation measures to prevent or limit the effect of construction and operations can also be found by referring to the following sections in **Appendix E** (Mitigation Measures):

- Section 5.1 – Clearing and Grubbing;
- Section 5.3 – Spill Prevention and Emergency Response;
- Section 5.4 – Noise Control;
- Section 5.7 – Temporary Watercourse Crossings;
- Section 5.11 – Bridge and Culvert Installation;
- Section 5.12 – Blasting Near a Watercourse;
- Section 5.14 – Wildlife and Wildlife Habitat;
- Section 5.16 – Erosion and Sediment Control;
- Section 5.17 – Concrete Washout Management Practices;
- Section 5.18 – Dust Control Practices;
- Section 5.19 – Aggregate Pit Decommissioning;
- Section 5.20 – Quarry Site Selection and Development;
- Section 5.21 – Site Decommissioning and Rehabilitation; and
- Section 5.23 – Prevention of the Transfer of Invasive Species.

A summary of mitigation measures applicable to all wildlife and wildlife habitat can be found in **Section 12.4.2** and Appendix E (Mitigation Measures). Section 13 provides additional information regarding Species at Risk.

12.4.7.1 Habitat Loss for Amphibians and Reptiles

12.4.7.1.1 Construction and Operations

Clearance Activities

Amphibian breeding habitats are among the most important features for herpetofauna as they are critical for species in embryonic and larval stages of life, and essential for activities such as mating and egg deposition. For reptiles, overwintering sites (hibernacula) are key to winter survival, and the same location may be used year after year. Habitats that are used by amphibians and reptiles for breeding, overwintering, and thermoregulation may be lost because of activities such as vegetation clearing and ground disturbance (e.g., grubbing, placement of materials) that occur during the construction phase. Habitat may also be lost during operation and maintenance of the WSR.

Mitigation measures designed to eliminate or minimize the potential effects of the Project on vegetation communities and plant species are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). In **Section 12.4.2.1** (Mitigation – Loss of Wildlife Habitat – Construction), techniques to minimize impacts on wildlife habitat were discussed. These measures are applicable to the loss of amphibian and reptile habitat. For example, during the planning stage, the Project Team minimized permanent habitat loss for amphibians and reptiles by proposing routes that used existing roads, trails and other areas of disturbance to the extent practicable. Although there weren't many in the LSA, use of existing areas of disturbance minimized the creation of new access routes. Other mitigation measures relating to the loss of amphibian and reptile habitat include:

- Developing a Vegetation and Invasive Species Management Plan, Wildlife Management Plan and Site Restoration and Monitoring Plan in advance of construction. These plans will form subcomponents of the CEMP and will be implemented following Project initiation. To the extent possible, restoration and management plans will be developed in cooperation with Webequie First Nation and other Indigenous communities and groups, Local Rights Holders, relevant Federal and/or Provincial Agencies and other Stakeholders.
- Reviewing, and updating as necessary, the Vegetation and Invasive Species Management Plan, Wildlife Management Plan and Site Restoration and Monitoring Plan as part of the OEMP, which will be implemented during the operations phase.
- Following all conditions of environmental approval for the Project, including any issued by MECP or CWS-ECCC.
- Maintaining protective vegetation buffers (or setbacks) of 30 m around waterbodies and avoiding the clearance of riparian vegetation to the extent practicable.
- Maintaining a cleared ROW of 35 m to the extent practicable, unless a specific area is required for construction.
- Avoiding, where practicable, the placement of camps, laydown areas, temporary access roads and other areas of short-term disturbance in sensitive habitats (e.g., amphibian breeding ponds or pools).
- Installing construction fencing to clearly delineate the boundaries of the work areas and prevent habitat damage and loss beyond the limits of the Project Footprint.
- Inspecting site-specific environmental measures to verify that they have been correctly installed, maintained and (when necessary) repaired.
- If evidence of an active snake hibernaculum is identified during active construction, including vegetation removal, work will stop and the proponent, relevant Project personnel, and appropriate regulatory agencies will be contacted immediately to discuss mitigation measures. Local Indigenous communities will be notified.
- To the extent practicable, using progressive reclamation to restore habitats temporarily disturbed by construction-related activities (e.g., access roads, construction camps, laydown areas, etc.), with areas being reclaimed as soon as practicable following the completion of work.
    - Restoration work will involve the removal of construction debris, decompaction and amendments to soils and the revegetation of disturbed areas. It will be completed under appropriate environmental conditions.
    - Restoration approaches will be designed to facilitate natural regeneration. Where necessary, restoration may be enhanced by transplanting species native to the RSA, or planting and seeding self-sustaining species indigenous to the area from approved lists and reputable suppliers.
- Conducting follow-up monitoring to evaluate the effectiveness of mitigation measures.

It is not anticipated that road operations will result in additional loss of overwintering, breeding, and/or thermoregulation habitats for herpetofauna, though there is a low probability that temporary areas of disturbance (e.g., access roads, laydown areas) may need to be re-opened or re-used during the operations phase. Nevertheless, the effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. The previously listed mitigation measures are expected to reduce, but not eliminate, potential effects from clearance activities on the habitat of amphibians and reptiles. As a result, the pathway of 'Habitat Loss for Amphibians and Reptiles' has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.7.2 Alteration or Degradation of Habitat for Amphibians and Reptiles

12.4.7.2.1 Construction

Habitat Structural Change

Vegetation clearing and ground disturbances during the construction phase may alter the structure of habitats that amphibians and reptiles use. Mitigation measures to reduce changes to vegetation communities and species compositions are described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures). Mitigation measures to reduce alteration or degradation of wildlife habitat more generally, are described in **Section 12.4.2.2**. Measures to minimize the effects of habitat structural change on amphibians and reptiles include:

- Following all approval conditions for the Project, including any issued by MECP or CWS-ECCC.
- Maintaining vegetation protection zones of 30 m around waterbodies and limiting the clearing of riparian vegetation to the extent practicable.
- Avoiding, where practicable, the placement of camps, laydown areas, temporary access roads and other areas of short-term disturbance in sensitive habitats (e.g., within 30 m of amphibian breeding ponds or pools).
- To the extent practicable, retaining habitat features such as trees, shrubs, ephemeral ponds, rock piles, uprooted trees and rotting logs in situ where it is safe to do so. Known breeding and overwintering locations will have a clearly marked setback (environmental protection zone) to minimize the likelihood of changes to amphibian and breeding habitats.
- Keeping working areas and the Project Footprint as small as possible and limiting physical disturbance to the extent necessary to permit construction. The cleared ROW will be minimized to the extent practicable and will be no larger than 35 m in width, unless a specific area is required for construction.
- Installing construction fencing to clearly identify the boundaries of work areas and prevent habitat damage and loss beyond the limits of the Project Footprint. Construction fencing will be installed that is also effective at excluding snakes from work areas.
- Having qualified personnel inspect site-specific environmental measures (e.g., fencing) to verify that they have been correctly installed, maintained and (when necessary) repaired.
- Developing the ROW and associated infrastructure in a phased approach that will be accompanied by progressive restoration (i.e., reclamation and restoration) as soon as possible following the completion of work.
- To the extent practicable, only conducting Project activities that have the potential to affect hibernacula between May 15 to August 31 (i.e., the overwintering period identified by MECP for SAR reptiles in northern and central Ontario).

- To the extent practicable, all other Project activities that have the potential to affect snakes or amphibians should be scheduled to occur outside of the active season, which is April 15 to October 15.
- To the extent practicable, progressively reclaiming areas of temporary disturbance by applying restoration techniques that facilitate natural regeneration following the completion of use of a given work area. Where necessary, natural regeneration will be augmented by transplanting vegetation from within the RSA, or planting or seeding self-sustaining native species from a reputable supplier based on approved lists.
- Restoration work will involve the removal of construction debris, decompaction and amendments to soils and the revegetation of disturbed areas. It will be completed under appropriate environmental conditions.
- Having qualified Project personnel conduct ecological monitoring to evaluate the effectiveness of mitigation measures and restoration efforts.

The alteration or degradation of amphibian and reptile habitat from structural change will be reduced through the previously mentioned measures; however, it is anticipated that impacts will not be eliminated. As a result, additional discussion about the effects of 'Habitat Structural Change' has been carried forward to **Section 12.7** (Predicted Net Effects).

Hydrological Changes

Changes in the quantity and quality of surface and/or groundwater may affect wetland and/or riparian areas, potentially degrading habitats that amphibians and reptiles depend upon. During planning, the Project Team considered the consolidation and compression processes of the peat layers and how these layers may be affected by the placement of fill for road construction (i.e., reduced the permeability of the peatlands and altered groundwater directions and pathways). Mitigation measures to reduce changes to hydrology and drainage patterns are provided in Section 7.4 (Mitigation Measures – Effects on Surface Water Resources), Section 8.4 (Mitigation Measures – Effects on Groundwater Resources), and Appendix E (Mitigation Measures). Mitigation measures designed to reduce the effects of hydrological changes on Wildlife and Wildlife Habitat are listed in **Section 12.4.2.1**. These measures, which are applicable to the habitat of amphibians and reptiles include:

- Developing Surface Water Management, Stormwater Management and Erosion and Sediment Control Plans as part of the CEMP and implementing them during construction.
- Minimizing areas where site grading or ground hardening occurs using efficient design techniques and appropriate materials (e.g., materials with the same or higher permeability as the surrounding native soils).
- Designing temporary crossings to accommodate anticipated water flows during their lifespan.
- Installing cross-culverts (900 mm diameter) at regular intervals in lowland areas to prevent water from ponding on either side of the roadway, instead allowing overland flow to follow existing hydrological paths. In wetland habitat, crossing structures should be spaced no more than 50 m apart (Schmidt and Zumbach, 2008; OMNRF, 2016).
- Using industry BMPs to verify that pumping volumes are minimal and moisture regimes in wetland and aquatic habitats are maintained to the extent practicable.
- Testing discharge water quality to confirm that it meets Ontario Provincial Water Quality Objectives, with detailed plans in place for monitoring and contingency measures recommended.
- Avoiding the use of road salt or sand on the road for de-icing.
- Avoiding the use of herbicides in the Project Footprint.

The effectiveness of mitigation will be evaluated during construction, with measures being modified or enhanced as necessary. Although measures will be implemented to mitigate against hydrological changes effecting the habitat of amphibians and reptiles, it is anticipated that net effects will remain. As a result, additional discussion about the pathway 'Hydrological Changes' has been carried forward to **Section 12.7** (Predicted Net Effects).

Accidental Spills

Amphibians have the potential to be affected by spills for several reasons. Their permeable skin allows them to easily absorb toxins and pollutants. Many amphibians live in both terrestrial and aquatic environments, exposing them to contaminants in both settings. Additionally, hazardous materials can travel over greater distances in water, increasing the risk of habitat alteration or degradation for inhabitants of wetlands and waterbodies.

To protect amphibians, reptiles, and their habitats, it will be important to implement the spill prevention measures described in Section 6.4 (Mitigation – Effects on Geology, Terrain and Soils), **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Accidental Spills), Section 23.5 (Accidents and Malfunctions) and Appendix E (Mitigation Measures). If properly applied, these measures are expected to effectively mitigate the effects of accidental spills on the habitat of herptiles. As a result, the pathway Accidental Spills has not been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

Sensory disturbances, including light and loud noises, have the potential to degrade the habitat of amphibians and reptiles, cause individuals to relocate and alter predator-prey relationships. Measures to mitigate effects on atmospheric environmental conditions are described in Section 9.4, while mitigation measures relating to the visual environment are discussed in Section 18.4. Approaches to mitigate the effects of sensory disturbance on wildlife are described in **Section 12.4.2.2** (Alteration and Degradation of Wildlife Habitat) and Appendix E (Mitigation Measures). These include:

- Developing and implementing measures identified in the Noise and Vibration Management Plan, the Light Management Plan and the Construction Blasting Plan (all of which form parts of the CEMP).
- To the extent practicable, carrying out any construction activities that have the potential to harm or kill herpetofauna outside of the active season, which extends from April 15 to October 15 in northern and central Ontario, unless the activity is one that has the potential to affect hibernating individuals or hibernation habitat. (In the latter case, activity should be conducted during the active season, when individuals are not making use of their overwintering habitats).
- Having construction activities typically occur within a 10-hour shift each day, with normal working hours occurring between 7:00 – 17:00.
- Maintaining protective vegetation buffers (or setbacks) of 30 m around waterbodies and maintaining riparian vegetation to the extent practicable.
- To the extent practicable, retaining vegetation and landforms adjacent to the ROW in situ to provide a buffer for Project activities.
- Prohibiting the recreational use of motorized vehicles (e.g., snowmobiles, ATVs) by Project personnel during construction and enforcing speed limits for vehicles in the LSA.
- Complying with noise by-laws and using noise control measures as agreed to by adjacent Indigenous communities and municipal authorities.
- Ensuring that noise abatement equipment is installed on vehicles and machines, and that the equipment is well maintained.

- Restricting the use of artificial lighting to locations required for health and safety purposes. Angling or shielding any lighting that is installed to reduce light trespass beyond the ROW.

The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. It is anticipated that these measures will only be partially effective in mitigating effects from sensory disturbance at the Project site (i.e., during the construction phase). As a result, the pathway of 'Sensory Disturbance' has been carried forward to **Section 12.7** (Predicted Net Effects).

Introduction of Invasive Species

The construction of roads may result in invasive species being introduced to an area. In addition, the process of road construction often creates abiotic conditions that are well tolerated by invasive species. Mitigation measures designed to minimize the introduction and/or spread of invasive plant species are discussed in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat) and Appendix E (Mitigation Measures). The effectiveness of mitigation will be evaluated during construction and operations, with measures being modified or enhanced as necessary. It is anticipated that the proposed measures will be effective in mitigating potential effect from invasive plant species on amphibians and reptiles. The pathway of 'Invasive Plant Species' is not further discussed in relation to herptiles in **Section 12.7** (Predicted Net Effects).

12.4.7.2.2 Operations

Habitat Structural Change

During the operations phase, maintenance activities, roadway repair and vegetation management will be periodically required; however, disturbance beyond the area affected by construction is not anticipated, and changes to the structure of amphibian and habitat is expected to be negligible. As such, many of the measures described in **Section 12.4.2.2** (Mitigation – Alteration and Degradation of Wildlife Habitat), **12.4.7.2.1** (Mitigation – Alteration and Degradation of the Habitat of Amphibians and Reptiles – Construction), and **Appendix E** (Mitigation Measures) will continue to be implemented throughout operations. Any Vegetation Management and Monitoring Plans or Wildlife Management and Monitoring Plans that were developed for the CEMP will be reviewed and updated before being incorporated in the OEMP and implemented during operations; however, is anticipated that these measures will only partially mitigate the potential effects of habitat structural change on amphibians and reptiles. As a result, this topic has been carried forward to **Section 12.7** (Predicted Net Effects).

Hydrological Changes

It is not anticipated that the operations phase of the Project will result in hydrological changes beyond the area affected by construction. As a result, applicable measures described in **Section 12.4.7.2.1** (Mitigation – Alteration and Degradation of Amphibian and Reptile Habitat – Construction), **Section 12.4.2.2** (Mitigation – Alteration and Degradation of Wildlife Habitat) and Appendix E (Mitigation Measures) will be implemented during operations to minimize effects on amphibians and reptiles in the LSA. The pathway 'Hydrological Changes' is further discussed in **Section 12.7** (Predicted Net Effects) as it is not anticipated that the proposed mitigation measures will eliminate potential effects from the Project on the habitat of herptiles.

Accidental Spills

During the operations phase, accidental spills may occur because vehicles and equipment will utilize the WSR; however, spills are predicted to be generally localized in nature and are unlikely to result in disturbance beyond the area affected by construction. In addition, there will be a Spill Prevention and Emergency Response Management component in the OEMP. Therefore, measures that have been described in **Section 12.4.7.2.1** (Mitigation – Alteration and Degradation of the Habitat of Amphibians and Reptiles – Construction) and **Section 12.4.2.2** (Mitigation – Alteration and Degradation of Wildlife Habitat), will also effectively mitigate the potential risks of accidental spills during the operations phase of the Project. As such, this pathway has not been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

Measures to mitigate potential effects from sensory disturbance on wildlife are described in **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Sensory Disturbance) and are similar for both the construction and operations phases. Implementation of these control measures, along with those referenced in **Section 12.4.7.2.1** (Mitigation – Alteration and Degradation of Amphibian and Reptile Habitat – Construction), and **Appendix E** (Mitigation Measures) is expected to minimize the effect of sensory disturbance on amphibians and reptiles. Potential effects will not be removed entirely so these effects have been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.7.3 Alteration in Amphibian and Reptile Movement

12.4.7.3.1 Construction

Loss of Connectivity

The movement of amphibians and reptiles may change if linkages between their breeding, overwintering and thermoregulation habitats are altered. Excavation, ground recontouring, soil berming, and moving equipment may create short-term physical barriers. To mitigate against potential effects of loss of connectivity on wildlife, the measures described in **Section 12.4.2.3** (Mitigation – Alteration in Wildlife Movement) will be implemented. These techniques supplement the measures described in Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and **Appendix E** (Mitigation Measures) to reduce changes to the structure and composition of vegetation communities. Additional measures that will be implemented to preserve habitat connectivity include:

- Maintaining 30 m buffer zones around waterbodies and maintaining riparian vegetation to the extent practicable.
- Limiting ground disturbance to the extent necessary for construction, with work areas being developed in phases (spatially and temporally) so that lengthy barriers are not created.
- Maintaining a cleared ROW no larger than 35 m to the extent practicable, unless a specific area is required for construction.
- Minimizing the Project Footprint and limiting vegetation clearing in each work area to the extent necessary for construction (i.e., a phased approach that would be accompanied by progressive restoration).
- To the extent practicable, retaining landforms in situ adjacent to the ROW.
- Installing exclusion fencing only in strategic locations based on predictive modelling and the results of field surveys (i.e., areas modelled as being of high use for amphibians and reptiles).

- Consideration will be given to incorporating eco-passages to accompany exclusion fencing during detailed design.

The effectiveness of these measures will be evaluated during the construction phase and modified or enhanced as necessary. Although it is anticipated that these measures will reduce effects on the movement of amphibians and reptiles, it is unlikely that the effects will be eliminated entirely. As a result, the pathway 'Loss of Connectivity' has been carried forward to **Section 12.7** (Predicted Net Effects).

Sensory Disturbance

The movement of amphibians and reptiles may also change in response to sensory disturbances from construction activities. Select measures to mitigate the effects of sensory disturbance on reptiles and amphibians were discussed in **Section 12.4.7.2** (Mitigation – Alteration or Degradation of Amphibian and Reptile Habitat – Sensory Disturbance). Additional measures can be found in Section 9.4 (Mitigation of Effects on Atmospheric Environmental Conditions), Section 18.4 (Mitigation of Effects on the Visual Environment), **Section 12.4.4.2** (Alteration and Degradation of Wildlife Habitat) and Appendix E (Mitigation Measures).

It is anticipated that these measures will only be partially effective in mitigating potential sensory effects to amphibians and reptiles at the Project Site during the construction phase, with net effects remaining in the LSA. As a result, this topic has been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.7.3.2 Operations

Loss of Connectivity and Sensory Disturbance

Reclamation activities should restore connections between habitats that were temporarily disturbed during the construction phase (i.e., along temporary access roads, laydown areas and construction camps); however, the success of restoration efforts will directly influence whether amphibians and reptiles resume pre-construction movement patterns. Portions of the WSR will continue to fragment habitat while the road is active (i.e., throughout the operations phase). Damaged road surfaces and subsequent repair work may result in localized effects to the movement of amphibians and reptiles, though the area of effect is expected to be the same, or less than the area affected by construction.

Mitigation measures relating to the loss of habitat connectivity and/or sensory disturbance are similar to those proposed for the construction phase. It is recommended that:

- Applicable measures described in **Section 12.4.2.3** (Mitigation – Alteration in Wildlife Movement), Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and Appendix E (Mitigation Measures) continue to be implemented during operations.
- To the extent practicable, maintenance activities that are likely to create barriers to movement are conducted outside of sensitive life cycle periods (e.g., the active season of snakes, inclusive of periods when they are moving to overwintering sites, and the seasons in which frogs move between terrestrial and aquatic habitats for breeding).
- The cleared ROW be maintained no larger than 35 m, to the extent practicable.
- Culverts and other potential amphibian crossing areas are checked for blockages as part of maintenance activities. If any barriers are found, they will be appropriately removed.
- Any wildlife passages that were built during the construction phase will be maintained.
- Speed limits will be posted and enforced to reduce sensory disturbances caused by moving vehicles.

The effectiveness of these measures will be evaluated during the operations phase and modified or enhanced as necessary. Although it is anticipated that these measures will reduce effects on the movement of amphibians and reptiles, it is unlikely that the effects will be eliminated entirely. As a result, the pathways 'Loss of Connectivity' and 'Sensory Disturbance' have been carried forward to **Section 12.7** (Predicted Net Effects).

12.4.7.4 Injury or Death of Reptiles and Amphibians

12.4.7.4.1 Construction and Operations

Collisions with Vehicles

The amphibians and reptiles in the Project areas are relatively small, giving drivers and equipment operators limited time to avoid collisions. Further, these amphibians and snake species are slow-moving, making it unlikely for them to evade being hit. Mitigation measures to address the collision of wildlife, more generally, with Project vehicles and equipment are listed in **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife). Additional measures to reduce the injury or death of amphibians and reptiles as a result of collisions include:

- Where practicable and appropriate, installing temporary reptile and amphibian exclusion fencing along the ROW in locations upland habitat borders wetlands and waterbodies, as such areas are preferred by eastern gartersnake. Temporary exclusion fencing should be installed during the overwintering period and remain in place throughout the active season. In northern and central Ontario, the overwintering period extends from October 16 to April 14.
- Where practicable, installing exclusion fencing adjacent to the ROW in strategic locations based on predictive modelling and the results of field surveys (i.e., areas modelled as being of high use for amphibians and reptiles).
- During the active season for amphibians and reptiles, having a qualified biologist or resource specialist inspect temporary exclusion fencing at least twice weekly for breaches and/or gaps, and make repairs as necessary. The fencing should also be inspected (and as appropriate repaired) following any storm events (e.g., heavy rainfall).
- Providing driver training to Project personnel that will be operating motorized vehicles and equipment to encourage reduced speeds in the Project Footprint, raise awareness of the need to provide herptiles with the right-of-way, where practicable, and reporting sightings of amphibians and reptiles in areas of active construction according to established wildlife reporting protocols.
- Where practicable, installing signage in areas where reduced speeds are needed (e.g., wildlife reporting procedures have documented an area where amphibians and reptiles are regularly crossing).
- Ensuring maintenance activities occur away from sensitive habitats (e.g., reptile hibernacula, amphibian breeding sites) during critical life periods.
- Maintaining any wildlife corridors or signage installed during construction, and installing new ones, where practicable, in locations a need is identified.

It is anticipated that these measures will partially mitigate potential injury and/or death of amphibians or reptiles at the Project site during the construction phase; however, effects will not be eliminated. As a result, the pathway 'Collisions with Vehicles' has been carried forward to **Section 12.7** (Predicted Net Effects).

Incidental Take

Activities such as vegetation clearing, bridge construction and culvert installation could result in the accidental injury or death of amphibians and reptiles. Measures to minimize the risk of incidental take include:

- Avoiding the disturbance of snake hibernacula during their overwintering period (October 16 to April 14).
- Restricting public access to the Project Footprint through the use of fencing, gates and/or signage.
- Ensuring that training for Project personnel raises awareness of the characteristics of snake hibernacula and know the appropriate procedures to follow if a potential hibernaculum is identified. This training will also inform personnel that herptiles always have the right of way (except in instances related to the imminent health and safety of workers and the public).
    - If a potential hibernaculum is located during construction, there will be a temporary stop in work, and the proponent and relevant Project personnel will be contacted. A qualified biologist or resource specialist will have the opportunity to determine whether it is active. Local indigenous communities will be notified.
    - Work will not resume within 30 m of active snake hibernacula until an appropriate course of action has been determined, in consultation with the appropriate regulatory agencies (e.g., CWS-ECCC, MNR) as required.
- Except for locations containing probable overwintering habitat, scheduling vegetation removal outside of the active season for amphibians and reptiles to the extent reasonably practicable.
- To address work in wetlands and waterbodies during the winter period (i.e., where overwintering habitat may be removed), exclusion fencing will be installed.
    - Isolating and dewatering aquatic works area prior to September 1 is an alternate mitigation measure that could be implemented if practicable and appropriate. However, this mitigation measure may not be appropriate in many instances since dewatering at that time could affect other environmental disciplines (e.g., surface water, fish and fish habitat). Isolation and dewatering may also not be practical given the scale of the Project. Nevertheless, this mitigation measure will be considered as applicable.
    - Work areas isolated by reptile and amphibian exclusion fencing will be searched by a qualified biologist or resource specialist to relocate reptiles and amphibians from the enclosed area.
    - An amphibian salvage plan will be undertaken if vegetation clearing and/or draining of water bodies is proposed during the amphibian breeding season (May 1 – July 15). The amphibian salvage plan will be developed in consultation with MNR and CWS-ECCC to guide salvage activities and with appropriate permitting or other approvals necessary.
- Blasting should be limited to areas where other methods, such as drilling and standard excavation, are not possible. It will occur outside of any established vegetation protection zones (buffers) that have been delineated.
- Blasting, regardless of location, shall have control measures for fly-rock generated so the risk of injury from projectiles is minimized.
- Open excavations and blasting areas will be fenced off when left unattended to avoid injury to, or death of amphibians and reptiles.
- Maintenance activities that involve vegetation clearing or ground disturbance should only occur outside of the reptile and amphibian active period, from October 16 to April 14.

The effectiveness of mitigation measures will be evaluated, with measures being modified or enhanced as necessary through adaptive management. There is a predicted negative effect on amphibians and reptiles from incidental take. Additional discussion of this issue has been carried forward to Predicted Net Effects (**Section 12.7**).

Increased Access

The creation of the WSR provides more opportunities for humans to access the area, which could result in the injury or death of amphibians and reptiles. Measures to address potential effects of increased human access to the LSA were discussed in **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife) and include waste management, access restrictions (e.g., fencing, gates, signage) and the appropriate storage of petroleum-based products. It is anticipated that the potential effects of increased access will be reduced through these measures but not eliminated entirely and additional discussion has been carried forward to Predicted Net Effects (**Section 12.7**).

Table 12-46: Summary of Potential Effects, Mitigation Measures, and Predicted Net Effects for Reptiles and Amphibians Sub VC

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to reptile and amphibian habitat availability (quantity) ▪ Changes to abundance and distribution of reptiles and amphibians and their habitats	Construction and Operations	**Construction Phase:** ▪ Vegetation clearing and grubbing ▪ Road Construction ▪ Construction and Use of Supportive Infrastructure **Operations Phase:** ▪ Vegetation management	Habitat Loss – Clearance Activities	▪ Developing a Vegetation and Invasive Species Management Plan, Wildlife Management Plan and Site Restoration and Monitoring Plan as part of the CEMP and implementing it during the construction phase. ▪ Reviewing, updating and implementing these plans during the operations phase. ▪ Minimizing the extent of clearings at temporary work areas. ▪ Following all environmental conditions of approval. ▪ Maintaining minimum 30 m vegetation protection zones (buffers) around waterbodies and avoiding the clearance of riparian vegetation to the extent practicable. ▪ Endeavour to maintain a cleared ROW of 35 m to the extent practicable. ▪ Installing construction fencing to clearly delineate the boundaries of work areas. ▪ Inspecting fencing, and other site-specific environmental measures to confirm they have been appropriately installed and are functioning correctly. ▪ Avoiding the placement of temporary areas of disturbance, to the extent practicable, in sensitive habitats such as amphibian breeding ponds. ▪ If evidence of a snake hibernaculum is identified during the construction phase, halting work and following appropriate reporting protocols. ▪ Utilizing progressive reclamation to restore temporary areas of disturbance as soon as practicable following the completion of work in each area. Restoration approaches will facilitate natural regeneration but may occasionally be supplemented with native self-sustaining species via transplant, seeding and/or planting. ▪ Conducting effectiveness monitoring. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.1** (Mitigation – Loss of Wildlife Habitat – Construction and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development	Yes
• Changes to reptile and amphibian habitat availability (quantity and quality) • Changes to abundance and distribution of reptiles and amphibians and their habitats	Construction and Operations	**Construction Phase:** ▪ Road construction ▪ Vegetation clearing and grubbing **Operations Phase:** ▪ Vegetation management ▪ Road Usage	Habitat Alteration or Degradation – Habitat Structural Change	Following all environmental conditions of approval. Maintaining minimum 30 m vegetation protection zones (buffers) around waterbodies and avoiding the clearance of riparian vegetation to the extent practicable. ▪ Keeping construction footprints as small as possible and minimizing the extent of clearings at temporary work areas. ▪ Endeavouring to maintain a cleared ROW of 35 m to the extent practicable. ▪ Avoiding the placement of temporary areas of disturbance, to the extent practicable, in sensitive habitats for amphibians and reptiles. ▪ To the extent practicable, retaining amphibian and reptile habitat features in situ where it is safe to do so. ▪ Installing construction fencing to clearly delineate the boundaries of work areas. Fencing will be designed to serve as exclusion fencing for reptiles. ▪ To the extent practicable, conducting any Project activities that could potentially affect snake hibernacula between May 15 and August 31.	Yes

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				Otherwise, minimize construction or operations during the active season for amphibians and reptiles in northern Ontario. ▪ Utilizing progressive reclamation to restore temporary areas of disturbance as soon as practicable following the completion of work in each area. Restoration approaches will facilitate natural regeneration but may occasionally be supplemented with native self-sustaining species via transplant, seeding and/or planting. ▪ Conducting effectiveness monitoring. ▪ Refer also to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.2.1** (Mitigation – Loss of Wildlife Habitat) and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control	
▪ Changes to reptile and amphibian habitat availability (quantity) ▪ Changes to abundance and distribution of reptiles and amphibians and their habitats	Construction and Operations	**Construction Stage:** ▪ Temporary Watercourse Diversions ▪ Road Construction ▪ Bridge and Culvert Installation **Operations Stage:** ▪ Repair and/or rehabilitation of culverts and bridges at water crossings	Habitat Alteration or Degradation – Hydrological Changes	▪ Refer to Section 7.4 (Mitigation Measures – Effects on Surface Water Resources), Section 8.4 (Mitigation Measures – Effects on Groundwater Resources), **Section 12.4.2.1** (Mitigation – Alteration or Degradation of Wildlife Habitat – Hydrology) and the following in Appendix E (Mitigation Measures). ▫ Section 5.7 – Temporary Watercourse Crossings ▫ Section 5.11 – Bridge and Culvert Installation ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control ▫ Section 5.22 – Water Quality Monitoring	Yes
▪ Changes to reptile and amphibian habitat availability (quality) ▪ Changes to abundance and distribution of reptiles and amphibians and their habitats	Construction and Operations	**Construction Stage:** ▪ Road Construction ▪ Bridge and Culvert Installation ▪ Construction and Use of Supportive Infrastructure ▪ Materials and Equipment Delivery **Operations Stage:** ▪ Road Usage ▪ Repair and/or rehabilitation of culverts and bridges at water crossings	Habitat Alteration or Degradation – Accidental Spills	▪ Refer to Section 6.4 (Mitigation – Effects on Geology, Terrain and Soils), **Section 12.4.2.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Accidental Spills), Section 23.5 (Accidents and Malfunctions) and the following in Appendix E (Mitigation Measures). ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.17 – Concrete Washout Management Practices	No
▪ Changes to reptile and amphibian habitat availability (quality) ▪ Changes to abundance and distribution of reptiles and amphibians	Construction and Operations	**Construction Stage:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Stage:** ▪ Vegetation management ▪ Road Usage	Habitat Alteration or Degradation – Sensory Disturbance	▪ Refer to Section 9.4 (Mitigation – Effects on Visual Environment), Section 18.4 (Mitigation – Effects on Atmospheric Environment), **Section 12.4.4.2** (Mitigation – Alteration or Degradation of Wildlife Habitat – Sensory Disturbance) and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices	Yes

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to reptile and amphibian habitat availability (quantity and quality)	Construction and Operations	**Construction Stage:** ▪ Vegetation clearing and grubbing ▪ Decommissioning and Site Restoration/Reclamation **Operations Stage:** ▪ Vegetation management ▪ Road Usage	Habitat Alteration or Degradation – Invasive Plant Species	▪ Refer to Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands), **Section 12.4.4.2** (Mitigation – Alteration or Degradation of Wildlife Habitat) and the following in Appendix E (Mitigation Measures). ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.19 – Aggregate Pit Decommissioning ▫ Section 5.21 – Site Decommissioning and Rehabilitation ▫ Section 5.23 – Prevention of the Transfer of Invasive Species.	No
▪ Changes to abundance and distribution of reptiles and amphibians	Construction and Operations	**Construction Stage:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Construction and Use of Supportive Infrastructure **Operations Stage:** • Vegetation management • Road Usage	Alterations in Movement – Loss of Connectivity	▪ Maintaining minimum 30 m buffer zones around waterbodies and retaining riparian vegetation, where practicable. ▪ Limiting ground disturbance to the extent necessary for construction. Retaining landforms adjacent to the ROW in situ where possible. ▪ Maintaining a cleared ROW no larger than 35 m to the extent practicable. ▪ Minimizing the Project Footprint and limiting the extent of vegetation clearing to the extent practicable. ▪ Installing exclusion fencing only in strategic locations. During detailed design, consider incorporating eco-passages with fencing. ▪ To the extent practicable, conducting maintenance activities that may cause barriers outside of sensitive life cycle period for amphibians and reptiles. ▪ Checking culverts and other potential amphibian crossing areas for blockages. Appropriately removing any found. ▪ Maintaining any ecopassages or wildlife crossing areas installed during construction. ▪ Refer also to **Section 12.4.2.3** (Mitigation – Alteration in Wildlife Movement – Sensory Disturbance), Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.16 – Erosion and Sediment Control	Yes
▪ Changes to abundance and distribution of reptiles and amphibians and their habitat (number/ha)	Construction and Operations	**Construction Stage:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Stage:** ▪ Vegetation management ▪ Road Usage	Alterations in Movement – Sensory Disturbance	▪ Refer to **Section 12.4.2.3** (Mitigation – Alteration in Wildlife Movement – Sensory Disturbance), Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.3 – Spill Prevention and Emergency Response ▫ Section 5.4 – Noise Control ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.18 – Dust Control Practices	Yes
▪ Changes to reptile and amphibian survival and reproduction ▪ Changes in reptile and amphibian mortality	Construction and Operations	**Construction Stage:** ▪ Construction and Use of Supportive Infrastructure ▪ Materials and Equipment Delivery **Operations Stage:** ▪ Road Usage	Injury or Death – Collisions	▪ Where appropriate, installing temporary reptile and exclusion fencing in locations along the ROW where upland habitat borders wetlands and waterbodies. Fencing should be installed during the overwintering period and maintained throughout the active season. ▪ Where appropriate, also installing exclusion fencing adjacent to the ROW in strategic locations based on surveys results and predictive modelling.	Yes

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
				▪ Having a qualified resource specialist inspect temporary exclusion fencing at least twice weekly as well as after large rainfall events to verify it is functioning correctly. ▪ Establishing speed limits within the Project Footprint, with lower limits enforced near sensitive habitats (e.g., breeding habitats and known crossing routes). ▪ Providing driver training to Project personnel to encourage reduced speeds and raise awareness of sensitivity of herptiles to vehicle strikes. ▪ Restricting access to the road during construction and controlling access to operational areas using signage, gates and other appropriate measures. ▪ Conducting construction and operations activities outside of sensitive habitats and sensitive periods for amphibians and reptiles (e.g., when they are migrating between breeding and overwintering habitats). ▪ Refer also to **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife – Collisions) and the following in Appendix E: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.14 – Wildlife and Wildlife Habitat ▫ Section 5.20 – Quarry Site Selection and Development Requirements	

Indicators	Project Phase	Project Component or Activity	Potential Effect	Key Mitigation Measures	Predicted Net Effect
▪ Changes to reptile and amphibian survival and reproduction ▪ Changes in reptile and amphibian mortality	Construction and Operations	**Construction Stage:** ▪ Vegetation clearing and grubbing **Operations Stage:** ▪ Vegetation management	Injury or Death – Incidental Take	▪ Conducting activities that have the potential to disturb snake hibernacula when the reptiles would not be inhabiting them (May 15 to August 31). ▪ To the extent practicable, conducting other construction and operations activities outside of the active season for amphibians and reptiles (April 15 and October 15) in the vicinity of sensitive habitats, including when they are migrating between breeding and overwintering habitats. ▪ Ensuring that Project personnel are made aware of the characteristics of snake hibernacula and know the appropriate protocols to follow if any are encountered during construction. ▪ Restricting public access to the Project Footprint during construction. ▪ In locations where potential amphibian habitat is being removed (e.g., wetlands where overwintering is occurring), installing exclusion fencing prior to the overwintering period. ▪ Having a qualified resource specialist search areas where exclusion fencing has been installed, to confirm no amphibians or reptiles are trapped on the side to be disturbed. ▪ Blasting will be conducted outside sensitive windows and will be limited to areas where drilling or standard excavation are not possible. Regardless of location, blasting shall have control measures implemented for fly rock. ▪ Open excavations and blasting areas will be fenced when unattended. ▪ Refer also to **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife – Incidental Take) and the following in Appendix E: ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.12 – Blasting Near a Watercourse ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes
▪ Changes to reptile and amphibian survival and reproduction ▪ Changes to predator access, habitat use and population	Construction and Operations	**Construction Stage:** ▪ Road Construction ▪ Vegetation clearing and grubbing ▪ Blasting ▪ Construction and Use of Supportive Infrastructure **Operations Stage:** ▪ Road Usage ▪ Vegetation management	Injury or Death – Increased Access	▪ Refer to **Section 12.4.2.4** (Mitigation – Injury or Death of Wildlife – Increased Access), Section 11.4 (Mitigation and Enhancement Measures for Vegetation and Wetlands) and the following in Appendix E (Mitigation Measures): ▫ Section 5.1 – Clearing and Grubbing ▫ Section 5.2 – Petroleum Handling and Storage ▫ Section 5.5 – Materials Handling and Storage ▫ Section 5.14 – Wildlife and Wildlife Habitat	Yes

12.5 Characterization of Net Effects

Net effects are defined as the effects of the Project that remain after application of proposed mitigation measures. The effects assessment follows the general process described in Section 5 – Environmental Assessment / Impact Assessment Approach. The focus of the effects assessment is on predicted net effects, which are the effects that remain after application of proposed mitigation measures. Potential effects with no predicted net effect after implementation of mitigation measures are not carried forward to the net effects characterization or the cumulative effects assessment.

Table 12-47 presents definitions for net effects criteria, developed with specific reference to the Wildlife and Wildlife Habitat VC. These criteria are considered together in the assessment, along with context derived from existing conditions and proposed mitigation measures, to characterize predicted net effects from the Project on the Wildlife and Wildlife Habitat VC.

Table 12-47: Net Effects Assessment Criteria Definitions

Characterization Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	Direction relates to the value of the effect in relation to the existing conditions	**Positive** – Net gain or benefit; effect is desirable. **Neutral** – No change compared with existing conditions conditions and trends. **Negative** – Net loss or adverse effect; effect is undesirable.
Magnitude	Magnitude is the amount of change in measurable parameters or the VC relative to existing conditions	**Negligible** – No measurable change. **Low** – A measurable change that is not expected to cause significant losses of wildlife species and the net effect will be unlikely to affect the overall population but is above negligible. **Moderate** – A measurable change that could cause impacts to a wildlife species within the area but likely can be managed. This effect would cause an observable effect to the wildlife species but would be within the adaptive capability of the species. **High** – An effect that may not be manageable and the change exceeds the ability for a species to continue sustained existence within the area.
Geographic Extent	Geographic extent refers to the spatial area over which a net effect is expected to occur or can be detected within the Project Footprint, Local Study Area and Regional Study Area	**Project Footprint** – The effect is confined to the Project Footprint or Project Development Area. **Local Study Area** – The effect is confined to the Local Study Area. **Regional Study Area** – The effect extends beyond the Local Study Area boundary, but is confined within the Total Study Area.
Timing	Timing criteria indicate the timing (e.g., dates or seasons) importance of the net effect	**Non-sensitive** – The effect is expected outside sensitive timing periods. **Sensitive** –The effect is expected inside sensitive timing periods (calving, nesting, maternity, migration). **All** – The effect is expected in all seasons. **N/A**: timing doesn't factor into the importance of the net effect.

Characterization Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	Duration is the period of time required until the measurable indicators or the VC returns to its existing condition, or the net effect can no longer be measured or otherwise perceived	**Short-term** – Net effect restricted to no more than the duration of the construction phase (approximately five years). **Medium-term** – Net effect extends through the operations phase of the Project (75-year life cycle). **Long-term** – Net effect extends beyond the operations phase (greater than 75 years). **Permanent** – Recovery to existing conditions unlikely.
Frequency	Frequency refers to the rate of occurrence of an effect over the duration of the Project or in a specific phase	**Infrequent** – The effect is expected to occur rarely. **Frequent** – The effect is expected to occur intermittently. **Continuous** – The effect is expected to occur continually.
Context	Context considers sensitivity and resilience of the VC to particular project-related changes	**Low –** Wildlife species is not sensitive to described activities or effects. **Moderate –** Wildlife species or species group have moderate resilience is somewhat sensitive to described activities or impacts but has capacity to assimilate change. **High –** Wildlife species or species group have weak resilience to stress and is very sensitive to described activities or impacts with little capacity to assimilate change.
Input from Indigenous Peoples	Views of the Indigenous communities and groups in assigning the criteria to be used and in characterizing the effects	**Yes –** Known to have a particular importance to local indigenous communities. **No –** Not known to have a particular importance to local indigenous communities.
Reversibility	Reversibility describes whether a measurable indicator or the VC can return to its existing condition after the project activity ceases	**Reversible** – The net effect is likely to be reversed after activity completion and rehabilitation. **Irreversible** – The net effect is unlikely to be reversed.
Likelihood of Occurrence	Likelihood of occurrence is a measure of the likelihood that an activity will result in an effect	**Unlikely** – The effect is not likely to occur. **Possible** – The effect may occur, but is not likely. **Probable** – The effect is likely to occur. **Certain** – The effect will occur.

12.6 Potential Effect Pathways Not Carried Through for Further Assessment

With the implementation of mitigation measures, the following potential effect pathways for wildlife and wildlife habitat are expected to be eliminated from further assessment. Potential effects that remain following the implementation of mitigation measures are carried forward for further assessment and are presented in **Section 12.7**.

12.6.1 All Species

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

- For habitat alteration by deposition of dust and other airborne emissions: No habitat alteration or degradation is expected as impacts are expected to be effectively controlled by the proposed mitigation measures and no net effect is anticipated.
- For habitat alteration by accidental spills: Emission and pollution controls are expected to be effective and there are no predicted net effects on any wildlife species.
- For habitat alteration by Invasive Plant Species: Mitigation measures included as part of the Vegetation and Invasive Species Management Plan will avoid and limit the introduction and spread of invasive plant species. There is no net effect predicted related to the alteration or degradation of wildlife habitat after implementation.

12.6.2 Moose

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated from further assessment.

All Project Phases

- For habitat loss by hydrological change: Mitigation measures included as part of road design will avoid and limit complete loss of moose habitat and changes are expected to result in negligible impacts.
- For Injury or death by disease: Introduction of brainworm (P. tenuis) is not expected to have a net effect as white tailed deer are not expected to enter the Project area in the foreseeable future, their northern range is ~275 km south near Lake Nipigon.

Operations Phase

- For habitat alteration by changes in habitat structure. The maintenance of vegetation along the ROW is expected to result in a positive change for moose as it increases early seral browse for moose.
- For habitat alteration by hydrological changes. Hydrological alteration will affect a negligible area of any individual moose home range, in conjunction with effective mitigations changes are expected to result in negligible impacts.

12.6.3 Furbearers (American Marten)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss by hydrological change. Mitigation measures included as part of road design will avoid and limit complete loss of American Marten habitat and changes are expected to result in negligible impacts.

Operations Phase

- For habitat alteration by hydrological changes. Hydrological alteration will affect an insignificant area of any individual American Marten's home range, in conjunction with effective mitigations changes are expected to result in negligible impacts.

12.6.4 Furbearers (North American Beaver)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss by hydrological change. Mitigation measures included as part of road design will avoid and limit complete loss of beaver habitat. In addition, beaver ability to modify their hydrological environment will result in negligible impacts.
- For habitat alteration by hydrological changes. Based on the beaver's ability to control and modify its hydrological environment any changes are expected to result in negligible impacts.
- For habitat alteration by sensory disturbance, given the low amount of traffic along the road and the ability of North American Beaver to use anthropogenically disturbed areas a negative effect is not predicted.
- For movement changes by sensory disturbance, given the low amount of traffic along the road and the ability of North American Beaver to use anthropogenically disturbed areas a negative effect is not predicted.

Operations Phase

- For Injury or death by incidental take. Due to the conspicuous nature of beaver dams and lodges and the expected effective mitigation measures for eliminating conflicts with problem beavers, unintentional harm or death of beavers is not expected during the operations phase.

12.6.5 Forest Songbirds (Orange-crowned Warbler, Tennessee Warbler)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss by hydrological change. Mitigation measures included as part of road design will avoid and limit complete loss of forest songbird habitat.
- For habitat alteration by hydrological changes: It is not anticipated there will be hydrological changes sufficient to alter upland forest songbird habitat.

12.6.6 Wetland Songbirds (Tennessee Warbler and Orange-crowned Warbler)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss by hydrological change. Mitigation measures included as part of road design will avoid and limit complete loss of wetland songbird habitat.

12.6.7 Shorebirds (Greater Yellowlegs)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss by hydrological change. Mitigation measures included as part of road design will avoid and limit complete loss of shorebird habitat.
- For Injury or Death due to Increased Access: Harvesting is expected to have no effect. Although poaching can affect shorebird survivorship, the isolated location of the road is anticipated to minimize effects from such activities.

12.6.8 Waterfowl (Canada Goose, Mallard)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss because of hydrological changes: Mitigation measures included as part of road design will avoid and limit complete loss of waterfowl habitat.
- For habitat alteration or degradation due to structural changes: For habitat alteration resulting in increases in early seral vegetation, mitigation measures included as part of the Vegetation and Invasive Species Management Plan are expected to result in negligible effects on waterfowl as they often inhabit areas with open vegetation structures.

12.6.9 Raptors (Red-tailed Hawk, Great Grey Owl)

After the implementation of mitigation measures, the following potential effect pathways and interactions are expected to be eliminated:

All Project Phases

- For habitat loss because of hydrological change: Mitigation measures included as part of road design will avoid and limit complete loss of raptor habitat.

- Alteration of movement due to loss of connectivity is expected to have no effect as raptors can fly above the roadway and are not known to avoid open areas or habitat gaps.
- For injury or death due to increased access: Harvesting is expected to have no effect. Although poaching can affect raptor survivorship, the isolated location of the road is anticipated to minimize effects from such activities.

Operations Phase

- Hydrological Changes: It is not anticipated there will be hydrological changes sufficient to alter forested raptor habitat, where preferred nesting occurs.

12.7 Predicted Net Effects

An effect on the Wildlife and Wildlife Habitat VC may remain after the implementation of mitigation measures. The predicted net effects include:

- Wildlife Habitat Loss;
- Wildlife Habitat Alteration or Degradation;
- Alteration in Wildlife Movement; and
- Wildlife Injury or Death.

12.7.1 Moose

12.7.1.1 Habitat Loss

Clearance Activities

Construction

Loss of moose habitat, including late winter habitat and aquatic foraging habitat, are expected due to construction activities, including direct removal of habitat for the Project Footprint during road construction. During the construction phase, vegetation will be removed from the Project Footprint, which will result in the permanent loss of moose habitat. Progressive reclamation will restore vegetation in some areas including temporary camps, laydowns and access roads reducing the net effect of vegetation removal. There is a predicted net effect of habitat loss after implementation of mitigation measures.

Moose utilization was modelled by estimating probability of use based on resource selection functions (RSFs) across the moose LSA. For moose RSF modeling was done using the Far North Land Cover (FNLC). Based on the results of RSF habitat modeling, the Project will result in the removal of 163.95 ha of high winter use Moose habitat from the Project LSA and 235.76 ha of high use Moose habitat from the Moose LSA due to construction activities. This represents 2.34% of high rated Moose habitat in the project LSA and 0.47% of high Moose habitat in the moose LSA.

Based on the assessment of ELC habitat mapping 147.48 ha of Moose late winter cover is estimated to be removed during construction activities, this represents 8.38 % of Moose late winter cover in the project LSA. Using FNLC only 74.5 ha of Moose late winter cover is estimated to be removed during construction activities, this represents 0.77% of Moose late winter cover in the Moose LSA. Moose Late Winter Habitat

is relatively rare in the RSA with only 6.4% of the project LSA and 3.8% of the Moose LSA suitable habitat.

Overall, given that late winter habitat is relatively rare, but removals of high use habitat is relatively low, the net effect on moose is considered moderate. A summary of the net effects relating to the habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-48**.

Table 12-48: Criteria Results for the Loss of Moose Habitat from Clearance Activities – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of moose habitat is expected because of Project construction.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of moose habitat, particularly moose late winter habitat.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All	Construction activities, including habitat removal, are expected to occur through the year.
Duration	Permanent	Any loss of moose habitat during construction is expected to permanent as the roadbed will remain on the landscape for the foreseeable future.
Frequency	Continuous	Moose habitat once removed from the Project Footprint will remain removed for the forceable future.
Context	Resilient	Moose are adaptable to anthropogenic changes in habitat, and high use habitat is common throughout the area.
Reversibility	Irreversible	The roadbed is unlikely to be removed hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Certain	The loss of habitat during construction is certain.

Operations

Loss of moose habitat is not expected to result from roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in the loss of moose habitat as repairs should be contained within the existing footprint. Continued use of the quarries is expected but the footprint of the quarry is not expected to be expanded with the potential removals of moose habitat accounted for in the construction phase. There is a small chance that reclaimed temporary laydowns and clearings may be reused during operations; if they are reopened temporarily, restoration will occur after use.

Overall, the effect on moose is expected to be negligible. A summary of the net effects relating to the habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-49**.

Table 12-49: Criteria Results for the Loss of Moose Habitat from Clearance Activities – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected because of Project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to occur during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All time periods	Additional loss of moose habitat is not expected during operations.
Duration	Short-term	Any loss of moose habitat will be short-term, during repairs or maintenance.
Frequency	Infrequent	Additional loss of moose habitat during operations is not expected.
Context	Resilient	Effects are likely to affect habitats that are common throughout the RSA. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Unlikely	Additional net effects of the Project during operations are unlikely.

12.7.1.2 Habitat Alteration or Degradation

Changes in Vegetation Structure

Construction

It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation. Clearing of the Project Footprint will promote early seral vegetative growth which can provide optimal moose foraging habitat; however, the conversion of areas of mature conifer forest into early seral communities will fragment and reduced in size some areas of Late Winter Habitat.

Predictive RSF modeling that converts existing habitats into upland disturbance habitat predicts a decrease of 25.3% in the Project Footprint and 8.7% decrease in use of the standard 1 km LSA. The effect is likely less than modelled as not all areas cleared for the road are reflective of the upland disturbance category, many wetland areas cleared for road including temporary laydowns, access roads and the road verge will recover as wetland habitats which will provide foraging habitat for moose. At the moose LSA scale the predicted change is a small decrease.

Overall, it is possible there will be a small negative effect due to habitat structural change. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-50**.

Table 12-50: Criteria Results for Habitat Alteration or Degradation of Moose Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be neutral, as moose would experience few changes in habitat structure.
Magnitude	Low	The magnitude of the effect is predicted to be low, as moose changes in habitat structure will be confined to area close to the Project Footprint.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure may occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present beyond the construction phase as recovery is slow for northern boreal habitats.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.
Context	Resilient	Effect will be low as the vegetation changes will be minimal and moose can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Probable	Even with mitigations, it's possible the changes in vegetation structure may affect some individual moose during construction activities.

Changes in wildlife species distribution following construction of the road was modelled by estimating probability of use (pUse) based on resource selection functions (RSFs) across the study areas (Project Footprint, LSA and RSA). Details of modelling methods are discussed in Section 11.3.1.2 and further details are provided in the Natural Environment and Existing Conditions (NEEC) report, but briefly, RSFs were then developed using a boosted-regression tree approach, with data from the FNLC and other environmental variables, including Landsat TM. Future disturbance effects were modelled by overlaying the Project Footprint with existing disturbances, including roads and aggregate sources on the FNLC map, and then reassigning wetland and upland values in the 3-ha hexagons underlying the anthropogenic layer as an upland anthropogenic disturbance. This modeling was done for the nine species/species groups used as Wildlife and Wildlife Habitat VC subcomponents. Interpretation of these results is complicated by the fact that there are no existing roads present. The area removed is represented by disturbance category which represents both natural and anthropogenic habitats.

Hydrological Changes

Construction

It is probable hydrological changes may result in the alteration or degradation of moose habitat during the construction phase. Roads that bisect peatlands can change flows of surface and subsurface water. Given that peatlands make up most vegetative communities within the Project Footprint, habitat alteration will probably occur. While road design will aim to maintain both surface and subsurface hydrologic flows and will minimize but not eliminate the effects. Based on the Groundwater assessment (Section 8.5) these changes are expected to be low in magnitude but permanent. For moose, as it uses a wide variety

of riparian habitat the effect of hydrology changes is likely only slight, although distribution of habitats may change.

After implementation of mitigation methods, a minor negative effect on moose habitat will likely remain. A summary of the net effects relating to the changes in hydrology during the construction phase based on the Characterization Criteria is presented in **Table 12-51**.

Table 12-51: Criteria Results for Habitat Alteration or Degradation of Moose Habitat Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as some alteration of hydrology is expected because of construction.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect could cause a measurable alteration of moose habitat, but the change is likely minimal.
Geographic Extent	LSA	The effect extends into the Local Study Area up to 250m.
Timing	All Time Periods	Alteration of hydrology could occur during any period of time.
Duration	Permanent	Hydrological changes originating in the construction phase are likely to be permanent as the roadbed will remain even after the operations phase ends.
Frequency	Continuous	Hydrological changes will be continuous.
Context	Resilient	Only a small fraction of moose foraging habitat is likely to be affected.
Reversibility	Irreversible	The roadbed is unlikely to be removed hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Probable	The alteration of wetland habitat during construction is likely to occur but mitigations should limit any changes.

Sensory Disturbances

Construction

Effects of sensory disturbance on degradation or alteration of moose habitat is probable during the construction phase. Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for moose adjacent to the Project Footprint as they are known to reduce use of areas where humans are active. Noise disturbance may be considerable during impulsive activities such as blasting or quarrying and moose lower use of areas with industrial noise, however moose can habituate to sensory disturbances, especially mechanical stimuli like construction vehicles. Overall, it is possible there will be a net low magnitude negative effect during the construction phase. A summary of the net effects relating to habitat alteration through sensory disturbance during the construction phase based on the Characterization Criteria is presented in |**Table 12-52**.

Table 12-52: Criteria Results for Habitat Alteration or Degradation of Moose Habitat Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected because of Project construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could cause a measurable alteration of moose habitat, but the change is likely small.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area.
Timing	All time periods	Effects on moose would occur during any point of the active season.
Duration	Short-term	Any alteration of moose habitat due to sensory effects will be short-term during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities; location and intensity will vary temporally.
Context	Moderate	Moose show some avoidance of areas when humans are present.
Reversibility	Reversible	Sensory disturbances should dissipate once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some moose during construction.

Operations

Effects of sensory disturbance on degradation or alteration of moose habitat is possible during the operations phase. For operations, most sensory effects will be related to traffic noise which may degrade moose habitat causing avoidance of areas near roads or decreased habitat value. Light pollution effects from the road during operations are considered non-existent as the road will not be lit except for existing lights around the community. While moose habitat utilization around high traffic roads is considerably lower up to 500 m away; utilization around low traffic roads, like the WSR, is also affected. Overall, it is possible there will be a low magnitude negative effect due to sensory disturbances during operations. The effect is expected to occur while the road is in use and can be considered reversible as it would stop when the operation phase ends and the road is no longer in use (See **Section 12.1.5.2** – Temporal Boundaries). A summary of the net effects relating to habitat alteration through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-53**.

Table 12-53: Criteria Results for Habitat Alteration or Degradation of Moose Habitat Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected because of operations activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could cause a measurable alteration of moose habitat, but the change is likely small.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area, up to 500 m.
Timing	All time periods	Effects on moose would occur all year.
Duration	Medium-term	Any alteration of moose habitat due to sensory effects will be medium-term, continuing until the end of the operations phase.
Frequency	Frequent	Sensory disturbances will occur primarily during daytime when traffic occurs.
Context	Moderate	A large body of research has shown moose avoid roads due to traffic.
Reversibility	Reversible	Sensory disturbances should cease once use of the road concludes.
Likelihood of Occurrence	Probable	Sensory disturbances may affect some moose, but some habituation may occur.

12.7.1.3 Alteration in Movement

Loss of Connectivity

Construction

Alteration in the movement of moose from changes in habitat connectivity is possible during the construction phase; however, vegetation removal, barriers and construction activities that could created gaps that affect habitat connectivity are not expected to result in significant changes to moose movement. Construction fencing may act as a barrier to moose movement, at least in the short-term. Moose may avoid risky habitats such as large open areas as they are more likely to encounter a predator (landscape of fear). At 35 m wide, the Project ROW is smaller than gaps that have been found to limit moose crossings (140 m). Construction activities themselves may alter moose movement as moose avoid areas of human activity. After implementation of mitigation methods, a negligible negative effect on moose movement will likely remain. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-54**.

Table 12-54: Criteria Results for Alteration in Movement of Moose Due to Loss of Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur because of construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the barrier effect would be small for moose.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the moose active season.
Duration	Medium-term	Any alteration of moose movement will be medium-term, as the effect will continue into the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Moose can adapt to habitat fragmentation especially when gaps are small.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some moose during construction.

Operations

Effects of changes to habitat connectivity on alteration in movement of moose is possible during the operations phase. Like the construction phase, decreased connectivity due to the road is expected to result in minor changes to moose movement. During winter, large snow windrows may act as a barrier to moose crossing the road but the effect is likely minor. Maintenance activities will maintain vegetation along the ROW in an early seral state and in some areas may decrease moose crossings because of structural differences compared to the adjacent forest and their visibility from the road. Moose may also alter their travel paths moving parallel to the road instead of crossing. Mitigation measures focused on connectivity included minimizing vegetative clearing but there is a predicted net effect from road construction on moose movement. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-55**.

Table 12-55: Criteria Results for Alteration in Movement of Moose Due to Loss of Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur because of operations activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as there would be a small drop in connectivity for moose.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the edge of Local Study Area.

Characterization Criteria	Result	Rationale
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen during all seasons.
Duration	Medium-term	Any alteration of moose movement will be medium-term, lasting until the end of the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Moose can adapt to habitat fragmentation especially when gaps are small.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some moose during operations.

Sensory Disturbances

Construction

Effects of sensory disturbance on moose movement is probable during the construction phase. Moose could alter their movement around the Project Footprint as they avoid disturbances like blasting, clearing, hauling and grading and other human actions during construction activities. The presence of humans, equipment and vehicles could cause moose to move away from the disturbance. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects but there is a predicted negative low magnitude effect from road construction on moose movement. Given the temporary nature of most construction activities, the effect is expected to occur infrequently and be short-term in nature. A summary of the net effects relating to alteration of movement through sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-56**.

Table 12-56: Criteria Results for Alteration in Movement of Moose Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected from Project construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few individuals.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations could happen throughout the entire year.
Duration	Short-term	Any alteration of moose movement will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities; location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small number of individuals and changes would only be temporary.

Characterization Criteria	Result	Rationale
Reversibility	Reversible	Sensory disturbance changes should be restored once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some individuals during construction.

Operations

Effects of sensory disturbance on moose movement is probable during the operations phase. During operations, traffic noise will be the primary sensory effect on moose. Traffic levels are known to influence moose movement as multiple studies have found road avoidance increases with increased disturbance. While traffic levels are expected to be low, it is possible that a few individual moose will alter their movement near the road. Human activity along the road may also cause seasonal shifts in moose movement patterns. Overall, it is possible there will be a small net negative effect due to sensory disturbances during operations. The effect would likely extend a few hundred meters into the LSA. A summary of the net effects relating to alteration of movement through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-57**.

Table 12-57: Criteria Results for Alteration in Movement of Moose Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected to result from project operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few individuals.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen during all seasons.
Duration	Medium-term	Any alteration of moose movement will be medium-term, during the operations phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of traffic and maintenance activities; location and intensity will vary temporally.
Context	Resilient	While moose show some avoidance of roads, most negative responses are shown at high volumes of traffic.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once operation of the road ceases.
Likelihood of Occurrence	Possible	Sensory disturbances may affect some moose during operations during periods of higher volume traffic.

12.7.1.4 Injury or Death

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures, such as vehicle speed limits, during the construction phase is expected to keep the number of collisions and fatalities between moose and vehicles and equipment low. Within construction sites vehicles will be traveling at low speeds and environmental monitors will watch for moose using the road verge and initiate mitigations if appropriate. Low numbers of vehicles will travel between camps and construction locations, collision risk will be minimized by effect enforcement of speed limits and wildlife training for personal. Despite effective mitigations risk of collisions between construction vehicles and moose cannot completely be eliminated within the Project Footprint, and a few individuals may be hit over the course of the construction period. It is expected there will be a small net negative effect on moose injury and death from collisions during the construction phase. A summary of the net effect assessment relating to injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-58**.

Table 12-58: Criteria Results for Moose Injury or Death Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, collisions with construction vehicles will result in moose injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in moose injury and death but is unlikely to affect overall moose populations.
Geographic Extent	LSA	The effect will extend to moose moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the year.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and moose.
Context	Resilient	Moose are expected to be resilient to the small number of mortalities that may result from collisions with construction vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and moose may occur, despite mitigation measures.

Operations

It is expected there will be a small net negative effect on moose injury and death from collisions during the operations phase. The predicted maximum vehicles travelling on the road is 500 per day, with most travel anticipated to take place during daylight hours. Lower traffic levels at night, may mitigate the number of moose deaths as collisions with vehicles are most common at night; however, mitigations will likely be not as effective during operations as the construction phase as enforcement will be more difficult.

Overall, collisions are expected to occur infrequently throughout the operational lifetime of the road. A summary of the net effect assessment relating to shorebird injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-59**.

Table 12-59: Criteria Results for Moose Injury or Death Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, collisions with vehicles will result in moose injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in moose injury and death but is unlikely to affect overall moose species populations.
Geographic Extent	LSA	The effect will extend to moose moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions between moose and vehicles are expected to occur throughout the year.
Duration	Medium-term	Collisions between moose and vehicles are expected to occur through road operations.
Frequency	Infrequent	As road use will mainly occur during daylight hours, collisions between moose and vehicles are expected to be rare.
Context	Resilient	Moose are expected to be resilient to a low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operations conclude.
Likelihood of Occurrence	Probable	Collisions between construction vehicles and moose are likely to occur despite mitigation measures which are less effective during the operations phase.

Increased Access

Construction

Injury and/or death from increased access is possible during the construction phase for moose. Opening new areas to human development can often result in increased hunting. This includes harvest from workers or other people entering the construction site; however, strict site controls and workplace policies are expected to effectively eliminate the risk of hunting and poaching of moose during the construction phase. Overall, there will be a negligible negative effect on moose survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the construction phase based on the Characterization Criteria is presented in **Table 12-60**.

Table 12-60: Criteria Results for Moose Injury or Death Due to Increased Access – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of moose may occur because of increased access.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as mitigations are expected to limit moose harvest during the construction phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Increased access to moose may occur throughout the year.
Duration	Short-term	The control of access by the proponent will cease at the end of the construction phase.
Frequency	Infrequent	Moose harvest during road construction is expected to be rare.
Context	Resilient	Moose populations are expected to be resilient to the small number of mortalities that may result from harvest during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some harvest may occur during construction.

Operations

Injury and/or death from increased access is certain during the operations phase for moose. Once the road opens moose will be exposed to increased hunting pressure. Construction of roads in previously inaccessible areas can often lead to increased use by hunters and increased moose mortality. The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase. Mitigations will depend on community input and reporting mechanisms. Harvest of a few individuals is likely certain to occur. However, indigenous hunting pressure within the cervid management unit is not expected to increase as while hunting may occur along the WSR this would mainly be expected as a shift in hunting locations within the management unit. In terms of non-indigenous hunting, the isolated location of the road in relation to population centres is expected to

Overall, there will be a moderate negative effect on moose survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the construction phase based on the Characterization Criteria is presented in **Table 12-61**.

Table 12-61: Criteria Results for Moose Injury or Death Due to Increased Access – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of moose may occur because of increased access.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in moose injury and death and may locally affect moose populations.

Characterization Criteria	Result	Rationale
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Harvest of moose may occur throughout the year.
Duration	Medium-term	The control of access by the proponent will cease at the end of the construction phase.
Frequency	Frequent	Moose harvest during road operations is expected to occur at regular intervals with increased access to new habitats.
Context	Resilient	Moose populations are expected to be resilient to the small number of mortalities that may result from harvest during operations and may alter behavior to avoid the road.
Reversibility	Reversible	The net effect is reversible once operations conclude.
Likelihood of Occurrence	Certain	Harvest of some moose along the road can be considered certain to happen.

Changes to Predator-Prey Dynamics

Construction

Injury and/or death from increased predation is probable during the construction phase for moose. Linear features are known to increase predator access and movement rates. For wolves, the primary predator of moose in northern Ontario, new roads can act as highspeed movement corridors. Effects on Moose from predator encounters are predicted to be long term in duration as wildlife are known to use linear features well beyond their operational lifetime. While predators like grey wolves often avoid areas of high human use like construction camps and industrial features, it is still probable that predators may use the linear features, especially in periods of low human use; therefore, a low magnitude negative effect on Moose survival is probable during the construction phase. A summary of the net effect assessment relating to injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-62**.

Table 12-62: Criteria Results for Moose Injury or Death Due to Changes to Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of moose may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in moose injury and death, but mitigations will limit the number of individuals effected.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the construction phase.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.

Characterization Criteria	Result	Rationale
Context	Resilient	Moose are expected to be resilient to the small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Wolves are known to take advantage of linear features to access prey.

Operations

Injury and/or death from predation is probable during the operations phase for moose. Predators will continue to use the road to increase movement speed and likely increase their encounters with moose. Mitigation will involve reclamation/blockage of any temporarily disturbed areas and access roads will reduce forage within these areas, attracting few moose and reducing predator-prey encounters. Road maintenance involving vegetation clearance will create foraging opportunities for moose. Roads may also increase availability of food through roadkill and litter, which may facilitate expansion of boreal scavenging species, such as the black bears which prey on moose calves. It is probable there will be a net negative effect on moose survival in the LSA during road operation due to increased predation. A summary of the net effects relating to injury and death through increased predation during the operations phase based on the Characterization Criteria is presented in **Table 12-63**.

Table 12-63: Criteria Results for Moose Injury or Death Due to Changes in Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of moose may occur due to improved predator access during operations.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in moose injury and death but is unlikely to affect regional moose populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the operations phase.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.
Context	Resilient	Moose are expected to be resilient to a small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Wolves are known to take advantage of linear features to access prey.

Table 12-64 and **Table 12-65** provide summaries of the characterized predicted net effects for moose during the construction and operations phases.

Table 12-64: Summary Table of the Predicted Net Effects for Moose During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Probable
Habitat Alteration or Degradation – Hydrological Changes	Negative	Negligible	LSA	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Probable
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Moderate	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Negative	Low	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Increased Access	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

Table 12-65: Summary Table of the Predicted Net Effects for Moose During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Moderate	Reversible	Possible
Alterations in Movement – Loss of Connectivity	Negative	Low	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Moderate	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All time periods	Medium-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Increased Access	Negative	Moderate	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Certain
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Moderate	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

12.7.2 Furbearers (American Marten)

12.7.2.1 Habitat Loss

Clearance Activities

Construction

There is a predicted net effect of habitat loss for American marten after implementation of mitigation measures. Marten habitat loss will occur during the construction phase, as footprint of the road ROW and supportive infrastructure areas will have vegetation removed, which may permanently alter marten use of suitable habitat, except in areas where forest and/or wetland cover is allowed to regenerate during the operations phase (i.e., construction camps, progressive reclamation aggregate sources areas).

For marten, based on the results of habitat modelling via Ecological Land Classification (refer to Section 11, Assessment of Effects on Vegetation and Wetlands), construction activities will remove 268.1 ha, representing approximately 2.0% of the most suitable marten habitat in the LSA. At the RSA level 373.3 ha of habitat will be removed, or 0.62% of suitable habitat. Overall, suitable marten habitat is common throughout the study areas with 48.4% of the LSA and 51.8% of the RSA consisting of these vegetation communities. Resource Selection Functions (RSFs) modelling was also done for marten. Based on the model, 86.99 ha or approximately 1.9% of high-use habitat in the LSA and 89.65 ha or approximately 0.46% of high-use habitat in the RSA would be removed due to road clearance and construction

Overall, given the small amount of forested habitat removed, the availability of forested habitat and the sensitivity of marten to habitat loss the net effect on marten is moderate. A summary of the net effects relating to the habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-66**.

Table 12-66: Criteria Results for Loss of American Marten Habitat from Clearance Activities – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of marten habitat is expected because of Project construction.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of marten habitat.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All	Construction activities, including habitat removal, are expected to occur through the year.
Duration	Permanent	Any loss of marten habitat during construction is expected to be permanent as the roadbed will remain on the landscape for the foreseeable future.
Frequency	Continuous	Once removed from the Project Footprint, marten habitat will remain unavailable for the foreseeable future.
Context	Moderate	American marten can be sensitive to anthropogenic changes in habitat.
Reversibility	Irreversible	The roadbed is unlikely to be removed, hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Certain	The loss of habitat during construction is certain.

Operations

Loss of American marten habitat is not expected to result from roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in additional loss of marten habitat as repairs should be contained within the existing footprint. A small chance exist that reclaimed temporary laydowns and clearings may be reused during operations, but marten make limited use of regenerating forests so impact would be minimal. Continued use of the quarries is expected but the footprint of the quarry is not expected to be expanded with the potential removals of marten habitat accounted for in the construction phase. Overall, the effect on marten is expected to be negligible. A summary of the net effects relating to the habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-67**.

Table 12-67: Criteria Results for Loss of American Marten Habitat from Clearance Activities – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected because of Project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to occur during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All time periods	Additional loss of marten habitat is not expected during operations.
Duration	Short-term	Any loss of American marten habitat will be short-term, during repairs or maintenance activities.
Frequency	Infrequent	Loss of additional marten habitat is not expected during operations.
Context	Resilient	Effects are likely to affect habitats that are common throughout the Local Study Area and the larger region. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Unlikely	Additional net effects of the Project during operations are unlikely.

12.7.2.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation. For American marten, in terms of habitat degradation, most of the effect is associated with removal of mature upland forests and replacement with early seral communities which are lower quality habitats for marten. While timber harvest can diminish marten use of an area, removals from road construction are limited.

Predictive RSF modeling that converts existing habitats into upland disturbance habitat predicts an increase of 62.6% in the Project Footprint an 18.1% increase in the LSA and an 4.2% increase in the RSA. The effect is likely less than modelled as not all areas cleared for the road are reflective of the upland disturbance category, many wetland areas cleared for road including temporary laydowns, access roads and the road verge will recover as wetland habitats. The results also conflict with most published literature on marten habitat requirements and may be due to the model being based on winter aerial track surveys which would have more difficulty in spotting smaller tracks in denser forest.

Overall, it is probable there will be a small negative effect due to habitat structural change. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-68**.

Table 12-68: Criteria Results for Habitat Alteration or Degradation of American Marten Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as marten would experience changes in habitat structure that diminish use.
Magnitude	Low	The magnitude of the effect is predicted to be low, as changes in habitat structure will be confined to area close to the Project Footprint.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present beyond the construction and operations phases as recovery is slow for northern boreal habitats.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.
Context	Resilient	Effect will be low as the vegetation changes will be minimal and American marten can use some disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Probable	Even with mitigations, it's probable the changes in vegetation structure may affect some individual marten during construction activities.

Operations

As stated in the habitat loss section (**12.7.2.1)**, it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction; however, maintenance of vegetation during road operations will create periodic disturbances and sustain edge effects along the ROW. While mitigations will keep vegetation removals to a minimum, removals for line-of-sight and other safety concerns will maintain the edge and early seral habitats in many locations. Open and young regenerating areas will remain poor habitat for marten due to low structural complexity and higher predation risk common with anthropogenically disturbed sites. Additionally, if reclaimed temporary laydowns and clearings are reused during operations recovery to preferred mature forested ecosites may be delayed.

Overall, it is possible there will be a low net negative effect during the operations phase. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the operations phase based on the Characterization Criteria is presented in **Table 12-69**.

Table 12-69: Criteria Results for Habitat Alteration or Degradation of American Marten Habitat Due to Changes in Vegetation Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; increased edge effects are expected as a result of vegetation clearing.
Magnitude	Low	The magnitude of the effect is predicted to be low, as marten changes in habitat structure will be confined to area close to the Project Footprint.
Geographic Extent	LSA	Edge effects will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present as long as the road remains active and will take time to recover post closure.
Frequency	Continuous	The changes in vegetation structure will be present continuously as long as maintenance activities occur.
Context	Resilient	Effect will be low as the vegetation changes will be minimal and marten can use some disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible that changes to habitat structure may affect some individual marten during operational activities.

Hydrological Changes

Construction

It is probable hydrological changes may result in the alteration or degradation of marten habitat during the construction phase. Roads that bisect peatlands can change flows of surface and subsurface water. Given that peatlands make up most vegetative communities within the Project Footprint, habitat alteration will probably occur. While road design will aim to maintain both surface and subsurface hydrologic flows and will minimize but not eliminate the effects. Based on the assessment of effects on groundwater (Section 8.5) these changes are expected to be low in magnitude but permanent. For marten, as it uses a wide variety of forested habitat the effect of hydrology changes is likely only slight, although distribution of habitats may change. Whether hydrological impacted areas provide marten habitat will depend on severity and changes in structural component like canopy closure, CWD, and snag availability.

After implementation of mitigation methods, a minor negative effect on marten habitat will likely remain. A summary of the net effects relating to the changes in hydrology during the construction phase based on the Characterization Criteria is presented in **Table 12-70**.

Table 12-70: Criteria Results for Habitat Alteration or Degradation of American Marten Habitat Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as some alteration of hydrology is expected as a result of construction.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect could cause a measurable alteration of marten habitat, but the change is likely minimal.
Geographic Extent	LSA	The effect extends into the Local Study Area up to 250m.
Timing	All Time Periods	Alteration of hydrology could occur during any period.
Duration	Permanent	Hydrological changes originating in the construction phase are likely to be permanent as the roadbed will remain even after the operations phase ends.
Frequency	Continuous	Hydrological changes will be continuous.
Context	Resilient	Only a small fraction of marten habitat is likely to be affected.
Reversibility	Irreversible	The roadbed is unlikely to be removed; hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Probable	The alteration of wetland habitat during construction is likely to occur but mitigations should limit any changes.

Sensory Disturbances

Construction

Effects of sensory disturbance on degradation or alteration of American marten habitat is probable during the construction phase. Noise and light may degrade marten habitat by reducing utilization of the area, this may be especially true during construction when activities such as blasting at quarries/pits earth hauling and vegetation clearing may occur causing marten to avoid the ROW and supportive infrastructure. Little information is known about sensory impacts on marten. While marten have been shown to tolerate low level human and vehicle disturbance, levels of disturbance from construction may be expected to cause some change in habitat use. Mitigation measures around permitted hours for construction and operation activities are expected to mitigate some of the potential effect but there is a predicted net effect during construction. Overall, it is possible there will be a net low magnitude negative effect during the construction phase. A summary of the net effects relating to habitat alteration through sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-71**.

Table 12-71: Criteria Results for Habitat Alteration or Degradation of American Marten Habitat Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected because of Project construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could cause a measurable alteration of American marten habitat, but the change is likely small.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area.
Timing	All time periods	Effects on marten would occur during any point as construction will be ongoing throughout the year.
Duration	Short-term	Any alteration of marten habitat due to sensory effects will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities; location and intensity will vary temporally.
Context	Resilient	Marten show some ability to adapt to human presence and activity.
Reversibility	Reversible	Sensory disturbances should cease to exist once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some marten during construction.

Operations

Effects of sensory disturbance on degradation or alteration of marten habitat is possible during the operations phase. For operations, most sensory effects will be related to traffic noise which may degrade marten habitat causing avoidance of areas near roads or decreased habitat value. While martens have been shown to avoid areas with high road density (Aylward et al., 2018) and even in areas with a low-density network of secondary roads, American marten use of habitat is at a reduced density (Robitaille and Aubry 1990). This avoidance may not be due to sensory disturbance as Zielinski et al. 2008 found that American marten tolerate noise disturbance from recreational vehicle use. . In terms of operations, traffic volumes are expected to be relatively low at a maximum of 500 vehicles a day, and marten may habituate to the low traffic noise levels; however, marten may avoid the road during high traffic periods and a low net effect expected due to sensory effects. A summary of the net effects relating to habitat alteration through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-72**.

Table 12-72: Criteria Results for Habitat Alteration or Degradation of American Marten Habitat Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected because of operational activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could cause a measurable alteration of marten habitat, but the change is likely small.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area.
Timing	All time periods	Effects on marten could occur during any point since the road will operate all year.
Duration	Medium-term	Any alteration of marten habitat due to sensory effects will be medium-term, lasting the length of the operations phase.
Frequency	Frequent	Sensory disturbances will occur primarily during daytime when traffic occurs.
Context	Resilient	Marten shows some ability to adapt to human presence and activity.
Reversibility	Reversible	Sensory disturbance changes should be restored once operation of the road concludes.
Likelihood of Occurrence	Probable	Sensory disturbances may affect some marten, but some habituation may occur.

12.7.2.3 Alteration in Movement

Loss of Connectivity

Construction

Alteration in movement of American marten due to changes in habitat connectivity is possible during the construction phase. Vegetation removal, construction activities that could create gaps that affect habitat connectivity. Marten may avoid risky habitats such as large open areas as they are more likely to encounter a predator (landscape of fear). At 35 m wide, the Project ROW is larger than gaps that have been found to limit some marten crossings, wider areas may also be created during construction. After implementation of mitigation methods, a low negative effect on marten movement will likely remain. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-73**.

Table 12-73: Criteria Results for Alteration in Movement of American Marten Due to Loss of Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur because of construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the barrier effect would be small for American marten.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations could happen at any period during the active season for American marten.
Duration	Long-term	Any alteration of marten movement will be medium-term, as the effect will continue past the construction phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	American marten can adapt to habitat fragmentation, especially when gaps are small.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Probable	Even with mitigations, it's probable decreased connectivity may affect some individual marten during construction.

Operations

Alteration in movement of marten due to loss of connectivity is possible during the operations phase. Like the construction phase, decreased connectivity due to the road is expected to result in minor changes to marten movement. Maintenance activities will maintain short vegetation along the shoulder of the road, combined with the 11 m road this open area may decrease marten crossings, most likely because of perceived higher predation potential. Mitigation measures focused on connectivity included minimizing the width of the vegetative clearing but there is a predicted net effect from road construction on marten movement. A summary of the net effects relating to alteration of movement through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-74**.

Table 12-74: Criteria Results for Alteration in Movement of American Marten Due to Loss of Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur because of operation activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as there would be a small drop in connectivity for marten.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the edge of Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen during all seasons.

Characterization Criteria	Result	Rationale
Duration	Long-term	Any alteration of marten movement will be medium-term, lasting throughout the operational phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Marten can adapt to some habitat fragmentation especially when gaps are small.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Probable	Even with mitigations its probable decreased connectivity may affect some individual marten during operations.

Sensory Disturbances

Construction

Alteration in movement of American marten due to sensory disturbance is probable during the construction phase. Marten could alter their movement around the Project Footprint as they avoid disturbances like blasting, clearing, hauling, grading and other human actions during construction. Unpredictable noises from construction activities may cause shifts in marten movement and the presence of humans, equipment and vehicles could alter how marten move in the area. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects but there is a predicted negative low magnitude effect from road construction on marten movement. Given the temporary nature of most construction activities, the effect is expected to occur infrequently and be short-term in nature. A summary of the net effects relating to alteration of movement through sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-75**.

Table 12-75: Criteria Results for Alteration in Movement of American Marten Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected to result from construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few individuals.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen during the entire year.
Duration	Short-term	Any alteration of marten movement will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities; location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small number of individuals and changes would only be temporary.

Characterization Criteria	Result	Rationale
Reversibility	Reversible	Sensory disturbance changes should be restored once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some individuals during construction.

Operations

Alteration in movement of American marten due to sensory disturbance is probable during the operations phase. During operations, traffic noise will be the primary sensory effect on marten as lighting would be limited. Roads are known to have impacts on marten with some association with traffic levels however the connection to noise levels is not clear and marten can use areas with low noise levels. While traffic levels are expected to be low, it is possible that a few individual martens will alter their movement patterns, either spatially or temporally, near the road. Overall, it is possible there will be a low net negative effect due to sensory disturbances during operations. A summary of the net effects relating to alteration of movement through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-76**.

Table 12-76: Criteria Results for Alteration in Movement of American Marten Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected because of operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few individuals.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen during all seasons.
Duration	Medium-term	Any alteration of marten movement by sensory disturbance will be medium-term, during the operations phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of traffic and maintenance activities; location and intensity will vary temporally.
Context	Resilient	While marten show some avoidance of roads, most negative responses are shown at high volumes of traffic.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once operation of the road ceases.
Likelihood of Occurrence	Possible	Sensory disturbances may affect some American marten during operations during periods of higher volume traffic.

12.7.2.4 Injury or Death

Collisions with Vehicles

Construction

Injury or death of American marten due to collisions with vehicles is possible during the construction phase. Strictly enforcing mitigation measures, such as vehicle speed limits, during the construction phase is expected to keep the number of collisions and fatalities between marten and vehicles and equipment low. Within construction sites vehicles will be traveling at low speeds and environmental monitors will watch for marten using the road verge and initiate mitigations if appropriate. Low numbers of vehicles will travel between camps and construction locations, collision risk will be minimized by effect enforcement of speed limits and wildlife training for personal. Marten are primarily nocturnal so encounters with vehicles are expected to be low.

Despite effective mitigations risk of collisions between construction vehicles and marten cannot completely be eliminated within the Project Footprint, and a couple of individuals may be hit over the course of the construction period. A summary of the net effect assessment relating to injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-77**.

Table 12-77: Criteria Results for Injury or Death of American Marten Due to Collisions with Vehicles Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of marten may occur because of collisions with vehicles.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect will cause an insignificant change in marten populations.
Geographic Extent	LSA	The effect will extend to marten moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the year.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and American marten.
Context	Resilient	Marten are expected to be resilient to the small number of mortalities that may result from collisions with construction equipment or vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and marten may occur, despite mitigation measures.

Operations

Injury or death of American marten due to collisions with vehicles is possible during the operations phase. The predicted maximum vehicles travelling on the road is 500 per day, with most of the travel anticipated to take place during daylight hours. Lower traffic levels at night, may mitigate the number of marten deaths as marten are primarily nocturnal. While small mammal deaths are known to be underreported due to lack of vehicular damage, marten deaths from collisions are expected to be low although dispersing juveniles may be more at risk. Mitigations will likely be not as effective during operations as the construction phase as enforcement of vehicle speed will be more difficult. Overall, collisions are expected to occur infrequently throughout the operational lifetime of the road. A summary of the net effect assessment relating to marten injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-78**.

Table 12-78: Criteria Results for Injury or Death of American Marten Due to Collisions with Vehicles – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of marten may occur as a result of collisions with vehicles.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect will cause an insignificant change in marten populations.
Geographic Extent	LSA	The effect will extend to marten moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions between marten and vehicles could occur throughout the year.
Duration	Medium-term	Collisions between marten and vehicles are expected to occur through road operations.
Frequency	Infrequent	As road use will mainly occur during daylight hours, collisions between marten and vehicles are expected to be rare.
Context	Resilient	Marten are expected to be resilient to a low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Probable	Collisions between vehicles and marten are likely to occur, despite mitigation measures which are less effective during the operations phase.

Incidental Take

Construction

Injury and/or death from incidental take is possible during the construction phase for American marten.

Vegetation clearing in marten habitat during road construction, and/or movement of equipment and vehicles though vegetated areas may result in injury or death to adults or kits. Marten use large caliber CWD, tree cavities and red squirrel middens as dens, which are well concealed to avoid predation, making them difficult to spot. Mitigation measures including timing windows will preclude the removal of possible dens within the breeding season in most situations; however, when removal occurs within the denning season mitigation measures such as wildlife sweeps will not eliminate incidental take.

Overall, a net negative effect is probable if maternal den removal occurs. A summary of the net effects relating to injury and death through incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-79**.

Table 12-79: Criteria Results for Injury or Death of American Marten Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of marten may occur because of incidental take.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	Sensitive periods	Incidental take would take place during denning season.
Duration	Short-term	Incidental take from construction activities will stop at the end of the construction phase of the Project.
Frequency	Infrequent	Timing mitigation will limit the number deaths due to clearance activities.
Context	Resilient	While some individuals may be affected, mitigations will limit any effects on marten populations.
Reversibility	Reversible	Incidental take would stop once construction activities are concluded.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some incidental take may occur during construction.

Operations

Injury and/or death from incidental take is unlikely during the operations phase for American Marten. The potential for incidental take would occur over the operating lifetime of the road as periodic clearing of the ROW may occur during operations as part of line-of-sight maintenance or infrastructure repairs. Though smaller in scale, if maintenance occurs during the denning season mitigative measures may not completely avoid incidental take. Almost all large caliber CWD and snags would have been removed during the construction phase so few potential denning sites would remain in the ROW. A summary of the net effects relating to injury and death through incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-80**.

Table 12-80: Criteria Results for Injury or Death of American Marten Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of marten may occur because of incidental take.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as conditions that create incidental take would not be present along most of the ROW.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.

Characterization Criteria	Result	Rationale
Timing	Sensitive periods	Incidental take would take place during denning season.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Timing mitigation will limit the number deaths due to clearance activities.
Context	Resilient	While some individuals may be affected, mitigations will limit any effects on marten populations.
Reversibility	Reversible	Incidental take would stop once construction activities are concluded.
Likelihood of Occurrence	Unlikely	With mitigations, it's unlikely any incidental take will occur during operations.

Changes to Predator-Prey Dynamics

Construction

Injury and/or death from increased predation is probable during the construction phase for American Marten. Linear features are known to increase predator access and movement rates. Effects on marten from predator encounters are predicted to be long term in duration as wildlife are known to use linear features well beyond their operational lifetime. Marten predators including fishers, lynx, fox and raptors such as Great-Horned Owl may use the ROW and secondary access roads for improved movement and hunting success rates. Avoidance of the road by marten will likely limit the number of marten predated from such opportunities, but some deaths will likely still occur. Mitigations involving reclamation (blockage) of any temporarily disturbed areas and access roads will reduce open areas and linear features; however, the effects of increased predation will not be eliminated. A low magnitude negative effect on marten survival is probable during the construction phase. A summary of the net effect assessment relating to injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-81**.

Table 12-81: Criteria Results for American Marten Injury or Death Due to Changes to Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of marten may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as increased predation may remove some individuals but is unlikely to affect regional marten populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the construction phase.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.

Characterization Criteria	Result	Rationale
Context	Resilient	American marten are expected to be resilient to a small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some predation may occur during construction.

Operations

Injury and/or death from predation is probable during the operations phase for American marten. Predators will continue to use the road to increase movement speed and likely increase their encounters with marten. Maintenance clearing during operations will maintain openness along the ROW which may expose marten to higher predation success. Roads may also increase availability of food through roadkill, which may facilitate expansion of boreal scavenging species, such as wolverines and coyotes which prey on beavers as well as attract marten which also feed opportunistically. It is probable there will be a net negative effect on marten survival in the LSA during road operation due to increased predation. A summary of the net effects relating to injury and death through increased predation during the operations phase based on the Characterization Criteria is presented in **Table 12-82**.

Table 12-82: Criteria Results for American Marten Injury or Death Due to Changes in Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of American marten may occur due to improved predator access during operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as increased predation may remove some individuals but is unlikely to affect regional marten populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the operations phase.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.
Context	Resilient	American marten are expected to be resilient to the small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Multiple marten predators are known to take advantage of linear features to access prey.

Increased Access

Construction

Injury and/or death from increased access is possible during the construction phase for American marten. Opening new areas to human development can often result in increased harvest and distance from roads is a predictor for presence of a trapline. While workers or other people entering the construction site may seek opportunities to harvest marten, strict site controls and workplace policies are expected to effectively eliminate the risk of harvesting of marten during the construction phase. Overall, there will be a low negative effect on marten survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the construction phase based on the Characterization Criteria is presented in **Table 12-83**.

Table 12-83: Criteria Results for American Marten Injury or Death Due to Increased Access – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of marten may occur because of increased access.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as mitigations are expected to limit marten harvest during the construction phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Harvest of American marten may occur throughout the year.
Duration	Short-term	The control of access by the proponent will cease at the end of the construction phase.
Frequency	Infrequent	American marten harvest during road construction is expected to be rare.
Context	Resilient	American marten populations are expected to be resilient to the small number of mortalities that may result from harvest during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some harvest may occur during construction.

Operations

Injury and/or death from increased access is certain during the operations phase for American marten. Once the road opens beaver will be exposed to increased trapping pressure. American marten is a heavily trapped furbearer, in Canada it accounts for about 20% of fur sales (Lavoie et al., 2019). Creation of roads in previously inaccessible areas can often lead to increased use by hunters and increased furbearer mortality. American martens are also potentially vulnerable to over trapping which is often associated with better access. The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase. Mitigations will depend on community input and reporting mechanisms. Harvest levels will be dependant on whether traplines get established which will be dependant on community interest. Overall, there will be a moderate negative effect on marten survival in the LSA. A summary of the net effect

assessment relating to injury and death due to increased access during the operations phase based on the Characterization Criteria is presented in **Table 12-84**.

Table 12-84: Criteria Results for American Marten Injury or Death Due to Increased Access – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of marten may occur because of increased access.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in marten injury and death and may locally affect marten populations.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Access to American marten may occur at any time during the year.
Duration	Medium-term	The control of access by the proponent will cease at the end of the operations phase.
Frequency	Frequent	American marten harvest during road operations is expected to occur at regular intervals with increased access to new habitats.
Context	Moderate	American martens are somewhat susceptible to overharvest due to their relatively low reproductive rates.
Reversibility	Reversible	The net effect is reversible once operations conclude.
Likelihood of Occurrence	Certain	Harvest of some marten along the road can be considered certain to happen.

Table 12-85 and **Table 12-86** provide summaries of the characterized predicted net effects for American marten during the construction and operations phases.

Table 12-85: Summary Table of the Predicted Net Effects for American Marten During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Probable
Habitat Alteration or Degradation – Hydrological Changes	Negative	Negligible	LSA	All time periods	Permanent	Continuous	Resilient	Irreversible	Probable
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Resilient	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Probable
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Incidental Take	Negative	Low	Project Footprint	Sensitive periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Increased Access	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible

Table 12-86: Summary Table of the Predicted Net Effects for American Marten During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Infrequent	Resilient	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Probable
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Negligible	LSA	All time periods	Medium-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Incidental Take	Negative	Negligible	Project Footprint	Sensitive periods	Medium-term	Infrequent	Resilient	Reversible	Unlikely
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Increased Access	Negative	Moderate	LSA	All time periods	Medium-term	Frequent	Moderate	Reversible	Certain

12.7.3 Furbearers (North American Beaver)

12.7.3.1 Habitat Loss

Clearance Activities

Construction

There is a predicted net effect of habitat loss for North American beaver after implementation of mitigation measures. Beaver habitat loss will occur during the construction phase, as footprint of the road ROW and supportive infrastructure areas will have vegetation removed, which may permanently alter beaver use of suitable habitat, except in areas where forest and/or wetland cover is allowed to regenerate during the operations phase (i.e., construction camps, progressive reclamation aggregate sources areas). Construction activities would result in the direct loss of 8.1 ha of high suitability habitat, 1.7 ha of moderate suitability habitat and 20.4 ha of low suitability habitat. For the LSA this would represent a lose of 0.57% of high and moderate suitability habitat. For the RSA this represents less than 0.12% in high and moderate suitability habitat. Overall, high and moderate beaver habitat is somewhat uncommon throughout the RSA with 6.04% of the LSA and 6.13% of the RSA consisting of these vegetation communities.

Overall, given that high and moderate habitat is relatively rare, but removals of high use habitat is relatively low, the net effect on beaver is considered moderate. A summary of the net effects relating to the habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-86**.

Table 12-87: Criteria Results for Loss of North American Beaver Habitat from Clearance Activities – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of beaver habitat is expected because of construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable loss of beaver habitat, but very small in relation to the available habitat in the RSA.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All	Construction activities, including habitat removal, are expected to occur through the year.
Duration	Permanent	Any loss of beaver habitat during construction is expected to permanent as the roadbed will remain on the landscape for the foreseeable future.
Frequency	Continuous	Once removed from the Project Footprint, beaver habitat will remain unavailable for the forceable future.
Context	Resilient	Beaver are adaptable to anthropogenic changes in habitat and can modify habitat to make it more suitable.
Reversibility	Irreversible	The roadbed is unlikely to be removed; hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Certain	The loss of habitat during construction is certain.

Operations

Loss of North American Beaver habitat is not expected to result from roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in additional loss of beaver habitat as repairs should be contained within the existing footprint. Beavers may use areas adjacent to the roadway and clearance activities may affect them but losses from within the footprint are accounted for by the construction phase although death of beaver may occur and are discussed in **Section 12.7.3.4**. Continued use of the quarries is expected but the footprint of the quarry is not expected to be expanded with the potential removals of beaver habitat accounted for in the construction phase. Additionally flooded areas of aggregate pits may become beaver habitat.

Overall, the effect on beaver is expected to be negligible. A summary of the net effects relating to the habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-88**.

Table 12-88: Criteria Results for Loss of North American Beaver from Clearance Activities – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected during the operations phase.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to occur during operations.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All time periods	Additional loss of beaver habitat is not expected during operations.
Duration	Short-term	Any loss of beaver habitat will be short-term, during repairs or maintenance.
Frequency	Infrequent	Additional loss of beaver habitat during operations is not expected.
Context	Resilient	Effects are most likely on habitats that are common throughout the RSA. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway is removed.
Likelihood of Occurrence	Unlikely	Additional net effects of the Project during operations are unlikely.

12.7.3.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

Vegetation removals during construction are likely to alter habitat composition in Project Footprint where temporary laydown areas, camps, access roads are created. While some high-quality North American beaver habitat is affected by construction of the road, the routing of the WSR generally avoids areas of open water, riparian and deciduous forest habitat. It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but

most areas will remain free of tall vegetation in the short-term. These temporary areas are likely to moderately benefit North American beaver as they will result in the creation of early successional habitat during and following the construction phase, including deciduous shrubs, which are preferred by North American beaver. The return of intermediate and large sized aspen and other preferred deciduous tree species in mixedwood and deciduous areas will take 20-40 years. Additionally, the construction phase will create areas that are devoid of woody vegetation and are of limited use by beavers.

Overall, it is possible there will be a low negative effect due to habitat structural change. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-89**.

Table 12-89: Criteria Results for Habitat Alteration or Degradation of North American Beaver Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be neutral, as beavers would experience few direct changes in habitat structure.
Magnitude	Low	The magnitude of the effect is predicted to be low, as negative changes in habitat structure for beavers will be confined to a few areas.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present beyond the construction and operational phases since recovery is slow for northern boreal habitats.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.
Context	Resilient	Effect will be low as the vegetation changes will be minimal and beavers can use many disturbed habitats that contain woody vegetation.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Probable	Even with mitigations, it's possible the changes in vegetation structure may affect some individual beavers during construction activities.

Operations

As stated in the habitat loss section (**12.7.3.1**), it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction; however, maintenance of vegetation during road operations will create periodic disturbances and sustain edge effects along the ROW. While mitigations will keep vegetation removals to a minimum, removals for line-of-sight and other safety concerns will maintain the edge in many locations. Open areas devoid of woody vegetation will remain poor habitat for beavers, and, if reclaimed temporary laydowns and clearings are reused during operations, recovery of mature mixedwood and deciduous areas may be delayed.

Overall, it is possible there will be a small net negative effect during the operations phase. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the operations phase based on the Characterization Criteria is presented in **Table 12-90**.

Table 12-90: Criteria Results for Habitat Alteration or Degradation of North American Beaver Habitat Due to Changes in Vegetation Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, increased edge effects are expected because of vegetation clearing.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as beaver habitat structure will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Medium-term	The changes in vegetation structure will be present as long as the road remains active.
Frequency	Continuous	The changes in vegetation structure will be present continuously while maintenance activities occur.
Context	Resilient	Impact will be low as the vegetation changes will be minimal and beavers can use many disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible that changes to habitat structure may affect some individual beavers during operational activities.

12.7.3.3 Alteration in Movement

Loss of Connectivity

Construction

Alteration in movement of North American beaver due to changes in habitat connectivity is possible during the construction phase. Construction fencing may act as a barrier to beaver movement, at least in the short-term. Temporary in water works such as cofferdams for water diversion during construction of bridges and culverts could also act as barriers for beaver in watercourses. Beavers may avoid risky habitats such as large open areas as they are more likely to encounter a predator (landscape of fear) and are devoid of forage that may act as an attractant. Construction activities themselves may alter beaver movement as beavers avoid areas with human scent. The implementation of mitigation measures including minimizing the construction footprint, maintaining water flow at crossings, and providing breaks in stockpiles/windrows are anticipated to result in a low magnitude negative effect on beaver movement. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-91**.

Table 12-91: Criteria Results for Alteration in Movement of North American Beaver Due to Loss of Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may a result of construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect of barriers or lost habitat connections would be small for beaver.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the LSA.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the active season for beaver.
Duration	Medium-term	Any alteration of beaver movement will be medium-term, as the effect will continue beyond construction into the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Beavers can adapt to habitat fragmentation, especially when gaps are small.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some beaver during construction.

Operations

Effects of changes to habitat connectivity on alteration in movement of beaver is possible during the operations phase. Like the construction phase, decreased connectivity due to the road is expected to result in minor changes to beaver movement. Maintenance activities will maintain an open structure along the road and road shoulder and in some areas may decrease beaver crossings because of structural differences compared to the adjacent wetlands and their visibility from the road. The roadbed may also alter beaver movement within their home range or during dispersal by redirecting movement. Mitigation measures focused on connectivity included minimizing vegetative clearing but there is a minor negative predicted net effect from road operations on beaver movement. A summary of the net effects relating to alteration of movement through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-92**.

Table 12-92: Criteria Results for Alteration in Movement of North American Beaver Due to Loss of Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur because of operation activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as while there would be a small drop in connectivity for beaver, dispersal and movement would not be significantly affected.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the edge of the LSA.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen during all seasons.

Characterization Criteria	Result	Rationale
Duration	Medium-term	Any alteration of beaver movement will be medium-term, lasting the duration of the operational phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Beaver can adapt to habitat fragmentation especially when gaps are small.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some beavers during operations.

12.7.3.4 Injury or Death

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures, such as vehicle speed limits, during the construction phase is expected to keep the number of collisions and fatalities between North American Beaver and vehicles and equipment low. Within construction sites vehicles will be traveling at low speeds and environmental monitors will watch for beaver using the road verge and initiate mitigations if appropriate. Low numbers of vehicles will travel between camps and construction locations, collision risk will be minimized by effect enforcement of speed limits and wildlife training for personal. Beavers may cross the road occasionally but will stay in aquatic environments if waterflow is maintained at crossings. Despite effective mitigations risk of collisions between construction vehicles and beavers cannot completely be eliminated within the Project Footprint, and a few individuals may be hit over the course of the construction period. It is expected there will be a negligible net negative effect on beaver injury and death from collisions during the construction phase. A summary of the net effect assessment relating to injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-93**.

Table 12-93: Criteria Results for North American beaver Injury or Death Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as the deaths of beavers may occur because of collisions with vehicles and equipment.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect will cause an insignificant change in beaver populations.
Geographic Extent	LSA	The effect will extend to beavers moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the year.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and beavers.

Characterization Criteria	Result	Rationale
Context	Resilient	Beavers are expected to be resilient to the small number of mortalities that may result from collisions with construction vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and beavers may occur, despite mitigation measures.

Operations

It is expected there will be a negligible net negative effect on beaver injury and death from collisions during the operations phase. The predicted maximum vehicles travelling on the road is 500 per day, with most travel anticipated to take place during daylight hours. Lower traffic levels at night, may mitigate the number of beaver deaths as beaver are primarily nocturnal. While potentially under-reported beaver deaths by collision are likely very low as they primarily stay in aquatic environments if movement corridors are maintained. Mitigations will likely be not as effective during operations as the construction phase as enforcement of vehicle speed will be more difficult. Overall, collisions are expected to occur infrequently throughout the operational lifetime of the road. A summary of the net effect assessment relating to beaver injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-94**.

Table 12-94: Criteria Results for North American Beaver Injury or Death Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as the deaths of beavers may occur because of collisions with vehicles.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect will cause an insignificant change in beaver populations.
Geographic Extent	LSA	The effect will extend to beavers moving between habitats in the LSA from either side of the Project Footprint.
Timing	All Time Periods	Collisions between beavers and vehicles are expected to occur throughout most of the year, with the exception of winter.
Duration	Medium-term	Collisions between beavers and vehicles are expected to occur through road operations.
Frequency	Infrequent	As road use will mainly occur during daylight hours, collisions between beavers and vehicles are expected to be rare.
Context	Resilient	Beavers are expected to be resilient to the low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Probable	Collisions between vehicles and beavers are likely to occur, despite mitigation measures, which may be less effective during the operations phase.

Incidental Take

Construction

Injury and/or death from incidental take is possible during the construction phase for North American beavers. Beavers may be injured or killed if water levels fluctuate during construction activities. Dams and lodges may also need to be removed or damaged as part of clearance activities for construction of the roadbed which could harm beavers both directly and indirectly.

Unlike many species, the characteristics of beaver dams and lodges do not make them difficult to detect. Mitigation measures including timing windows for dam and lodge removal will minimize but not eliminate incidental take. Overall, a net negative effect is probable if lodge and dam removal occurs. A summary of the net effects relating to injury and death through incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-95**.

Table 12-95: Criteria Results for Injury or Death of North American beavers Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of beavers may result from incidental take.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	Sensitive periods	Incidental take would take place at any time of year.
Duration	Short-term	Incidental take from construction activities will stop at the end of the construction phase of the Project.
Frequency	Infrequent	Timing mitigation will limit the number deaths from incidental take.
Context	Resilient	While some individuals may be affected, mitigations will limit any effects on beaver populations.
Reversibility	Reversible	Incidental take would stop once construction activities are concluded.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some incidental take may occur during construction.

Changes to Predator-Prey Dynamics

Construction

Injury and/or death from increased predation is probable during the construction phase for North American beaver. Linear features are known to increase predator access and movement rates. For wolves, the primary predator of beavers in northern Ontario, new roads can act as high-speed movement corridors. Effects on beavers from predator encounters are predicted to be long term in duration as wildlife are known to use linear features well beyond their operational lifetime. While predators, like grey wolves, often avoid areas of high human use like construction camps and active construction areas, it is still probable that other beaver predators like coyotes and bears will predate on beavers if opportunities arise.

A low magnitude negative effect on beaver survival is probable during the construction phase. A summary of the net effect assessment relating to injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-96**.

Table 12-96: Criteria Results for North American Beaver Injury or Death Due to Changes to Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of beaver may occur because of improved predator access during the construction phase.
Magnitude	Low	The magnitude of the effect is predicted to be low, as increased predation may remove some individuals but is unlikely to affect regional beaver populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the construction phase.
Duration	Long-Term	The effect that originated as part of construction would last beyond the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.
Context	Resilient	Beavers are expected to be resilient to the small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some predation may occur during construction.

Operations

Injury and/or death from predation is probable during the operations phase for North American beaver. Predators will continue to use the road to increase movement speed, which will likely increase their encounters with beavers. Road maintenance involving vegetation clearance will create foraging opportunities for beavers. Roads may also increase availability of food through roadkill and litter, which may facilitate expansion of boreal scavenging species, such as wolverines and coyotes that prey on beavers. The magnitude of the impact on beavers will be low as beaver populations recover quickly from predation even when predation removes a large percentage of the local population. It is probable there will be a net negative effect on beaver survival in the LSA during road operation from increased predation. A summary of the net effects relating to injury and death through increased predation during the operations phase based on the Characterization Criteria is presented in **Table 12-97**.

Table 12-97: Criteria Results for North American Beaver Injury or Death Due to Changes in Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of beavers may occur due to improved predator access during operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as increased predation may remove some individuals but is unlikely to affect regional beaver populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the operations phase.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.
Context	Resilient	Beavers are expected to be resilient to the small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Wolves, which are a major beaver predator, are known to take advantage of linear features to access prey.

Increased Access

Construction

Injury and/or death from increased access is possible during the construction phase for North American beaver. Opening new areas to human development can often result in increased harvest. This includes harvest from workers or other people entering the construction site; however, strict site controls and workplace policies are expected to effectively eliminate the risk of increased access on beavers during the construction phase. Problem beavers may need to be removed during the construction phase if they flood construction sites or dam water crossings. Overall, there will be a negligible negative effect on beaver survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the construction phase based on the Characterization Criteria is presented in **Table 12-98**.

Table 12-98: Criteria Results for North American Beaver Injury or Death Due to Increased Access – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of beavers may occur because of increased access.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as mitigations are expected to limit beaver harvest during the construction phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Increased access to beavers may occur throughout the year.
Duration	Short-term	The control of access by the proponent will cease at the end of the construction phase.
Frequency	Infrequent	The hunting and trapping of beavers during road construction is expected to be rare.
Context	Resilient	Beaver populations are expected to be resilient to the small number of mortalities that may result from increased access during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some harvest may occur during construction.

Operations

Injury and/or death from increased access is certain during the operations phase for North American beaver. Once the road opens beaver will be exposed to increased trapping pressure. Beaver has historically been the most trapped furbearer in North America. Construction of roads in previously inaccessible areas can often lead to increased use by hunters and increased furbearer mortality. The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase. Mitigations will depend on community input and reporting mechanisms. Harvest will be dependant on whether traplines get established. Conflicts between beavers and road infrastructure will also affect beaver harvest as maintenance issues when beavers plug culverts or flood roads may lead to lethal removal of beavers. Overall, there will be a moderate negative effect on beaver survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the operations phase based on the Characterization Criteria is presented in **Table 12-99**.

Table 12-99: Criteria Results for North American Beaver Injury or Death Due to Increased Access – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, death of beavers may occur because of increased access.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in beaver injury and death and may locally affect beaver populations.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Increased access to beavers may occur throughout the year.
Duration	Medium-term	The control of access by the proponent will cease at the end of the construction phase.
Frequency	Frequent	Beaver harvest during road operations is expected to occur at regular intervals with increased access to new habitats.
Context	Resilient	Beaver populations are expected to be resilient to the small number of mortalities that may result from increased access during operations as populations recover quickly.
Reversibility	Reversible	The net effect is reversible once operations conclude.
Likelihood of Occurrence	Certain	Harvest of some beaver along the road can be considered certain to happen.

Table 12-100 and **Table 12-101** provide summaries of the characterized predicted net effects for North American beaver during the construction and operations phases.

Table 12-100: Summary Table of the Predicted Net Effects for North American Beaver During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Negative	Low	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Incidental Take	Negative	Low	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Increased Access	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible

Table 12-101: Summary Table of the Predicted Net Effects for North American Beaver During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Negligible	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Negligible	LSA	All time periods	Medium-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Increased Access	Negative	Moderate	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Certain

12.7.4 Bats

12.7.4.1 Habitat Loss

Loss of bat habitat, including maternity roosting habitat and foraging habitat, are expected due to construction activities, including direct removal of habitat for the Project Footprint and long-term changes to terrestrial vegetation community composition within the ROW during road construction. There is a predicted net effect of habitat loss after implementation of mitigation measures.

Clearance Activities

Construction

Road construction will require the removal of 9.22 ha of high use bat habitat in the LSA, comprised of Mixedwood Swamps (2.45 ha), Open Shore Fen/Thicket Swamp (0.02 ha), Open Shore Shrub Fen (0.83 ha) and River/Open Water (0.92 ha). Mixedwood Swamp is rare in the RSAs, typically occurring in very small pockets within a Conifer Swamp mosaic. Overall, the net effect to bats is negative due to the loss of suitable maternity roosting habitat and foraging habitat. A summary of the net effect assessment relating to habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-102**.

Table 12-102: Criteria Results for Loss of Bat Habitat – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of maternity roosting habitat and foraging habitat is undesirable and considered the be adverse.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of bat habitat, but the habitat loss experienced is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of habitat loss will occur throughout the bat active season.
Duration	Permanent	Recovery to existing habitat conditions following construction is unlikely.
Frequency	Continuous	Once bat habitat is removed, the effect will occur continuously.
Context	Moderate	While bats are sensitive to habitat loss, they are moderately resilient to change and have capacity to adapt.
Reversibility	Irreversible	Habitat loss from the road construction will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Habitat loss will occur because of road construction.

Operations

Maintenance of the road including vegetation trimming and repairs to road infrastructure may be required over time, which may result in the removal of suitable roosting habitat that has temporarily re-grown in the Project Footprint. Overall, it is probable there will be a neutral effect on bats. A summary of the net effect assessment relating to habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-103**.

Table 12-103: Criteria Results for Loss of Bat Habitat – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected due to road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable loss of habitat during road operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Although additional loss of bat habitat is not expected during operations, road maintenance may occur at any time during the year.
Duration	Short-term	Any additional loss of bat habitat will be short-term, until vegetation management activities are completed.
Frequency	Infrequent	Loss of additional bat habitat during operations is not expected.
Context	Low	Habitat loss because of vegetation management along the road is expected to be minimal and selective. Bats are expected to be resilient to small habitat losses that may result from vegetation management during road operations.
Reversibility	Reversible	The net effect is reversible as vegetation is expected to regrow once vegetation management is completed.
Likelihood of Occurrence	Unlikely	Additional negative effects of road operation are unlikely to occur.

12.7.4.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

Vegetation removals, creation of the ROW, and construction of the paved and gravel road surfaces may alter or degrade bat habitat near the Project Footprint and extend into the LSA. Changes in vegetation height, density, and community composition all are likely to occur. The ROW will be 35 m wide with a road surface spanning 12 m composed of gravel (eastern half) and asphalt or chip seal treatment (western half) (refer to Section 4.3.1, Project Components: Roadway). After the implementation of mitigation measures, construction of the road may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat, along with the physical habitat structural changes. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to habitat alteration and degradation due to habitat structural change during the construction phase based on the Characterization Criteria is presented in **Table 12-104**.

Table 12-104: Criteria Results for Bat Habitat Alteration or Degradation due to Habitat Structural Change – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as it is undesirable and considered the be adverse relating to alteration of bat habitat.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in bat habitat, and low levels of high use habitat are available in the area.
Geographic Extent	LSA	The effects will extend beyond the Project Footprint into the LSA.
Timing	All Time Periods	The effects are expected to occur throughout the bat active season.
Duration	Medium-term	The effects are expected to extend throughout construction and into road operations.
Frequency	Continuous	Vegetation permanently removed from road construction will generate continuous habitat structural changes.
Context	Moderate	In the context of habitat alteration due to habitat structural change, bats are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	The effects are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Certain	Habitat structural changes will occur because of construction.

Operations

Habitat structural changes will occur in the LSA due to vegetation clearing and changes to vegetation community structure initiated during road construction. These vegetation changes will be maintained during road operations, but no new habitat structural changes are expected to be generated as a result. Overall, the net effect is expected to be neutral. A summary of the net effect assessment relating to habitat structural changes during the operations phase based on the Characterization Criteria is presented in **Table 12-105**.

Table 12-105: Criteria Results for Bat Habitat Alteration or Degradation from Habitat Structural Change – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no new habitat structural changes are expected during road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable change in habitat structure during road operation.
Geographic Extent	LSA	The effects will extend beyond the Project Footprint into the LSA.
Timing	All Time Periods	The effects are expected to occur throughout the bat active season.

Characterization Criteria	Result	Rationale
Duration	Short-term	Any additional structural changes in bat habitat will be short-term, occurring only until vegetation management activities are completed.
Frequency	Infrequent	Vegetation management that may lead to temporary effects will be infrequent.
Context	Low	Habitat structural changes because of vegetation management along the road are expected to be minimal and temporary. Bats are expected to be resilient to the small changes that may result from vegetation management during road operations.
Reversibility	Reversible	The effects are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Unlikely	Additional negative effects because of road operation are unlikely to occur.

Sensory Disturbance

Construction

During construction, activities such as blasting at quarries or pits, earth hauling and vegetation clearing, and the use of lighting around facilities, may reduce the ability of bats to use habitat along the ROW and supportive infrastructure due to sensory disturbances. Mitigation measures around timing (hours of work) for construction activities are expected to mitigate most of the potential effects but there is a predicted net effect from noise due to construction activities. Daytime noise has the potential to affect suitable roosting habitat. Overall, it is probable there will be a net negative effect due to sensory disturbance. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-106**.

Table 12-106: Criteria Results for Bat Habitat Alteration or Degradation- Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to bat habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in bat habitat but is unlikely to affect overall bat populations.
Geographic Extent	LSA	Sensory disturbances altering bat habitat will extend beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering bat habitat are expected to occur through the year during the construction phase.
Duration	Short-term	Sensory disturbances generated by construction activities will conclude after the construction phase.
Frequency	Frequent	Sensory disturbances that alter bat habitat are expected to occur intermittently during construction.
Context	Moderate	In the context of habitat alteration due to sensory disturbances, bats are moderately resilient to change and have the capacity to adapt.

Characterization Criteria	Result	Rationale
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the Project Footprint.
Likelihood of Occurrence	Certain	Sensory disturbances altering bat habitat during construction are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Operations

Noise and light from vehicles travelling on the road during operations may impact habitat along the ROW and supportive infrastructure. It is expected that the road will mainly be used during daylight hours, minimizing effects on bat activity between dusk and dawn; however, road noise generated during daylight hours has the potential to affect day roosts and maternity roosting habitat. Overall, the effect is expected to be negative. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-107**.

Table 12-107: Criteria Results for Bat Habitat Alteration or Degradation Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to bat habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of bat habitat but is unlikely to affect overall bat populations.
Geographic Extent	LSA	Sensory disturbances altering bat habitat will extend beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering bat habitat are expected to occur throughout the bat active season.
Duration	Medium-term	Sensory disturbances altering bat habitat are expected to extend throughout road operations.
Frequency	Frequent	While sensory disturbances altering bat habitat between dusk and dawn during the bat active season are expected to be rare, road use when bats are roosting during the daytime will occur regularly.
Context	Low	Bats are expected to be resilient to sensory disturbances that alter habitat resulting from road operations as the same species are common in urban areas with higher densities of roads and road usage.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Certain	Sensory disturbances altering bat habitat during road operations are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Hydrological Changes

Construction

Bat habitat, particularly foraging habitat, may be altered hydrologically, with construction activities such as grading for road installation resulting in changes to both surface and groundwater water causing flooding or drying of vegetation communities. Based on the assessment of effects on groundwater levels and flow direction (Section 8.5) these changes are certain to result in a net negative effect in the LSA. A summary of the net effect assessment relating to hydrological changes during the construction phase based on the Characterization Criteria is presented in **Table 12-108**.

Table 12-108: Criteria Results for Bat Habitat Alteration or Degradation- Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as it is undesirable and considered the be adverse relating to bat habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of bat habitat but will be unlikely to affect the local bat populations.
Geographic Extent	LSA	The effect will extend into the LSA.
Timing	All Time Periods	Hydrological changes are expected to occur through the year during the construction phase.
Duration	Permanent	Recovery to baseline hydrological conditions following construction is unlikely.
Frequency	Continuous	The effect of hydrological changes resulting from construction will occur continuously.
Context	Moderate	In the context of habitat alteration from hydrological changes, bats are moderately resilient to change and have the capacity to adapt.
Reversibility	Irreversible	Hydrological changes will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Hydrological changes will occur during construction.

Operations

Operation of the road is not anticipated to result in further changes to hydrology. It is possible that changes to hydrology may occur during the operations phase due to culvert and drainage maintenance. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to hydrological changes during the operations phase based on the Characterization Criteria is presented in **Table 12-109**.

Table 12-109: Criteria Results for Bat Habitat Alteration or Degradation Due to Hydrological Changes – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as changes to hydrology are undesirable and considered the be adverse relating to bat habitat.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable hydrological changes during the operations phase.
Geographic Extent	LSA	Hydrological changes will extend beyond the Project Footprint into the LSA.
Timing	All Time Periods	Hydrological changes are expected to occur throughout the bat active season.
Duration	Short-term	Hydrological changes during road operations will be temporary until maintenance and repair activities are completed.
Frequency	Infrequent	Hydrological changes during road operations are expected to be rare.
Context	Low	Bats are expected to be resilient to the small habitat alterations that may result from hydrological changes during road operations.
Reversibility	Reversible	Hydrological changes should be restored once maintenance activities are concluded.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur during the operations phase.

12.7.4.3 Alteration in Movement

Loss of Connectivity

Construction

Bat movement is likely to be altered by construction of the road due to the fragmentation of forest habitat, resulting in a loss of connectivity. There are few effective mitigation measures that can be applied to minimize the effects of habitat fragmentation on bats. Wildlife overpasses are well established in North America as successful solutions for maintaining habitat connectivity across transportation corridors but is unlikely practicable in the context of the proposed road construction and landscape. Specific bat overpass designs have been employed in European countries to varying degrees of success (Berthinussen and Altringham, 2012; Claireau et al., 2018), with poor success potentially attributed to sampling design and not the overpass itself (Claireau et al., 2019). While a gantry overpass with a diamond mesh metal grate has been found as a successful bat crossing solution in France (Claireau et al., 2019), it is unknown

whether that is suitable for bats in Ontario. Therefore, after mitigation measures are applied, it is probable that there will be a net negative effect due to movement barriers created by habitat fragmentation. A summary of the net effect assessment relating to alteration in movement due to the loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-110**.

Table 12-110: Criteria Results for Alteration in Bat Movement Due to Loss of Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of connectivity is undesirable and considered the be adverse relating to alteration of bat movement.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as loss of connectivity will cause a measurable change in bat movement but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Alteration in bat movement due to loss of connectivity is expected to happen throughout the bat active season.
Duration	Medium-term	Effects from loss of connectivity are expected to extend throughout the construction phase and into operations.
Frequency	Continuous	Vegetation permanently removed during road construction will generate continuous effects to habitat connectivity.
Context	Moderate	In the context of alteration in movement due to loss of connectivity, bats are moderately resilient to change and have the capacity to adapt.
Reversibility	Reversible	Effects to bat movement due to loss of connectivity are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Probable	Alteration in bat movement due to loss of connectivity is likely to occur.

Operations

No further fragmentation of forest habitat resulting in loss of connectivity is anticipated to occur during the operations phase. Overall, the effect will be neutral. A summary of the net effect assessment relating to loss of connectivity during the operations phase based on the Characterization Criteria is presented in **Table 12-111**.

Table 12-111: Criteria Results for Alteration in Bat Movement Due to Loss of Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no additional loss of connectivity is expected during road operations.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable loss of connectivity during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.

Characterization Criteria	Result	Rationale
Timing	All Time Periods	Alteration in bat movement due to loss of connectivity may happen throughout the bat active season.
Duration	Medium-term	Alteration in bat movement due to loss of connectivity is expected to extend through the operations phase.
Frequency	Infrequent	Additional loss of connectivity is expected to be rare as road operations will not result in the fragmentation of habitat.
Context	Low	Bats are expected to be resilient to the small alterations in movement that may result from loss of connectivity during road operations.
Reversibility	Reversible	Effects to bat movement due to loss of connectivity are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur as there will be no additional loss of connectivity from road operations.

Sensory Disturbance

Construction

Bat movement is also likely to be altered by sensory disturbances. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of bats as they avoid the road the ROW and supportive infrastructure areas. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects but there is a predicted net negative effect from construction activities on bat movement. A summary of the net effect assessment relating to alteration in bat movement due to sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-112**.

Table 12-112: Criteria Results for Alteration in Bat Movement Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to bat movement.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as sensory disturbances will cause a measurable change in bat movement but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of sensory disturbance on bat movement will occur throughout the bat active season.
Duration	Short-term	Construction-related sensory disturbances altering bat movement will conclude after the completion of the construction phase.
Frequency	Continuous	Sensory disturbances altering bat movement are expected to occur continuously.

Characterization Criteria	Result	Rationale
Context	Moderate	In the context of alteration in movement due to sensory disturbances, bats are moderately resilient to change and have the capacity to adapt.
Reversibility	Reversible	Alteration in movement due to sensory disturbances is reversible once construction and operations activities cease to generate them in the ROW.
Likelihood of Occurrence	Certain	Alteration in movement due to sensory disturbances during construction is certain as mitigation measures cannot entirely return sensory inputs to baseline levels.

Operations

After the implementation of mitigation measures, road operations are also expected to result in alterations in bat movement. While traffic levels are expected to be low, bats may experience a net negative effect due to sensory disturbance from road operation. A summary of the net effect assessment relating to alteration in bat movement due to sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-113**.

Table 12-113: Criteria Results for Alteration in Bat Movement Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to bat movement.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in bat movement but is unlikely to affect overall bat populations.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of sensory disturbance on bat movement will occur throughout the bat active season.
Duration	Medium-term	Alteration in bat movement due to sensory disturbances is expected to extend through the operations phase.
Frequency	Frequent	Sensory disturbances that alter bat movement are expected to occur intermittently during the operations phase.
Context	Moderate	In the context of alteration in movement due to sensory disturbances, bats are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Alteration in movement due to sensory disturbances is reversible once construction and operations activities cease to generate them in the ROW.
Likelihood of Occurrence	Possible	Alteration in movement due to sensory disturbances during the operations phase may occur but is unlikely as traffic levels are expected to be low and will mainly travel during daylight hours.

12.7.4.4 Injury or Death

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures during the construction phase is expected to keep the number of collisions and fatalities between bats and vehicles and equipment to a negligible level. Construction is expected to take place largely between 7am and 7pm, avoiding the period between dusk and dawn when bats are most active during their active season. Risk of collisions between construction vehicles and bats cannot completely be eliminated, therefore it is expected there will be a net negative effect on bat injury and death from collisions during the construction phase. A summary of the net effect assessment relating to bat injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-114**.

Table 12-114: Criteria Results for Bat Injury or Death Due to Collisions with Vehicles – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; collisions with construction vehicles are undesirable and considered to be adverse relating to bat injury and death.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible; no measurable change in bat injury or death is expected during construction.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the bat active season.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and bats.
Context	Low	Bats are expected to be resilient to the small number of mortalities that may result from collisions with construction vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and bats may occur, despite mitigation measures.

Operations

Mortality during the operational phase is not expected to be eliminated by mitigations but is expected to occur throughout the bat active season where flyways cross the road, such as near watercourses and upland forest habitat. The predicted maximum vehicles travelling on the road is 500 per day, with most of the travel anticipated to take place during daylight hours. Overall, a net negative effect is expected due to vehicle traffic. A summary of the net effect assessment relating to bat injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-115**.

Table 12-115: Criteria Results for Bat Injury or Death Due to Collisions with Vehicles – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as collisions between bats and vehicles are undesirable and considered the be adverse relating to bat injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in the amount of bat injury and death but is unlikely to affect overall bat populations.
Geographic Extent	Project Footprint	Collisions between bats and vehicles will be limited to the Project Footprint.
Timing	All Time Periods	Collisions between bats and vehicles are expected to occur throughout the bat active season.
Duration	Medium-term	Collisions between bats and vehicles are expected to occur through road operations.
Frequency	Infrequent	Since road use will mainly occur during daylight hours, collisions between bats and vehicles are expected to be rare.
Context	Moderate	Bats are expected to be moderately resilient to the low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Possible	While it expected to be rare, vehicles travelling between dusk and dawn during the bat active season may result in collisions.

Incidental Take

Construction

After mitigation measures have been applied, including timing windows avoiding vegetation clearing in bat habitat during the maternity roosting season (May 1 – August 31), it is less likely that bat injury or death will occur. Overall, a net neutral effect is likely. A summary of the net effect assessment relating to bat injury and death resulting from incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-116**.

Table 12-116: Criteria Results for Bat Injury or Death Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as mitigation measures are expected to effectively manage incidental take by limiting vegetation removal in bat habitat within the maternity roosting season.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as no measurable change in the amount of bat injury or death is expected during construction.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the bat active season.

Characterization Criteria	Result	Rationale
Duration	Short-term	Incidental take from construction activities will cease at the end of the construction phase.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Low	Bats are expected to be resilient to the small number of mortalities that may result from incidental take during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur.

Operations

Vegetation trimming in bat habitat during road operation may result in injury or death to bats if conducted during the active season, even after mitigation measures have been applied. Bats have very small body sizes, ranging from just a few centimetres to 15 cm, and can roost individually in leaf clusters, knot holes, loose bark, and cracks and crevices of trees, making them difficult to detect if a visual inspection is conducted prior to vegetation clearing. Overall, a net negative effect is possible if vegetation clearing occurs during the active season. A summary of the net effect assessment relating to bat injury and death resulting from incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-117**.

Table 12-117: Criteria Results for Bat Injury or Death Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of bats may occur due to incidental take road maintenance activities (i.e., vegetation management).
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in the amount of bat injury or death but is unlikely to affect overall bat populations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the bat active season.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Low	Bats are expected to be resilient to the small number of mortalities that may result from incidental take during road operation.
Reversibility	Reversible	The net effect is reversible once road operation concludes.
Likelihood of Occurrence	Possible	While it expected to be rare, vegetation management activities during the bat active season may result in incidental take, resulting in injury or death.

Changes to Predator-Prey Dynamics

Construction

Effects on bat survival from improved predator access and movement rates is possible. Mitigation involving reclamation/blockage of any temporarily disturbed areas and access roads after construction will minimize the effect as these actions will reduce open areas and linear features; however, the effects of changes to predator-prey dynamics via increased predation cannot be eliminated. It is possible there will be a net negative effect on bat survival in the LSA during construction due to changes to predatory-prey dynamics. A summary of the net effect assessment relating to bat injury and death due to changes to predator-prey dynamics during the construction phase based on the Characterization Criteria is presented in **Table 12-118**.

Table 12-118: Criteria Results for Bat Injury or Death Due to Changes to Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of bats may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in the amount of bat injury or death but is unlikely to affect overall bat populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the bat active season.
Duration	Long-term	Improved predator access is expected to remain throughout construction and extend beyond the operations phase.
Frequency	Infrequent	Predation events are expected to be rare as there are no predators that specialize on bats in the region.
Context	Low	Bats are expected to be resilient to the small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has been re-established in the linear features following operations.
Likelihood of Occurrence	Possible	While it is expected to be rare, improved predator access may result in increased predation of bats.

Operations

Predators may be attracted to the road during operations due to increased prey availability, such as rodents using roadside habitat in the managed ROW. It is possible there will be a net negative effect on bat survival in the LSA during road operation due to increased predation. A summary of the net effect assessment relating to bat injury and death due to predators during the operations phase based on the Characterization Criteria is presented in **Table 12-119**.

Table 12-119: Criteria Results for Bat Injury or Death Due to Changes to Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as predation of bats is undesirable and considered to be adverse relating to bat injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in the amount of bat injury and death but is unlikely to affect overall bat species populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the bat active season.
Duration	Medium-term	Increased predation due predators attracted to the road during operations is expected to stop after the operations phase.
Frequency	Infrequent	Predation events are expected to be rare as there are no predators that specialize on bats in the region.
Context	Low	Bats are expected to be resilient to the small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Increased predation is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Possible	Predators attracted to the ROW during road operations will possibly depredate bats but are not known to specialize on these species.

Increased Energy Expenditures

Construction

The cumulative effects of habitat loss, alteration and degradation, and alteration of movements on bats during construction will likely lead to increased efforts to travel between roosting and foraging habitats as well as to successfully forage for food in habitats near the Project Footprint. Mitigation measures applied during construction to the individual effects will cumulatively minimize increased energy expenditure to some degree but cannot eliminate it. It is possible there will be a net negative effect on Bat survival in the LSA during construction due to increased energy expenditures for bats. A summary of the net effect assessment relating to bat injury and death due to increased energy expenditure during the construction phase based on the Characterization Criteria is presented in **Table 12-120**.

Table 12-120: Criteria Results for Bat Injury or Death Due to Increased Energy Expenditure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of bats may occur due to increased energy expenditure during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as increased energy expenditure will cause a measurable change in bat injury or death but is unlikely to affect overall bat species populations.
Geographic Extent	LSA	The effect will extend to the LSA since bats will be travelling away from the Project Footprint to seek suitable habitat.
Timing	All Time Periods	Increased energy expenditure may occur at any time during the bat active season.
Duration	Medium-term	Increased energy expenditure from road construction is expected to continue throughout construction and extend into the operations phase.
Frequency	Frequent	Increased energy expenditure in the LSA is expected to be frequent during construction.
Context	Low	Bats are expected to be resilient to the small number of mortalities that may result from increased energy expenditure during the construction phase.
Reversibility	Reversible	Increased energy expenditure is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Possible	While it is expected to be rare, increased energy expenditure may result in increased mortality of bats.

Operations

Bats may experience increased energy expenditures during road operations because of other effects such as alteration in movement due to road avoidance, improved predator access, and sensory disturbances generated by road operations. A net negative effect is possible. A summary of the net effect assessment relating to bat injury and death due to increased energy expenditure during the operations phase based on the Characterization Criteria is presented in **Table 12-121**.

Table 12-121: Criteria Results for Bat Injury or Death Due to Increased Energy Expenditure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of bats may occur due to increased energy expenditure during operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as increased energy expenditure will cause a measurable change in bat injury and death but is unlikely to affect overall bat populations.
Geographic Extent	LSA	The effect will extend to the LSA as bats will be travelling away from the Project Footprint to avoid sensory effects and seek suitable habitat.
Timing	All Time Periods	Increased energy expenditure may occur at any time during the bat active season.

Characterization Criteria	Result	Rationale
Duration	Medium-term	Increased energy expenditure from road construction is expected to continue through the operations phase.
Frequency	Frequent	Increased energy expenditure in the LSA is expected to be frequent during operations.
Context	Low	Bats are expected to be resilient to a small number of mortalities that may result from increased energy expenditure during the operations phase.
Reversibility	Reversible	Increased energy expenditure is expected to end once vegetation has been re-established in the linear features following operations.
Likelihood of Occurrence	Possible	While it is expected to be rare, increased energy expenditure may result in increased mortality of bats.

Table 12-122 and **Table 12-123** provide summaries of the characterized predicted net effects for bats during the construction and operations phases.

Table 12-122: Summary Table of the Predicted Net Effects for Bats During the Constructions Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Moderate	Irreversible	Certain
Habitat Alteration or Degradation – Structural Change	Negative	Moderate	LSA	All Time Periods	Medium Term	Continuous	Moderate	Reversible	Certain
Habitat Alteration or Degradation – Hydrological Changes	Negative	Low	LSA	All Time Periods	Permanent	Continuous	Moderate	Irreversible	Certain
Habitat Alteration of Degradation – Sensory Disturbance	Negative	Low	LSA	All Time Periods	Short-term	Frequent	Moderate	Reversible	Certain
Alteration in Movement – Loss of Connectivity	Negative	Moderate	Project Footprint	All Time Periods	Medium-term	Continuous	Moderate	Reversible	Probable
Alteration in Movement – Sensory Disturbance	Negative	Moderate	Project Footprint	All Time Periods	Short-term	Continuous	Moderate	Reversible	Certain
Injury or Death – Collisions with Vehicles	Negative	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Possible
Injury or Death – Incidental Take	Neutral	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All Time Periods	Long-term	Infrequent	Low	Reversible	Possible
Injury or Death – Increased Energy Expenditure	Negative	Low	LSA	All Time Periods	Medium-term	Frequent	Low	Reversible	Possible

Table 12-123: Summary Table of the Predicted Net Effects for Bats During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Habitat Alteration or Degradation – Habitat Structural Change	Neutral	Negligible	LSA	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Habitat Alteration or Degradation – Hydrological Changes	Negative	Negligible	LSA	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All Time Periods	Medium-term	Frequent	Low	Reversible	Certain
Alteration in Movement – Loss of Connectivity	Neutral	Negligible	Project Footprint	All Time Periods	Medium-term	Infrequent	Low	Reversible	Unlikely
Alteration in Movement – Sensory Disturbance	Negative	Low	Project Footprint	All Time Periods	Medium-term	Frequent	Moderate	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Low	Project Footprint	All Time Periods	Medium-term	Infrequent	Moderate	Reversible	Possible
Injury or Death – Incidental Take	Negative	Low	Project Footprint	All Time Periods	Medium-term	Infrequent	Low	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All Time Periods	Medium-term	Infrequent	Low	Reversible	Possible
Injury or Death – Increased Energy Expenditure	Negative	Low	LSA	All Time Periods	Medium-term	Frequent	Low	Reversible	Possible

12.7.5 Forest Songbirds (Tennessee Warbler and Orange-crowned Warbler)

12.7.5.1 Habitat Loss

Loss of migratory forest songbird habitat, including breeding habitat and foraging habitat, are expected due to construction activities, including direct removal of habitat for the Project Footprint and permanent changes to terrestrial vegetation community composition within the ROW during road construction. There is a predicted net effect of habitat loss after implementation of mitigation measures.

Clearance Activities

Construction

Road construction will require the removal of 150.80 ha (8.0%) of Conifer Forest, 4.21 ha (3.32%) of Mixed Forest and 1.60 ha (3.13%) of hardwood Forest in the LSA, representing approximately 7.58% of available migratory forest songbird habitat in the LSA. Overall, the net effect to migratory forest songbirds is negative due to the loss of suitable breeding and foraging habitat. A summary of the net effect assessment relating to habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-124**.

Table 12-124: Criteria Results for Loss of Forest Songbird Habitat – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of breeding habitat and foraging habitat is undesirable and considered to be adverse.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of migratory forest songbird habitat, but the habitat loss experienced is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of habitat loss will occur throughout the songbird active season.
Duration	Permanent	Recovery to baseline habitat conditions following construction is unlikely.
Frequency	Continuous	Once habitat is removed, the effect will occur continuously.
Context	Moderate	While migratory forest songbirds are sensitive to habitat loss, they are moderately resilient to change and have the capacity to adapt.
Reversibility	Irreversible	Habitat loss from the road construction will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Habitat loss will occur because of road construction.

Operations

Maintenance of the road including vegetation trimming and repairs to road infrastructure may be required over time, which may result in the removal of suitable breeding and foraging habitat that has temporarily re-grown in the Project Footprint. Overall, it is probable there will be a neutral effect on Migratory Forest Songbirds. A summary of the net effect assessment relating to habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-125**.

Table 12-125: Criteria Results for Loss of Forest Songbird Habitat – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected due to road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable loss of habitat during road operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Additional loss of migratory forest songbird habitat is not expected during operations, but road maintenance may occur at any time during the year.
Duration	Short-Term	Any additional loss of migratory forest songbird habitat will be short-term, until vegetation management activities are completed.
Frequency	Infrequent	Additional loss of migratory forest songbird habitat during operations is not expected.
Context	Resilient	Habitat loss because of vegetation management along the road is expected to be minimal and selective. Migratory forest songbirds are expected to be resilient to the small habitat losses that may result from vegetation management during road operations.
Reversibility	Reversible	The net effect is reversible as vegetation is expected to regrow once vegetation management is completed.
Likelihood of Occurrence	Unlikely	Additional negative effects because of road operation are unlikely to occur.

12.7.5.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

Vegetation removals, creation of the ROW and construction of the paved and gravel road surfaces may alter or degrade Migratory Forest Songbird habitat near the Project Footprint, extending into the LSA by generating edge effects that change vegetation height, density, and community composition. The ROW will be 35 m wide with a road surface spanning 12 m composed of gravel (eastern half) and asphalt or chip seal treatment (western half) (refer to Section 4.3.1). After the implementation of mitigation measures, construction of the road may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat. Overall, the net effect is expected to be negative. A summary of the net effect

assessment relating to habitat alteration and degradation due to edge effects during the construction phase based on the Characterization Criteria is presented in **Table 12-126**.

Table 12-126: Criteria Results for Forest Songbird Habitat Alteration or Degradation due to Habitat Structural Change- Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as edge effects are undesirable and considered the be adverse relating to alteration of migratory forest songbird habitat.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in migratory forest songbird habitat, and low levels of high use habitat are available in the area.
Geographic Extent	LSA	Edge effects will occur beyond the Project Footprint into the Local Study Area.
Timing	All Time Periods	Edge effects are expected to occur throughout the migratory forest songbird active season.
Duration	Permanent	Recovery to baseline habitat conditions following construction is unlikely. ROW width is likely to persist, and even unpaved road corridors 8-10 m in width have been found to reduce relative abundance of migratory birds.
Frequency	Continuous	Vegetation permanently removed by road construction will generate continuous edge effects.
Context	Moderate	In the context of habitat alteration due to edge effects, migratory forest songbirds are moderately resilient to change and have the capacity to adapt.
Reversibility	Irreversible	Edge effects from the construction of the ROW are unlikely to be reversed.
Likelihood of Occurrence	Probable	The effect is likely to occur.

Operations

Edge effects will occur in the LSA due to vegetation clearing and changes to vegetation community structure initiated during road construction. These vegetation changes will be maintained during road operations, but no new edge effects are expected to be generated as a result. The increased early successional habitat created during the construction phase will be maintained in the ROW during operations. Vegetation management may lead to temporary increases in early successional habitat. Overall, the net effect from operations is expected to be neutral. A summary of the net effect assessment relating to edge effects during the operations phase based on the Characterization Criteria is presented in **Table 12-127**.

Table 12-127: Criteria Results for Migratory Forest Songbirds Habitat Alteration or Degradation Due to Habitat Structural Change – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no new structural changes are expected during road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable change in edge effects during road operation.
Geographic Extent	LSA	Habitat structural change will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	The changes in vegetation structure will be present during all periods.
Duration	Short-term	Any additional habitat structural change in migratory forest songbird habitat will be short-term, ceasing shortly after vegetation management activities have been completed.
Frequency	Infrequent	Vegetation management that may lead to temporary edge effects will be infrequent.
Context	Low	Habitat structural change because of vegetation management along the road are expected to be minimal and temporary. Migratory forest songbirds are expected to be resilient to effects that may result from vegetation management during road operations.
Reversibility	Reversible	Habitat structural changes are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Unlikely	Any additional negative effects because of road operations is unlikely to occur.

Sensory Disturbance

Construction

During construction, activities such as blasting at quarries or pits, earth hauling and vegetation clearing, and the use of lighting around facilities may reduce the ability of Migratory Forest Songbirds to utilize habitat along the ROW and supportive infrastructure due to sensory disturbances. Noise abatement mitigation measures will not entirely prevent daytime noise, which has the potential to affect suitable breeding and foraging habitat. Overall, it is probable there will be a net negative effect due to sensory disturbance. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-128**.

Table 12-128: Criteria Results for Migratory Forest Songbird Habitat Alteration or Degradation Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to the alteration of migratory forest songbird habitat.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable alteration of migratory forest songbird habitat, such as reduced foraging efficiency, but is likely within the adaptive capabilities of these species.
Geographic Extent	LSA	Sensory disturbances altering migratory forest songbird habitat will extend beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering migratory forest songbird habitat are expected to occur through the year during the construction phase.
Duration	Short-term	Sensory disturbances generated by construction activities that alter migratory forest songbird habitat are expected to stop after the construction phase.
Frequency	Frequent	Sensory disturbances that alter migratory forest songbird habitat are expected to occur intermittently during construction.
Context	Moderate	In the context of habitat alteration due to sensory disturbances, migratory forest songbirds are moderately resilient to change and have the capacity to adapt.
Reversibility	Reversible	Sensory disturbances are reversible when construction and operations activities generating them stop in Project Footprint.
Likelihood of Occurrence	Certain	Sensory disturbances altering migratory forest songbird habitat during construction are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Operations

Noise and light from vehicles travelling on the road during operations may impact habitat along the ROW and supportive infrastructure. It is expected that the road will mainly be used during daylight hours when Migratory Forest Songbirds are primarily active. Use of the road during this time may cause sensory disturbances that can degrade breeding and foraging habitat. Overall, the effect is expected to be negative. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-129**.

Table 12-129: Criteria Results for Migratory Forest Songbird Habitat Alteration or Degradation Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of migratory forest songbird habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of Migratory Forest Songbird habitat but is unlikely to affect overall Migratory Forest Songbird species populations.
Geographic Extent	LSA	Sensory disturbances altering Migratory Forest Songbird habitat will occur beyond the Project Footprint into the Local Study Area.
Timing	All Time Periods	Sensory disturbances altering Migratory Forest Songbird habitat are expected to occur throughout the bird active season.
Duration	Medium-term	Sensory disturbances altering Migratory Forest Songbird habitat are expected to extend through road operations.
Frequency	Frequent	Sensory disturbances are expected to occur frequently during daylight hours during the Migratory Forest Songbird active season.
Context	Moderate	In the context of habitat alteration due to sensory disturbances, Migratory Forest Songbirds are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Certain	Sensory disturbances altering Migratory Forest Songbird habitat during road operations are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

12.7.5.3 Alteration in Movement

Connectivity

Construction

Migratory forest songbird movement is likely to be altered because of the fragmentation of forest habitat caused by vegetation removals during construction. There are few effective mitigation measures that can be applied to minimize the effects of habitat fragmentation on Migratory Forest Songbirds. After mitigation measures are applied, there will be a moderate net negative effect to some Migratory Forest Songbirds due to habitat fragmentation. A summary of the net effect assessment relating to alteration in movement due to habitat fragmentation during the construction phase based on the Characterization Criteria is presented in **Table 12-130**.

Table 12-130: Criteria Results for Alteration in Migratory Forest Songbird Movement Due to Habitat Fragmentation – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as habitat fragmentation is undesirable and considered the be adverse relating to alteration of Migratory Forest Songbird movement.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as habitat fragmentation will cause a measurable change in Migratory Forest Songbird movement but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Alteration in Migratory Forest Songbird movement due to habitat fragmentation is expected to happen throughout their active season.
Duration	Medium-term	Effects from habitat fragmentation are expected to extend through the operations phase.
Frequency	Continuous	Vegetation permanently removed during road construction will generate continuous effects to habitat connectivity.
Context	Moderate	In the context of alteration in movement due to habitat fragmentation, Migratory Forest Songbirds are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Effects to Migratory Forest Songbird movement due to habitat fragmentation are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Probable	Alteration in Migratory Forest Songbird movement due to habitat fragmentation is likely to occur.

Operations

No further fragmentation of forest habitat is anticipated to occur during the operations phase. Overall, the effect will be neutral. A summary of the net effect assessment relating to habitat fragmentation during the operations phase based on the Characterization Criteria is presented in **Table 12-131**.

Table 12-131: Criteria Results for Alteration in Migratory Forest Songbird Movement Due to Habitat Fragmentation – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no additional habitat fragmentation is expected during road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable change in habitat fragmentation during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Alteration in Migratory Forest Songbird movement due to habitat fragmentation may happen throughout their active season.
Duration	Short-term	Effects from vegetation management during operations will be short-term.

Characterization Criteria	Result	Rationale
Frequency	Infrequent	Additional habitat fragmentation is expected to be rare as road operations will not result in the fragmentation of habitat.
Context	Moderate	In the context of alteration in movement due to habitat fragmentation, Migratory Forest Songbirds are moderately resilient to change and are able to adapt to small variations.
Reversibility	Reversible	Effects to Migratory Forest Songbird movement due to habitat fragmentation are reversible if the cleared vegetation is restored.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur.

Sensory Disturbance

Construction

Migratory Forest Songbird movement is also likely to be altered by sensory disturbances. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of Migratory Forest Songbirds as they avoid the road, the ROW, and supportive infrastructure areas. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects but there is a predicted net negative effect from construction activities on Migratory Forest Songbird movement. A summary of the net effect assessment relating to alteration in Migratory Forest Songbird movement due to sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-132**.

Table 12-132: Criteria Results for Alteration in Migratory Forest Songbird Movement Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to Migratory Forest Songbird movement.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as sensory disturbances will cause a measurable change in Migratory Forest Songbird movement but is likely within the adaptive capability of these species.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area.
Timing	All Time Periods	The effect of sensory disturbance on Migratory Forest Songbird movement will occur throughout their active season.
Duration	Short-term	Construction-related sensory disturbances altering Migratory Forest Songbird movement will conclude after the completion of the construction phase.
Frequency	Continuous	Sensory disturbances altering Migratory Forest Songbird movement are expected to occur continuously.
Context	Moderate	In the context of alteration in movement due to sensory disturbances, Migratory Forest Songbirds are moderately resilient to change and have capacity to adapt.

Characterization Criteria	Result	Rationale
Reversibility	Reversible	Alteration in movement due to sensory disturbances is reversible when sensory disturbances are no longer generated in the ROW.
Likelihood of Occurrence	Certain	Alteration in movement due to sensory disturbances during construction is certain as mitigation measures cannot entirely minimize light, noise, and other sensory effects that are generated.

Operations

After the implementation of mitigation measures, road operations are also expected to result in changes to Migratory Forest Songbird movement. While traffic levels are expected to be low, some Migratory Forest Songbird species may experience a net negative effect from sensory disturbance during road operation. A summary of the net effect assessment relating to alteration in movement due to sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-133**.

Table 12-133: Criteria Results for Alteration in Migratory Forest Songbird Movement Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to Migratory Forest Songbird movement.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Migratory Forest Songbird movement but is unlikely to affect overall Migratory Forest Songbird species populations.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area.
Timing	All Time Periods	The effect of sensory disturbance on Migratory Forest Songbird movement will occur throughout their active season.
Duration	Medium-term	Alteration in Migratory Forest Songbird movement due to sensory disturbances is expected to extend throughout the operations phase.
Frequency	Frequent	Sensory disturbances that alter Migratory Forest Songbird movement are expected to occur intermittently during the operations phase.
Context	Moderate	In the context of alteration in movement due to sensory disturbances, Migratory Forest Songbirds are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once operation of the road ceases.
Likelihood of Occurrence	Possible	Alteration in movement due to sensory disturbances during the operations phase may occur but is unlikely as traffic levels are expected to be low and will mainly travel during daylight hours.

12.7.5.4 Injury or Death

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures, such as vehicle speed limits, during the construction phase is expected to keep the number of collisions and fatalities between Migratory Forest Songbirds and vehicles and equipment low. Risk of collisions between construction vehicles and Migratory Forest Songbirds cannot completely be eliminated; therefore, it is expected there will be a net negative effect on Migratory Forest Songbird injury and death from collisions during the construction phase. A summary of the net effect assessment relating to injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-134**.

Table 12-134: Criteria Results for Migratory Forest Songbird Injury or Death Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; collisions with construction vehicles are undesirable and considered to be adverse relating to Migratory Forest Songbird injury and death.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible; no measurable change in Migratory Forest Songbird injury and mortality is expected during construction.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the migratory forest songbird active season.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and Migratory Forest Songbirds.
Context	Low	Migratory Forest Songbirds are expected to be resilient to the small number of mortalities that may result from collisions with construction vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and Migratory Forest Songbird may occur, despite mitigation measures.

Operations

Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the Migratory Forest Songbird active season near foraging and breeding habitats. The predicted maximum number of vehicles travelling on the road is 500 per day, with most travel anticipated to take place during daylight hours. Overall, a net negative effect is expected to result from vehicle traffic. A summary of the net effect assessment relating to Migratory Forest Songbird injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-135**.

Table 12-135: Criteria Results for Migratory Forest Songbird Injury or Death Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as collisions between Migratory Forest Songbirds and vehicles are undesirable and considered the be adverse relating to Migratory Forest Songbird injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Migratory Forest Songbird injury and death but is unlikely to affect overall Migratory Forest Songbird species populations.
Geographic Extent	Project Footprint	Collisions between Migratory Forest Songbirds and vehicles will be limited to the Project Footprint.
Timing	All Time Periods	Collisions between Migratory Forest Songbirds and vehicles are expected to occur throughout their active season.
Duration	Medium-term	Collisions between Migratory Forest Songbird and vehicles are expected to occur throughout road operations.
Frequency	Infrequent	Since road use will mainly occur during daylight hours, collisions between Migratory Forest Songbirds and vehicles are expected to be infrequent.
Context	Moderate	Migratory Forest Songbird are expected to be moderately resilient to a low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Certain	Passerines make up 65.1% of avian road mortalities in Canada, and woodland birds that forage on the bark and in foliage of trees are most vulnerable. Migratory Forest Songbird injuries and deaths will occur during the operations phase from vehicles using the road.

Incidental Take

Construction

After mitigation measures have been applied, including timing windows for (i.e., restrictions to clear) vegetation in Migratory Forest Songbird habitat during the breeding season (May 1 – July 31), it is less likely that bird injury or death will occur. Overall, a net neutral effect is likely. A summary of the net effect assessment relating to injury and death resulting from incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-136**.

Table 12-136: Criteria Results for Migratory Forest Songbird Injury or Death Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be neutral, as deaths of forest songbirds may occur due to vegetation removal in Migratory Forest Songbird habitat during the breeding season.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as no measurable change in Migratory Forest Songbird injury and death is expected during construction.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the bird active season.
Duration	Short-term	Incidental take from construction activities will cease at the end of the construction phase.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Resilient	Migratory Forest Songbirds are expected to be resilient to the small number of mortalities that may result from incidental take during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur.

Operations

Vegetation trimming in Migratory Forest Songbird habitat during road operation may result in injury or death to birds if conducted during the breeding season, even after mitigation measures have been applied. The characteristics of Migratory Forest Songbird nests can make them difficult to detect if a visual inspection is conducted prior to vegetation clearing. Overall, a net negative effect is possible if vegetation clearing occurs during the active season. A summary of the net effect assessment relating to injury and death resulting from incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-137**.

Table 12-137: Criteria Results for Migratory Forest Songbird Injury or Death Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Migratory Forest Songbirds may occur due to incidental take from vegetation management conducted during road operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Migratory Forest Songbird injury and death but is unlikely to affect overall Migratory Forest Songbird populations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the Migratory Forest Songbird active season.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Low	Migratory Forest Songbirds are expected to be resilient to the small number of mortalities that may result from incidental take during road operation.
Reversibility	Reversible	The net effect is reversible once road operation concludes.
Likelihood of Occurrence	Possible	While it expected to be rare, vegetation management activities during the bird active season may result in incidental take, causing Migratory Forest Songbird injury or death.

Changes to Predator-Prey Dynamics

Construction

Vegetation Clearing during construction of the ROW may improve access for predators of migratory forest songbirds, thereby increasing pressure on these species. Mitigation involving reclamation (blockage) of any temporarily disturbed areas and access roads after construction will minimize potential effects as these actions will reduce open areas and linear features; however, the effects of increased predation cannot be eliminated. Effects on Migratory Forest Songbirds from predator encounters from construction of the road are predicted to be long term in duration as predators are known to use linear features well beyond their operational lifetime. Overall, there will be a net negative effect on Migratory Forest Songbird survival in the LSA. A summary of the net effect assessment relating to injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-138**.

Table 12-138: Criteria Results for Migratory Forest Songbird Injury or Death Due to Changes in Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Migratory Forest Songbirds may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Migratory Forest Songbird injury and death but is unlikely to affect overall Migratory Forest Songbird species populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the Migratory Forest Songbird active season.
Duration	Long-term	Predator attraction to the ROW is expected to extend beyond the throughout construction and into the operations phase as the linear feature will remain.
Frequency	Infrequent	Predation events are expected to be rare.
Context	Resilient	Migratory Forest Songbirds are expected to be resilient to the small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Several different species of Migratory Forest Songbird predators are known in the RSA that are likely take advantage of the ROW to access prey.

Operations

Predators may be attracted to the road during operations due to increased prey availability, such as rodents using roadside habitat in the managed ROW. It is probable there will be a net negative effect on Migratory Forest Songbirds survival in the LSA during road operation due to increased predation. A summary of the net effect assessment relating to bat injury and death due to predators during the operations phase based on the Characterization Criteria is presented in **Table 12-139**.

Table 12-139: Criteria Results for Migratory Forest Songbird Injury or Death Due to Changes in Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as predation of Migratory Forest Songbirds is undesirable and considered to be adverse relating to Migratory Forest Songbird injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Migratory Forest Songbird injury and death but is unlikely to affect overall Migratory Forest Songbird populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the Local Study Area.
Timing	All Time Periods	Predation may occur at any time during the Migratory Forest Songbird active season.
Duration	Medium-term	Increased predation due predators attracted to the road is expected to stop after the operations phase.
Frequency	Infrequent	Predation events linked to increased exposure to predation from changes in predator access are expected to be relatively rare.
Context	Resilient	Migratory Forest Songbird are expected to be resilient to a small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Increased predation is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Several different species of Migratory Forest Songbird predators are known in the RSA that may be attracted by road operations.

Table 12-140 and **Table 12-141** provide summaries of the characterized predicted net effects for forest songbirds during the construction and operations phases.

Table 12-140: Summary Table of the Predicted Net Effects for Forest Songbirds During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Moderate	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Moderate	LSA	All time periods	Permanent	Continuous	Moderate	Reversible	Probable
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Moderate	LSA	All time periods	Short-term	Frequent	Moderate	Reversible	Certain
Habitat Alteration or Degradation – Decreased Insect Availability	Negative	Low	Project Footprint	All time periods	Medium-term	Continuous	Moderate	Reversible	Possible
Alterations in Movement – Loss of Connectivity	Negative	Moderate	Project Footprint	All time periods	Medium-term	Continuous	Moderate	Reversible	Probable
Alterations in Movement – Sensory Disturbance	Negative	Moderate	LSA	All time periods	Short-term	Continuous	Moderate	Reversible	Certain
Injury or Death – Collisions with Vehicles	Negative	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Incidental Take	Negative	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

Table 12-141: Summary Table of the Predicted Net Effects for Forest Songbirds During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Vegetation Structure	Neutral	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Moderate	Reversible	Certain
Habitat Alteration or Degradation – Decreased Insect Availability	Negative	Low	Project Footprint	All time periods	Medium-term	Continuous	Moderate	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Moderate	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Low	Project Footprint	All time periods	Medium-term	Infrequent	Moderate	Reversible	Certain
Injury or Death – Incidental Take	Negative	Low	Project Footprint	All time periods	Medium-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

12.7.6 Wetland Songbirds (Palm Warbler and Alder Flycatcher)

12.7.6.1 Habitat Loss

Clearance Activities

Construction

Wetland songbirds (i.e., those that inhabit bog, fen and swamp habitats) are represented by Palm Warbler and Alder Flycatcher. Loss of Palm Warbler and Alder Flycatcher habitat by clearance activities is certain to be a result of construction activities. Palm Warbler and Alder Flycatcher habitat loss are expected due to site preparation and construction activities as well as terrestrial vegetation changes during road construction and operations. There is a predicted net effect of habitat loss after implementation of mitigation measures.

For Palm Warbler, based on the results of habitat modelling via Ecological Land Classification (refer to Section 11 – Assessment of Effects on Vegetation and Wetlands), construction activities will remove 135.15 ha, representing approximately 1.16 % of the most suitable Palm Warbler habitat in the LSA. At the RSA level, 135.59 ha of habitat will be removed, or 0.23% of suitable habitat. Overall, suitable Palm Warbler nesting habitat is common throughout the RSA with 42.0% of the LSA and 48.5% of the RSA consisting of these vegetation communities. Resource Selection Functions (RSFs) modelling was done for Palm Warbler. Based on the model, 45.5 ha or approximately 0.94% of high-use habitat in the LSA and 0.16% of high-use habitat in the RSA would be removed due to vegetation clearance and road construction.

For Alder Flycatcher, based on the results of habitat modelling via Ecological Land Classification (refer to Section 11 – Assessment of Effects on Vegetation and Wetlands), construction activities will remove 135.15 ha, representing approximately 1.01 % of the most suitable Alder Flycatcher habitat in the LSA. At the RSA level, 135.59 ha of habitat will be removed, or 0.21% of suitable habitat. Overall, suitable Alder Flycatcher nesting habitat is somewhat uncommon throughout the RSA with 3.14% of the LSA and 3.74% of the RSA consisting of these vegetation communities. Resource Selection Functions (RSFs) modelling done for Palm Warbler. Based on the model, 26.7 ha or approximately 1.39% of high-use habitat in the LSA and 0.26% of high-use habitat in the RSA would be removed due to vegetation clearance and road construction.

Overall, given the small amount of wetland habitat removed, and the availability of wetland habitat the net effect on wetland bird's moderate. A summary of the net effects relating to the habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-142**.

Table 12-142: Criteria Results for Loss of Wetland Songbird Habitat from Clearance Activities – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of Wetland Songbird habitat is expected to result from project construction.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of Wetland Songbird habitat, but small in relation to the available habitat in the area.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All	Construction activities, including habitat removal, are expected to occur through the year
Duration	Permanent	Any loss of Wetland Songbird habitat during construction is expected to permanent as the roadbed will remain on the landscape for the foreseeable future.
Frequency	Continuous	Once Wetland Songbird habitat has been removed from the Project Footprint, it will remain absent for the forceable future.
Context	Resilient	Effects are likely for habitat types that are common throughout the RSA.
Reversibility	Irreversible	The roadbed is unlikely to be removed; hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Certain	The loss of habitat during construction is certain.

Operations

Loss of Wetland Songbird habitat is not expected to result from roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not anticipated to result in loss of Wetland Songbird habitat since repairs should be contained within the existing footprint. A small chance exists that reclaimed temporary laydowns and clearings may be reused during operations. Continued use of the quarries is expected but the footprint of the quarries are not expected to be expanded, and potential removal of Wetland Songbird Habitat was accounted for in the construction phase. Overall, the effect on Palm Warbler or Alder Flycatcher would be negligible. A summary of the net effects relating to the habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-143**.

Table 12-143: Criteria Results for Loss of Wetland Songbird Habitat from Clearance Activities – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected to result from Project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to occur during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All time periods	Additional loss of Wetland Songbird habitat is not expected during operations.

Characterization Criteria	Result	Rationale
Duration	Short-term	Any loss of Wetland Songbird habitat will be short-term, during repairs or maintenance.
Frequency	Infrequent	Additional loss of Wetland Songbird habitat during operations is not expected.
Context	Resilient	Effects are likely to affect habitats that are common throughout the RSA. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Unlikely	Additional net effects of the Project during operations are unlikely.

12.7.6.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

It is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, but most areas will remain free of tall vegetation. Microhabitat features may experience edge effects if they occur adjacent to the ROW and could affect Wetland Songbirds. The edge effect on Wetland Songbirds is expected to be relatively low since their preferred wetland communities are more open and have less tall vegetation structures compared to forested habitats that experience large changes from edge effects. Species that use shrubby low vegetation for nesting and foraging such as Palm Warbler and Alder Flycatcher have also shown increased abundance near wide linear features (Kalukapuge et al., 2024).

RSF modeling was used to predict the change in habitat use following vegetation clearing for the ROW and changing existing habitat features into early seral communities. The modeling showed both Palm Warbler and Alder Flycatcher would have increased usage of the Project Footprint after clearing (29.6% and 18.4% respectively). This assumes the entire ROW would stay vegetated. Overall, it is possible there will be a neutral effect due to habitat structural change. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-144**.

Table 12-144: Criteria Results for Habitat Alteration or Degradation of Wetland Songbird Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as wetland songbirds would experience few changes in habitat structure.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as changes in the habitat structure of wetland songbirds will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the Local Study Area adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.

Characterization Criteria	Result	Rationale
Duration	Medium-term	The changes in vegetation structure will be present as long as the road remains active.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.
Context	Resilient	Effects will be low as the vegetation changes will be minimal and wetland songbirds can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway has been removed.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible the changes in vegetation structure may affect some individual wetland songbirds during construction activities.

Operations

As stated in the previous section, it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction; however, maintenance of vegetation during road operations will create periodic disturbances and sustain edge effects along the ROW. While mitigations will keep vegetation removals to a minimum, removals for line-of-sight and other safety concerns will maintain the edge in many locations. Additionally, while wide linear features are often used by bird species that prefer open habitats, some wetland species like Palm Warbler show avoidance of clearings related to transportation corridors (ABMI, 2023). Overall, it is possible there will be a negligible net negative effect during the operations phase. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-145**.

Table 12-145: Criteria Results for Habitat Alteration or Degradation of Wetland Songbird Habitat Due to Changes in Vegetation Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, increased edge effects are expected because of vegetation clearing.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as wetland songbirds habitat structure will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Medium-term	The changes in vegetation structure will be present as long as the road remains active.
Frequency	Continuous	The changes in vegetation structure will be present continuously as long as maintenance activities occur.
Context	Resilient	Impact will be low as the vegetation changes will be minimal and wetland songbirds can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations its possible the edge effect may affect some individual wetland songbirds during operational activities.

Hydrological Changes

Construction

It is probable hydrological changes may result in the alteration or degradation of Wetland Songbird habitat during the construction phase. Peatlands, which make up most of the vegetative communities within the Project Footprint are susceptible to changes in the flow of surface and subsurface water resulting from the bisection of these features by road construction. While road design will aim to maintain both surface and subsurface hydrologic flows and will minimize but not eliminate the effects. Based on the Groundwater assessment (Section 8.5) these changes are expected to be low in magnitude but permanent. For Alder Flycatcher, as it uses a wide variety of riparian habitat the effect of hydrology changes is likely only slight. For Palm Warbler, while some nest sites may be lost if flooding occurs, given the availability of preferred nesting habitats, changes to hydrology are predicted to have a minimal influence on habitat availability. After implementation of mitigation methods, a minor negative effect on Wetlands Songbird habitat will likely remain. A summary of the net effects relating to the changes in hydrology during the construction phase based on the Characterization Criteria is presented in **Table 12-146**.

Table 12-146: Criteria Results for Habitat Alteration or Degradation of Wetland Songbird Habitat Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as some alteration of hydrology is expected as a result of project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect could cause a measurable alteration of Wetland Songbird habitat, but the change is likely minimal.
Geographic Extent	LSA	The effect extends into the Local Study Area up to 250m.
Timing	All Time Periods	Alteration of hydrology could occur during any period.
Duration	Permanent	Hydrological changes originating in the construction phase are likely to be permanent as the roadbed will remain even after the operations phase ends.
Frequency	Continuous	Hydrological changes will be continuous.
Context	Resilient	Only a small fraction of Wetland Songbird breeding habitat is likely to be affected.
Reversibility	Irreversible	The roadbed is unlikely to be removed hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Probable	The alteration of wetland habitat during construction is likely to occur but mitigations should limit any changes.

Operations

It is probable hydrological changes may result in the alteration or degradation of wetland songbird's habitat during the operations phase. Changes could occur due to culvert and drainage maintenance. These changes are likely to be more localized and temporary as culvert clearing and repairs would restore the existing hydrology and a responsive maintenance program, including reporting mechanisms would limit the area affected. After implementation of mitigation methods, it is not expected that hydrological alterations would affect Palm Warbler or Alder Flycatcher habitat to a measurable extent. A

summary of the net effects relating to the changes in hydrology during the operations phase based on the Characterization Criteria is presented in **Table 12-147**.

Table 12-147: Criteria Results for Habitat Alteration or Degradation of Wetland Songbird Habitat Due to Hydrological Changes – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as some alteration of hydrology is expected as a result of project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to increase to an appreciable degree during the operations phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All time periods	Impacts on Wetland Songbirds would occur during any point of the active season.
Duration	Short-term	Any loss of Wetland Songbird habitat will be short-term, during repairs or maintenance where in-water work is required.
Frequency	Infrequent	Additional loss of Wetland Songbird habitat during operations is not expected.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Hydrological changes should be restored once maintenance activities are concluded.
Likelihood of Occurrence	Possible	Additional hydrological effects during operations are unlikely but have a small chance to occur if mitigations are ignored.

Sensory Disturbances

Construction

Effects of sensory disturbance on degradation or alteration of wetland songbird habitat is probable during the construction phase. Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for Rusty Blackbird adjacent to the Project Footprint as they are known to avoid changes in their environment. Noise disturbance may be considerable during impulsive activities such as blasting or quarrying. Impulsive noise has shown to be effective at reducing songbird use of areas such as airports and agricultural fields, similar responses around active construction sites may be expected; however, these activities will only occur in a few places. Construction lighting could alter wetland songbird singing and foraging behavior with wetland habitats more susceptible than forested habitats due to their open structure. Mitigations will aim to confine disturbance both spatially and temporally using noise and light mitigation plans. Overall, it is possible there will be a net low magnitude negative effect during the construction phase. A summary of the net effects relating to habitat alteration through sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-148**.

Table 12-148: Criteria Results for Habitat Alteration or Degradation of Rusty Blackbird Habitat Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected as a result of project construction activities.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable alteration of wetland songbird habitat use in more sensitive species, such as Palm Warbler, but is likely within the adaptive capabilities of these species.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area approximately 125 m.
Timing	All time periods	Effects on wetland songbirds would occur during any point of the active season.
Duration	Short-term	Any alteration of wetland songbird habitat due to sensory impacts will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.
Context	Moderate	Some wetland songbirds show avoidance of alterations in their environment.
Reversibility	Reversible	Sensory disturbance changes should be restored once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some wetland songbirds during construction.

Operations

Effects of sensory disturbance on degradation or alteration of wetland songbird habitat is possible during the operations phase. For operations, most sensory effects will be related to traffic noise which may degrade wetland songbird habitat causing avoidance of areas near roads or decreased habitat value. Light pollution effects from the road during operations are considered non-existent as the road will not be lit except for existing lights around the community. While documented noise effects of roads on wetland songbird are mixed, with some studies showing positive and others negative associations, low traffic levels are likely to result in minimal effects on wetland songbird as most studies documenting an effect usually have volumes in the tens of thousands (Smith et al. 2005); however, some wetland songbirds such as Palm Warbler seem to avoid all transportation corridors (ABMI, 2023). Overall, it is possible there will be a low magnitude negative effect due to sensory disturbances during operations. The effect is expected to occur while the road is in use and can be considered reversible as it would stop when the operation phase ends and the road is no longer in use. A summary of the net effects relating to habitat alteration through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-149**.

Table 12-149: Criteria Results for Habitat Alteration or Degradation of Wetland Songbirds Habitat Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected as a result of project construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could cause a measurable alteration of wetland songbird habitat, but the change is likely small.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area approximately 125 m.
Timing	All time periods	Effects on wetland songbirds would occur during any point of the active season.
Duration	Medium-term	Any alteration of wetland songbird habitat due to sensory impacts will be medium-term, lasting the length of the operations phase.
Frequency	Frequent	Sensory disturbances will occur primarily during daytime when traffic occurs.
Context	Moderate	Some wetland songbirds show some avoidance of transportation corridors.
Reversibility	Reversible	Sensory disturbance changes should be restored once use of the road concludes.
Likelihood of Occurrence	Possible	Sensory disturbances may affect some wetland songbird but responses to low levels of traffic are not conclusive, and some habituation may occur.

12.7.6.3 Alteration in Movement

Loss of Connectivity

Construction

Effects of changes to habitat connectivity on alteration in movement of wetland songbirds is possible during the construction phase. Vegetation removal and construction activities that could created gaps that affect habitat connectivity are not expected to result in major changes to wetland songbird movement. At 35 m wide, the project ROW is smaller than the smallest gap size (50 m) found to limit crossings for some boreal birds, however wetland birds have not been studied to the same extent as forest birds, so wetland species specific responses are generally unknown. While both Alder Flycatcher and Palm Warbler uses shrubby semi-open areas like road verges, there is the potential for fragmented areas by roads to act as a barrier for Palm Warbler to movement as some avoidance of roads has been detected. After implementation of mitigation methods, a negligible negative effect on wetland bird movement will likely remain. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-150**.

Table 12-150: Criteria Results for Alteration in Movement of Wetland Songbirds Due to Loss of Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur due to construction activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the barrier effect would be small for wetland songbirds.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the Rusty Blackbird active season.
Duration	Medium-term	Any alteration of wetland songbird movement will be medium-term, as the effect will continue into the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and edge habitats have little effect on wetland songbirds.
Reversibility	Reversible	Changes in connectivity should be end after the construction and operations phases are complete.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some wetland songbirds during construction.

Operations

Effects of changes to habitat connectivity on alteration in movement of wetland songbirds is possible during the operations phase. Like the construction phase, decreased connectivity due to the road connectivity is not expected to result in meaningful changes to wetland songbird movement. While some bird species treat high traffic roads as a barrier, given the predicted maximum vehicles travelling on the proposed road is 500 per day, with the majority of travel anticipated to take place during daylight hours, any barrier effect is likely to be minimal as there will be long periods of time with little to no traffic. Maintenance activities will maintain vegetation along the ROW in an early seral state which is not considered a deterrence as wetland songbirds often early seral vegetation such as small conifers (Palm Warbler) or deciduous shrubs (Alder Flycatcher) as nesting sites and the gap width is relatively small at ~35 m. After implementation of mitigation methods, a negligible negative effect on wetland songbird movement will likely remain. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-151**.

Table 12-151: Criteria Results for Alteration in Movement of Wetland Songbirds Due to Loss of Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur as a result of operation activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the barrier effect would be minimal for wetland songbirds.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the edge of Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the wetland songbird active season.
Duration	Medium-term	Any alteration of wetland songbird movement will be medium-term, lasting the operations phase of the project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and edge habitats have little effect on most wetland songbirds.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some wetland songbirds during operations.

Sensory Disturbance

Construction

Effects of sensory disturbance on wetland songbird movement is probable during the construction phase. wetland songbird could alter their movement around the Project Footprint as they avoid disturbances like blasting, clearing, hauling and grading and other human actions during construction activities. Many of these disturbances will be abrupt and occur randomly and at different locations which could cause individual wetland songbirds to abandon the area near the disturbance. Construction lighting could attract areal insectivores like Alder Flycatchers for forging. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects but there is a predicted net effect from road construction on wetland songbird movement. A summary of the net effects relating to alteration of movement through sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-152**.

Table 12-152: Criteria Results for Alteration in Movement of Wetland Songbirds Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected as a result of project operation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few breeding pairs.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen at any period during the wetland songbird active season.
Duration	Short-term	Any alteration of wetland songbird movement will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Sensory disturbance changes should be restored once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some wetland songbird during construction.

Operations

Effects of sensory disturbance on wetland songbird movement is probable during the operations phase. During operations traffic noise will be the primary sensory effect on wetland songbirds. While not specific to wetland songbirds, traffic noise has been found to lower abundance and promote avoidance in many in many bird species. Sensory disturbance been shown to affect bird distribution when noise exceeded 56 dB, but the WSR noise study indicates only a small area may exceed these decibel limits (Appendix J – Noise and Vibration Impact Assessment Report). While traffic levels are expected to be low, it is possible that a few individual wetland songbirds will experience a negative alteration in movement in the LSA. The response is likely to be species specific as some wetland species like Palm Warbler show avoidance of transportation corridors while others like Alder Flycatcher use road verges (ABMI, 2023; OBBA, 2005). Overall, it is possible there will be a small net negative effect due to sensory disturbances during operations. A summary of the net effects relating to alteration of movement through sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-153**.

Table 12-153: Criteria Results for Alteration in Movement of Wetland Songbird Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected due to Project operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few breeding pairs.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen at any period during the Rusty Blackbird active season.
Duration	Medium-term	Any alteration of Rusty Blackbird movement will be medium-term, during the operations phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of traffic and maintenance activities, location and intensity will vary temporally.
Context	Resilient	While some wetland birds show avoidance of roads, most negative responses are shown at high volumes of traffic.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once operation of the road ceases.
Likelihood of Occurrence	Possible	Sensory disturbances may affect some wetland songbird during operations during periods of higher volume traffic.

12.7.6.4 Injury or Death

Collisions with Vehicles

Construction

Injury and/or death from collisions is possible during the construction phase for wetland songbirds. Low numbers of vehicles will travel between camps and construction locations, collision risk will be minimized by effect enforcement of speed limits and wildlife training for personal. Strictly enforcing mitigation measures during the construction phase is expected to keep the number of collisions between wetland songbirds and vehicles and equipment low and the magnitude low. Within construction sites vehicles will be traveling at low speeds and environmental monitors will watch for any roosting or nesting birds and initiate mitigations if appropriate.

Due to their behavior of perching and foraging in low vegetation both Alder Flycatcher and Palm Warbler may be vulnerable to some vehicle collisions occurring where suitable habitat is crossed by the Project Footprint. This behavior is common with many other wetland songbird species. After mitigations, a small net negative effect is possible due to vehicle traffic. A summary of the net effects relating to injury and death through collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-154**.

Table 12-154: Criteria Results for Injury or Death of Wetland Songbirds Due to Collisions with Vehicles – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths due to collisions with construction vehicles may occur during the construction phase.
Magnitude	Low	The magnitude of the effect is predicted to be low, as only a few individuals may be affected.
Geographic Extent	LSA	The effect will extend to birds moving between habitats within the LSA on either side of the Project Footprint.
Timing	All time periods	Collisions could happen during any period during the wetland songbird active season.
Duration	Short-term	Collisions with construction vehicles will occur during the construction phase of the Project.
Frequency	Infrequent	Strict enforcements will limit the number of collisions between construction vehicles and wetland songbirds.
Context	Moderate	Wetland songbirds forage and perch near ground which may make them susceptible to collisions.
Reversibility	Reversible	Collisions will stop once construction activities are concluded.
Likelihood of Occurrence	Probable	Even with mitigations its probable some collisions with wetland songbirds may occur during construction.

Operations

Injury and/or death from collisions is possible during the operations phase for wetland songbirds. Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the wetland songbirds active season where the road crosses breeding and foraging habitats. The low elevation perching and ground foraging habits of Palm Warbler may make them more susceptible to vehicle collisions than Alder Flycatcher; however, many wetland songbird species may be somewhat vulnerable to vehicle collisions due to the short structure of wetland habitat communities. While the low traffic levels will generally keep the number of collisions at low levels, collisions are still expected along low-volume forest roads like the WSR. Additionally, mitigations are likely not as effective during operations as the construction phase as enforcement will be more difficult. Overall, a net negative effect is probable due to vehicle traffic. A summary of the net effects relating to Injury and death through collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-155**.

Table 12-155: Criteria Results for Injury or Death of Wetland Songbird Due to Collisions with Vehicles – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, deaths due to collisions may occur as a result of road operation.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as songbird collisions occur along low volume roads.
Geographic Extent	LSA	The effect will extend to birds moving between habitats in the LSA on either side of the Project Footprint.
Timing	All time periods	Collisions could happen during any period during the wetland songbird active season.
Duration	Medium-term	These collisions will occur through the lifetime of the operations phase of the Project.
Frequency	Infrequent	Low traffic volume will limit the number of collisions between vehicles and wetland songbirds.
Context	Moderate	Wetland songbirds forage and perch near ground which may make them susceptible to collisions.
Reversibility	Reversible	Collisions will stop once operation activities are concluded.
Likelihood of Occurrence	Probable	Even with mitigations its probable some collisions with wetland songbirds will occur during operations phase as road users may ignore mitigations and the operational duration.

Incidental Take

Construction

Injury and/or death from incidental take is possible during the construction phase for wetland songbirds. Vegetation clearing in wetland songbird habitat during road construction, and/or movement of equipment/vehicles though vegetated areas, may result in injury or death to birds, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season. Like most wetland songbirds the characteristics of Alder Flycatcher and Palm Warbler nests can make them difficult to detect. Mitigation measures including timing windows will preclude the removal of vegetation within the breeding season in most situations; however, when removal occurs within the breeding season mitigation measures such as nest sweeps will not eliminate incidental take. Overall, a net negative effect is probable if vegetation clearing occurs during the breeding season. A summary of the net effects relating to injury and death through incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-156**.

Table 12-156: Criteria Results for Injury or Death of Wetland Songbird Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of wetland songbirds may occur as a result of incidental take.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	Sensitive periods	Incidental take would primarily occur during the wetland songbirds breeding season.
Duration	Short-term	Incidental take from construction activities will stop at the end of the construction phase of the Project.
Frequency	Infrequent	Timing mitigation will limit the number deaths due to clearance activities.
Context	Resilient	While some individuals may be affected, mitigations will limit any effects on wetland songbirds populations.
Reversibility	Reversible	Incidental take would stop once construction activities are concluded.
Likelihood of Occurrence	Possible	Even with mitigations its possible some incidental take may occur during construction.

Operations

Injury and/or death from incidental take is possible during the operations phase for wetland songbirds. The potential for incidental take would occur over the operating lifetime of the road as periodic clearing of the ROW may occur during operations as part of line-of-sight maintenance or infrastructure repairs. Though smaller in scale, if maintenance occurs during the breeding season mitigative measures could not completely avoid incidental take. These activities would be confined to the Project Footprint. Palm Warbler prefers to nest under small dense clumps of conifers while Alder Flycatcher nest low in thick shrubs, both of which would likely be present in areas along the ROW targeted for maintenance or if any temporary areas or laydowns are reopened during operations. Overall, for wetland birds a net negative effect is probable if vegetation clearing during the operations phase occurs during the breeding season. A summary of the net effects relating to injury and death through incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-157**.

Table 12-157: Criteria Results for Injury or Death of Wetland Songbirds Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of wetland songbirds may occur as a result of incidental take.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals. And avoidance of the road by wetland songbirds may limit the number of individuals affected.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	Sensitive periods	Incidental take would primarily occur during the wetland songbirds breeding season.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Timing mitigations will limit the number deaths due to clearance activities.
Context	Moderate	Wetland songbirds often use early seral along ROW which could be targeted for maintenance.
Reversibility	Reversible	Incidental take would stop once road operations are concluded.
Likelihood of Occurrence	Probable	Even with mitigations its possible some incidental take may occur during operations given the extended lifetime of the road.

Changes to Predator-Prey Dynamics

Construction

Injury and/or death from predation is possible during the construction phase for wetland songbirds. Use of linear features and edge habitats by predators of wetland songbird will increase predation as these species have been document to use forest edges like a road ROW to increase their predation success. Ground nesting wetland birds, like Palm Warbler are particularly vulnerable to mammal predators like red fox and coyote which are known to spread via human infrastructure like roads (Elmhagen et al., 2015). Mitigations involving reclamation/blockage of any temporarily disturbed areas and access roads will reduce open areas and linear features; however, the effects of increased predation will not be eliminated. It is expected predation will extend somewhat into the LSA, as predators may use the roads to access new areas. Parasitism is not expected due to the non-presence of Brown-headed Cowbird. With mitigations is probable there will be a low magnitude, negative effect on wetland songbirds from increased predation. A summary of the net effects relating to injury and death through changes to predator-prey dynamics during the construction phase based on the Characterization Criteria is presented in **Table 12-158**.

Table 12-158: Criteria Results for Injury or Death of Wetland Songbirds Due to Changes to Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of wetland songbirds may occur because of increased predation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	LSA	The effect will extend into the Local Study Area.
Timing	All time periods	Predation would occur throughout the wetland songbird active season.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of the Project.
Frequency	Infrequent	Predation events are likely to be low in frequency due to the cryptic nature of the wetland songbirds and few individuals will be using areas near the road.
Context	Resilient	Mitigations will limit any effects on wetland songbird populations.
Reversibility	Reversible	The effect of increased predation would end once the linear features have regenerated sufficiently.
Likelihood of Occurrence	Probable	Even with mitigations its probable that increased predation could occur given known use of linear edges by predators.

Operations

Injury and/or death from predation is probable during the operations phase for wetland songbirds. Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the wetland songbird active season where the road crosses breeding and foraging habitats. Maintenance clearing will consist of only removing vegetation when essential; however, the open nature of the ROW is required for safe operations of the road which will allow predators increased access to wetland and forested habitat associated with wetland songbirds. Limited traffic volume and the longer time frame compared to the construction phase will allow predators to spread further along the road and further into adjacent areas. It is probable there will be a moderate magnitude, negative effect on wetland songbirds' survival in the LSA due to increased predation. A summary of the net effects relating to injury and death through increased predation during the operations phase based on the Characterization Criteria is presented in **Table 12-159**.

Table 12-159: Criteria Results for Injury or Death of Wetland Songbirds Due to Changes to Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of wetland songbirds may occur because of increased predation.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as songbird predators are known to have increased success along edges.
Geographic Extent	LSA	The effect will extend into the Local Study Area.
Timing	All time periods	Predation would occur throughout the wetland songbirds active season.
Duration	Long-term	Effects from operational activities would last past the operational lifetime of the Project.
Frequency	Infrequent	Predation events are likely to be low in frequency due to the hidden nature of wetland songbirds nests and few individuals will be using areas near the road.
Context	Resilient	Mitigations including restoration will limit any effects on wetland songbird populations.
Reversibility	Reversible	The effect of increased predation would end once the linear features have regenerated sufficiently.
Likelihood of Occurrence	Probable	Even with mitigations its probable that increased predation could occur given known use of linear edges by predators.

Table 12-160 and **Table 12-161** provide summaries of the characterized predicted net effects for wetland songbirds during the construction and operations phases.

Table 12-160: Summary Table of the Predicted Net Effects for Wetland Songbirds During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Neutral	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Hydrological Changes	Negative	Low	LSA	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Probable
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Moderate	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All time periods	Short-term	Infrequent	Moderate	Reversible	Probable
Injury or Death – Incidental Take	Negative	Low	Project Footprint	Sensitive periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

Table 12-161: Summary Table of the Predicted Net Effects for Wetland Songbirds During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Vegetation Structure	Neutral	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Hydrological Changes	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Moderate	Reversible	Possible
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Moderate	LSA	All time periods	Medium-term	Infrequent	Moderate	Reversible	Probable
Injury or Death – Incidental Take	Negative	Low	Project Footprint	Sensitive periods	Medium-term	Infrequent	Moderate	Reversible	Probable
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Moderate	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

12.7.7 Shorebirds (Greater Yellowlegs)

12.7.7.1 Habitat Loss

Clearance Activities

Construction

Loss of shorebird habitat, including breeding habitat and foraging habitat, are expected due to construction activities, including direct removal of habitat for the Project Footprint during road construction. There is a predicted net effect of habitat loss after implementation of mitigation measures. During the construction phase, vegetation will be removed from the Project Footprint which will result in the permanent loss of shorebird habitat. Progressive reclamation will restore vegetation in some areas including temporary camps, laydowns and access roads reducing the net effect of vegetation removal.

Based on the of habitat modelling via Ecological Land Classification construction activities will result in the removal of 80.77 ha, representing approximately 1.15% of the most suitable Greater Yellowlegs habitat in the LSA. 80.77 ha of habitat will also be removed at the RSA level, or 0.23% of suitable habitat. Overall, suitable Greater Yellowlegs habitat is common throughout the study area, with 25.4% of the LSA and 26.29% of the RSA consisting of these vegetation communities. Resource Selection Functions (RSFs) modelling was done for Greater Yellowlegs. Based on the model, 45.5 ha or approximately 0.63% of high-use habitat in the LSA and 0.14% of high-use habitat in the RSA would be removed due to road clearance and construction.

Overall, given the small amount of forested habitat removed, and the availability of shorebird habitat the net effect on wetland bird's moderate. A summary of the net effect assessment relating to habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-162**.

Table 12-162: Criteria Results for Loss of Shorebird Habitat – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of breeding habitat and foraging habitat is undesirable and considered the be adverse.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable loss of Greater Yellowlegs habitat, but very small in relation to the available habitat in the RSA.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of habitat loss will occur throughout the bird active season.
Duration	Permanent	Recovery to baseline habitat conditions following construction is unlikely.
Frequency	Continuous	Once habitat is removed, the effect will occur continuously.
Context	Resilient	Shorebirds are expected to be resilient to small amounts of habitat loss that will occur because of road construction.
Reversibility	Irreversible	Habitat loss from the road construction will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Habitat loss will occur because of road construction.

Operations

Loss of shorebird habitat is not expected to result from roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in loss of shorebird habitat as repairs should be contained within the existing footprint. A small chance exist that reclaimed temporary laydowns and clearings may be reused during operations, but these should undergo restoration. Continued use of the quarries is expected but the footprint of the quarry is not expected to be expanded, and the footprint area of the quarries do not contain preferred shorebird habitats. Overall, it is probable there will be a neutral effect on Shorebirds. A summary of the net effect assessment relating to habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-163**.

Table 12-163: Criteria Results for Loss of Shorebird Habitat – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected due to road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable loss of habitat during road operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Additional loss of Shorebird habitat is not expected during operations, but road maintenance may occur at any time during the year.
Duration	Short-term	Any additional loss of Shorebird habitat will be short-term, until vegetation management activities are completed.
Frequency	Infrequent	Additional loss of Shorebird habitat during operations is not expected.
Context	Resilient	Habitat loss from vegetation management along the road is expected to be minimal and selective. Shorebirds are expected to be resilient to small habitat losses that may result vegetation management during road operations.
Reversibility	Reversible	The net effect is reversible as vegetation is expected to regrow once vegetation management is completed.
Likelihood of Occurrence	Unlikely	An additional negative effect as a result of road operation is unlikely to occur.

12.7.7.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

Vegetation removals, creation of the ROW and construction of the paved and gravel road surfaces may alter or degrade Shorebird habitat near the Project Footprint, extending into the LSA by generating habitat structural changes that change vegetation height, density, and community composition. The edge effect on shorebirds, including Greater Yellowlegs is expected to be relatively low due to the more open and lower vegetation structure of its preferred wetland communities compared to forested habitats which experience large changes due to edge effects and its ability to use disturbed habitats.

Predictive RSF modeling that converts existing habitats into upland disturbance habitat predicts a decrease of 5.69% in the Project Footprint an 0.09% decrease in the LSA and an 0.04% decrease in the RSA. This suggests a small degradation of habitat for shorebirds in the Project Footprint from conversion of wetlands to uplands along the ROW. It also suggests no major effects within the LSA and RSA.

After the implementation of mitigation measures, construction of the road may lead to edge effects, including abiotic, direct biotic, and indirect biotic effects on the habitat. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to habitat alteration and degradation due to edge effects during the construction phase based on the Characterization Criteria is presented in **Table 12-164**.

Table 12-164: Criteria Results for Habitat Alteration or Degradation of Shorebird Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, increased edge effects are expected because of vegetation clearing.
Magnitude	Low	The magnitude of the effect is predicted to be low, as shorebird habitat structure will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present even beyond the operations phase.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.
Context	Resilient	Effects will be low as the vegetation changes will be minimal, and shorebird can use disturbed habitats.
Reversibility	Reversible	The effect is reversible once the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations its possible the changes in vegetation structure may affect some individual Greater Yellowlegs during construction activities.

Operations

Changes to habitat structure will continue to be present throughout the operations phase. Maintenance of vegetation during road operations will create periodic disturbances and sustain edge effects along the ROW. While mitigations will keep vegetation removals to a minimum, removals for line-of-sight and other safety concerns will maintain the edge in many locations. While restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, it is possible there will be a net negative effect during the operations phase. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-165**.

Table 12-165: Criteria Results for Habitat Alteration or Degradation of Shorebird Habitat Due to Changes in Vegetation Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, increased edge effects are expected as a result of vegetation clearing.
Magnitude	Low	The magnitude of the effect is predicted to be low, as Greater Yellowlegs habitat structure will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present even beyond the operations phase.
Frequency	Continuous	The changes in vegetation structure will be present continuously as long as maintenance activities occur.
Context	Resilient	Impact will be low as the vegetation changes will be minimal and Greater Yellowlegs can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations its possible the edge effect may affect some individual Greater Yellowlegs during operational activities.

Hydrological Changes

Construction

Shorebird habitat may be altered hydrologically, with construction activities such as grading for road installation resulting in changes to both surface and groundwater water causing flooding or drying of vegetation communities. Overall, it is probable there will be a net negative effect in the LSA. Based on the Groundwater assessment of alteration to groundwater level and flow direction (Section 8.5) these changes are certain and permanent. Mitigation is mainly through road design which will aim to maintain both surface and subsurface hydrologic flows. Also, given the flexibility of many boreal shorebirds, including Greater Yellowlegs, in their habitat and food selection, the effect of hydrology changes is likely only slight. A summary of the net effect assessment relating to hydrological changes during the construction phase based on the Characterization Criteria is presented in **Table 12-166**.

Table 12-166: Criteria Results for Shorebird Habitat Alteration or Degradation Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as it is undesirable and considered the be adverse relating to alteration of Shorebird habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of Shorebird habitat but will be unlikely to affect the local Shorebird populations.
Geographic Extent	LSA	The effect will extend into the LSA.

Characterization Criteria	Result	Rationale
Timing	All Time Periods	Hydrological changes are expected to occur through the year during the construction phase.
Duration	Permanent	Recovery to baseline hydrological conditions following construction is unlikely.
Frequency	Continuous	The effect of hydrological changes resulting from construction will occur continually.
Context	Resilient	In the context of habitat alteration resulting from minor hydrological changes, shorebirds are resilient to change and have capacity to adapt.
Reversibility	Irreversible	Hydrological changes will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Hydrological changes will occur during construction.

Operations

Operation of the road is not anticipated to result in further changes to hydrology. It is possible that changes to hydrology may occur during the operations phase due to culvert and drainage maintenance. Repairs would restore the existing hydrology and a responsive maintenance program, including reporting mechanisms would limit the area affected. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to hydrological changes during the operations phase based on the Characterization Criteria is presented in **Table 12-167**.

Table 12-167: Criteria Results for Shorebird Habitat Alteration or Degradation Due to Hydrological Changes – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as changes to hydrology are undesirable and considered the be adverse relating to alteration of Shorebird habitat.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to increase during the operations phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Hydrological changes are expected to occur throughout the bird active season.
Duration	Short-term	Hydrological changes during road operations will be temporary until maintenance and repair activities are completed.
Frequency	Infrequent	Hydrological changes during road operations are expected to be rare.
Context	Resilient	Shorebirds are expected to be resilient to small habitat alterations that may result from hydrological changes that may occur during road operations.
Reversibility	Reversible	Hydrological changes should be restored once maintenance activities are concluded.
Likelihood of Occurrence	Possible	Additional hydrological effects during operations should be rare but have a small chance to occur if mitigations are ignored.

Sensory Disturbance

Construction

The net effect of increased sensory disturbance during construction is expected to be minor. Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for Greater Yellowlegs adjacent to the Project Footprint.

Noise abatement mitigation measures will not entirely prevent daytime noise, which has the potential to affect suitable breeding and foraging habitat. Disturbance may be considerable during impulsive activities such as blasting or quarrying, or during activities such as hauling which may occur during all hours causing wetland birds to avoid the ROW and supportive infrastructure. The effect is expected to be short-term and reversible within the LSA as it would stop following the construction phase of the Project. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-168**.

Table 12-168: Criteria Results for Shorebird Habitat Alteration or Degradation Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of Shorebird habitat.
Magnitude	Low	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable alteration of Shorebird habitat, such as reduced foraging efficiency, but is likely within the adaptive capabilities of these species.
Geographic Extent	LSA	Sensory disturbances altering Shorebird habitat will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering Shorebird habitat are expected to occur through the year during the construction phase.
Duration	Short-term	Sensory disturbances generated by construction activities that alter Shorebird habitat are expected to stop after the construction phase.
Frequency	Frequent	Sensory disturbances that alter Shorebird habitat are expected to occur intermittently during construction.
Context	Resilient	In the context of habitat alteration due to sensory disturbances, shorebirds are generally resilient to change and have capacity to adapt.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the Project Footprint.
Likelihood of Occurrence	Certain	Sensory disturbances altering Shorebird habitat during construction are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Operations

The net effect of increased sensory disturbance during operations is expected to be minimal. For operations most sensory effects will be related to traffic noise which may degrade shorebird habitat causing avoidance of areas near roads or decreased habitat value. It is expected that the road will mainly be used during daylight hours when Shorebirds are primarily active, which may cause sensory disturbances that can degrade breeding and foraging habitat. Low traffic levels are likely to result in minimal effects on shorebirds including Greater Yellowlegs, for example no avoidance of the road by birds was found at the Ekati mine road with ~200 vehicles a day, whereas studies detailing an effect usually have volumes in the tens of thousands (Smith et al. 2005). Overall, it is possible there will be a small net negative effect due to sensory disturbances during operations. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-169**.

Table 12-169: Criteria Results for Shorebird Habitat Alteration or Degradation Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of Shorebird habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of Shorebird habitat but is unlikely to affect overall Shorebird species populations.
Geographic Extent	LSA	Sensory disturbances altering Shorebird habitat will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering Shorebird habitat are expected to occur throughout the bird active season.
Duration	Medium-term	Sensory disturbances altering Shorebird habitat are expected to extend through road operations.
Frequency	Frequent	Sensory disturbances are expected to occur frequently during daylight hours during the bird active season.
Context	Resilient	In the context of habitat alteration due to sensory disturbances, generally shorebirds have shown little response to sensory disturbances at low levels.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Probable	Sensory disturbances altering Shorebird habitat use during road operations are probable as mitigation measures cannot entirely minimize noise generated to baseline levels.

12.7.7.3 Alteration in Movement

Sensory Disturbance

Construction

Shorebird movement is also likely to be altered by sensory disturbances. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of bats as they avoid the road the ROW and supportive infrastructure areas. Loud sudden noises could also cause Greater Yellowlegs to abandon an area temporarily. Construction areas would be confined to a small section of the road at any point in time. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects but there is a predicted net negative effect from construction activities on Shorebird movement. A summary of the net effect assessment relating to alteration in Shorebird movement due to sensory disturbance during the construction phase based on the Characterization Criteria is presented in
Table 12-170.

Table 12-170: Criteria Results for Alteration in Movement of Shorebirds Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected as a result of project operation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few breeding pairs.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen at any period during the shorebird active season.
Duration	Short-term	Any alteration of Greater Yellowlegs movement will be short-term, during the construction phase of the Project.
Frequency	Infrequently	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes in behavior would only be temporary.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once the construction phase ends.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some shorebirds during construction.

Operations

During operations, noise will be the primary sensory impact on Greater Yellowlegs. While not specific to Greater Yellowlegs, traffic noise has been found to lower abundance and promote avoidance in many in many bird species. The direct effect of sensory disturbance on Greater Yellowlegs during operations is likely to be low as changes in shorebird distribution are related to high traffic when noise exceeded 56 dB. The WSR road is predicted to have only 500 vehicles a day and the noise study indicates only a small

area may exceed these decibel limits (Appendix J – Noise and Vibration Impact Assessment Report). While traffic levels are expected to be low, it is possible that a few individual shorebirds will experience a negative alteration in movement in the LSA. A summary of the net effect assessment relating to alteration in movement due to sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-171**.

Table 12-171: Criteria Results for Alteration in Shorebird Movement Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to alteration of Shorebird movement.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Shorebird movement but is unlikely to affect overall Shorebird species populations.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of sensory disturbance on Shorebird movement will occur throughout the bird active season.
Duration	Medium-term	Alteration in Shorebird movement due to sensory disturbances is expected to extend through the operations phase.
Frequency	Frequent	Sensory disturbances that alter Shorebird movement are expected to occur intermittently during the operations phase.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and impacts would be intermittent.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once operation of the road ceases.
Likelihood of Occurrence	Possible	Alteration in movement due to sensory disturbances during the operations phase may occur but is unlikely as traffic levels are expected to be low and will mainly travel during daylight hours.

Loss of Connectivity

Construction

Vegetation removal and construction activities that could created gaps that affect habitat connectivity are not expected to result in significant changes to shorebirds `movement. Bird species that have shown reluctance to cross gaps like those created by roads are generally forest species where the road creates a distinctive edge between the road and preferred habitats, with larger gaps acting as a greater barrier. Furthermore, at 35 m wide, the Project ROW is smaller than the smallest gap size (50 m) found to limit crossings for some boreal birds. Some boreal shorebirds, including Greater Yellowlegs, have shown some avoidance of transportation corridors which may reduce crossings by certain species. After implementation of mitigation methods, a small negative effect on shorebirds movement will likely remain. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-172**.

Table 12-172: Criteria Results for Alteration in Movement of Shorebirds Due to Changes in Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may result from construction activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the barrier effect would be minimal for shorebirds.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the shorebird active season.
Duration	Medium-term	Any alteration of shorebirds movement will be medium-term, as the effect will continue into the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some shorebirds during construction.

Operations

Connectivity is not expected to be affected for shorebirds during road operations. The structural similarity between the ROW and preferred shorebird habitat will be unlikely to be treated as a barrier and no studies have shown that shorebirds are reluctant to cross gaps. While some bird species treat high traffic roads as a barrier, given the predicted maximum vehicles travelling on the proposed road is 500 per day, with the majority of travel anticipated to take place during daylight hours, any barrier effect is likely to be minimal as there will be long periods of time with little to no traffic. After implementation of mitigation methods, a negligible negative effect on shorebird movement will likely remain. A summary of the net effects relating to alteration in movement through loss of connectivity during the operations phase based on the Characterization Criteria is presented in **Table 12-173**.

Table 12-173: Criteria Results for Alteration in Movement of Shorebirds Due to Changes in Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur because of operations activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the barrier effect would be minimal for shorebirds.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the edge of Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the shorebirds active season.

Characterization Criteria	Result	Rationale
Duration	Medium-term	Any alteration of shorebirds movement will be medium-term, lasting the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some shorebirds during operations.

12.7.7.4 Injury or Death

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures, such as vehicle speed limits, during the construction phase is expected to keep the number of collisions and fatalities between shorebirds and vehicles and equipment low. Within construction sites vehicles will be traveling at low speeds and environmental monitors will watch for any roosting or nesting birds and initiate mitigations if appropriate. Low numbers of vehicles will travel between camps and construction locations, collision risk will be minimized by effect enforcement of speed limits and wildlife training for personal. Risk of collisions between construction vehicles and shorebirds cannot completely be eliminated; therefore, it is expected there will be a net negative effect on shorebird injury and death from collisions during the construction phase. A summary of the net effect assessment relating to injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-174**.

Table 12-174: Criteria Results for Shorebird Injury or Death Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, collisions with construction vehicles are undesirable and considered to be adverse relating to Shorebird injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Shorebird injury and death but is unlikely to affect overall Shorebird species populations.
Geographic Extent	LSA	The effect will extend to birds moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the bird active season.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and Shorebirds.
Context	Resilient	Shorebirds are expected to be resilient to a small number of mortalities that may result from collisions with construction vehicles.

Characterization Criteria	Result	Rationale
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and shorebirds may occur, despite mitigation measures.

Operations

Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the shorebird active season near foraging and breeding habitats. As stated earlier, shorebirds comprise a relatively small number of avian casualties attributed to collisions with vehicles in Canada but are likely under reported and the effect on shorebirds populations including Greater Yellowlegs is unknown. The predicted maximum vehicles travelling on the road is 500 per day, with most of the travel anticipated to take place during daylight hours. Mitigations will likely be not as effective during operations as the construction phase as enforcement will be more difficult. Overall, a net negative effect is expected due to vehicle traffic. A summary of the net effect assessment relating to shorebird injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-175**.

Table 12-175: Criteria Results for Shorebird Injury or Death Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as collisions between Shorebirds and vehicles are undesirable and considered the be adverse relating to Shorebird injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Shorebird injury and death but is unlikely to affect overall Shorebird species populations.
Geographic Extent	Project Footprint	Collisions between Shorebirds and vehicles will be limited to the Project Footprint.
Timing	All Time Periods	Collisions between Shorebirds and vehicles are expected to occur throughout their active season.
Duration	Medium-term	Collisions between Shorebirds and vehicles are expected to occur through road operations.
Frequency	Infrequent	As road use will mainly occur during daylight hours, collisions between shorebirds and vehicles are expected to be rare.
Context	Resilient	Shorebirds are expected to be resilient to a low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Probable	While shorebirds make up 0.9% of reported avian road mortalities in Canada, even with mitigations its probable some collisions with shorebirds will occur during operations phase due to the length of the operations phase.

Incidental Take

Construction

Vegetation clearing in Greater Yellowlegs habitat during road construction may result in injury or death to shorebird, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season. The characteristics of Greater Yellowlegs nests and hatchlings, as well as most shorebirds can make them difficult to detect. After mitigation measures have been applied, including timing windows avoiding vegetation clearing in shorebird habitat during the breeding season (May 1 – July 31), it is less likely that bird injury or death will occur. Overall, a low magnitude negative effect is likely. A summary of the net effect assessment relating to injury and death resulting from incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-176**.

Table 12-176: Criteria Results for Shorebird Injury or Death Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of shorebirds may occur because of clearing during the breeding period.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the bird active season.
Duration	Short-term	Incidental take from construction activities will cease at the end of the construction phase.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Resilient	Shorebird populations are expected to be resilient to a small number of mortalities that may result from incidental take during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Possible	Even with mitigations its possible some incidental take may occur during construction.

Operations

Vegetation clearing in shorebird habitat during road operation may result in injury or death to birds if conducted during the breeding season, even after mitigation measures have been applied. The characteristics of Shorebird nests can make them difficult to detect if a visual inspection is conducted prior to vegetation clearing, and some adults may not abandon their nest when approached. Though smaller in scale compared to construction activities, periodic clearing of the ROW and other repairs may occur during operations as part of required road maintenance. Overall, a net negative effect is possible if vegetation clearing occurs during the active season. A summary of the net effect assessment relating to injury and death resulting from incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-177**.

Table 12-177: Criteria Results for Shorebird Injury or Death Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Shorebirds may occur due to incidental take during vegetation management conducted because of road operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Shorebird injury and death but is unlikely to affect overall Shorebird species populations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	Sensitive periods	Incidental take would primarily occur during the shorebird breeding season.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Moderate	Shorebirds, like Greater Yellowlegs, often use early seral vegetation which could be targeted for maintenance and nest and fledglings are extremely cryptic.
Reversibility	Reversible	The net effect is reversible once road operation concludes.
Likelihood of Occurrence	Probable	Even with mitigations its probable some incidental take may occur during operations given the extended lifetime of the road.

Changes to Predator-Prey Dynamics

Construction

Creation of the ROW by vegetation clearing during construction may improve access for predators of Shorebirds, increasing predation pressures on these species. Mitigation involving reclamation/blockage of any temporarily disturbed areas and access roads after construction will minimize the effect as these actions will reduce open areas and linear features; however, the effects of increased predation cannot be completely eliminated. Possible predators of Greater Yellowlegs include a variety of raptor species, such as Bald Eagle, Northern Harrier, Merlin, and Peregrine Falcon (Elphick and Tibbitts, 2020). Nest predators are not well documented for Greater Yellowlegs (Elphick and Tibbitts, 2020) but likely include small and medium sized mammals like red fox and mustelids. These predators would also prey on other shorebird species. Effects on Shorebirds from predator encounters from construction of the road are predicted to be long term in duration as predators are known to use linear features well beyond their operational lifetime. Overall, there will be a net negative effect on Shorebird survival in the LSA. A summary of the net effect assessment relating to injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-178**.

Table 12-178: Criteria Results for Shorebird Injury or Death Due to Altered Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of shorebirds may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Shorebird injury and death, but mitigations will limit the number of individuals.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the shorebird active season.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Increases in nest predation due to building of the road are expected to occur occasionally.
Context	Resilient	Shorebirds are expected to be resilient to a small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Several different species of Shorebird predators are known in the RSA which will likely take advantage of the ROW to access prey.

Operations

Injury and/or death from predation is probable during the operations phase for shorebirds. Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the wetland shorebird active season where the road crosses breeding and foraging habitats. Predators may be attracted to the road during operations due to increased prey availability, such as rodents using habitat in the managed ROW. Roads may also cause an increase of food through roadkill and litter, which may facilitate expansion of boreal scavenging species, such as the red fox which prey on shorebirds (Rod-Eriksen et al., 2020). It is probable there will be a net negative effect on Shorebirds survival in the LSA during road operation due to increased predation. A summary of the net effects relating to injury and death through increased predation during the operations phase based on the Characterization Criteria is presented in **Table 12-179**.

Table 12-179: Criteria Results for Shorebird Injury or Death Due to Altered Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as predation of Shorebirds is undesirable and considered to be adverse relating to Shorebird injury and death.
Magnitude	Moderate	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Shorebird injury and death, but is unlikely to affect overall Shorebird species populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the shorebird active season.
Duration	Long-term	Effects from operational activities would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare as there are no predators that specialize on Shorebirds in the region.
Context	Resilient	Shorebirds are expected to be resilient to a small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Increased predation is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Several different species of Shorebird predators are known in the RSA which may be attracted by road operations.

Table 12-180 and **Table 12-181** provide summaries of the characterized predicted net effects for shorebirds during the construction and operations phases.

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Table 12-180: Summary Table of the Predicted Net Effects for Shorebirds During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Low	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Hydrological Changes	Negative	Low	LSA	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Resilient	Reversible	Certain
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Incidental Take	Negative	Low	Project Footprint	Sensitive periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

Table 12-181: Summary Table of the Predicted Net Effects for Shorebirds During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Hydrological Changes	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Probable
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All time periods	Medium-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Incidental Take	Negative	Low	Project Footprint	Sensitive periods	Medium-term	Infrequent	Moderate	Reversible	Probable
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Moderate	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Probable

12.7.8 Waterfowl (Canada Goose, Mallard)

12.7.8.1 Habitat Loss

Clearance Activities

Construction

Loss of waterfowl habitat, including breeding habitat and foraging habitat, are expected due to construction activities, including direct removal of habitat for the Project Footprint during road construction. There is a predicted net effect of habitat loss after implementation of mitigation measures. During the construction phase, vegetation will be removed from the Project Footprint which will result in the permanent loss of waterfowl habitat. Some small areas of open water habitat may also be lost as a result of construction of the roadbed. Progressive reclamation will restore vegetation in some areas including temporary camps, laydowns and access roads reducing the net effect of vegetation removal.

For waterfowl, based on the results of habitat modelling via Ecological Land Classification (refer to Section 11), construction activities will remove 284.37 ha, representing approximately 1.77% of the most suitable waterfowl habitat in the LSA. At the RSA level 321.17 ha of habitat will be removed, or 0.43% of suitable habitat. Overall, suitable waterfowl nesting habitat is common throughout the study areas with 59.7% of the LSA and 55.1% of the RSA consisting of these vegetation communities.

Resource Selection Functions (RSFs) modelling was done for both Mallard and Canada Goose. Based on the model, for Mallard 12.47 ha or approximately 0.86% of high-use habitat in the LSA and 14.53 ha or 0.16% of high-use habitat in the RSA would be removed due to road clearance and construction. For Canada Goose 138.11 ha or approximately 2.34% of high-use habitat is removed from the LSA and 219.52 ha or 1.19% of high-use habitat in the RSA would be removed due to road clearance and construction.

Overall, given the small amount of waterfowl breeding habitat removed, and the availability of waterfowl habitat the net effect on waterfowl is deemed moderate. A summary of the net effect assessment relating to habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-182**.

Table 12-182: Criteria Results for Loss of Waterfowl Habitat – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of breeding habitat and foraging habitat is undesirable and considered the be adverse.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable loss of waterfowl habitat, but very small in relation to the available habitat in the area.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of habitat loss will occur throughout the waterfowl active season.
Duration	Permanent	Recovery to baseline habitat conditions following construction is unlikely.

Characterization Criteria	Result	Rationale
Frequency	Continuous	Once habitat is removed, the effect will occur continuously.
Context	Resilient	Shorebirds are expected to be resilient to small amounts of habitat loss that will occur due to road construction.
Reversibility	Irreversible	Habitat loss from the road construction will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Habitat loss will occur because of road construction.

Operations

Loss of waterfowl habitat is not expected to result from roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in loss of waterfowl habitat as repairs should be contained within the existing footprint. Where in-water work may be required to complete repairs of culverts and bridges, no new loss of waterfowl habitat is predicted at that time. Continued use of the quarries is expected but the footprint of the quarry is not expected to be expanded; however, if inundation of these borrow pit areas occurs waterfowl habitat could be created. Overall, it is probable there will be a neutral effect on waterfowl. A summary of the net effect assessment relating to habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-183**.

Table 12-183: Criteria Results for Loss of Waterfowl Habitat – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected due to road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable loss of habitat during road operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Additional loss of waterfowl habitat is not expected during operations, but road maintenance may occur at any time during the year.
Duration	Short-term	Any additional loss of waterfowl habitat will be short-term, until vegetation management activities are completed.
Frequency	Infrequent	Additional loss of waterfowl habitat during operations is not expected.
Context	Resilient	Habitat loss from vegetation management along the road is expected to be minimal and selective. Waterfowl are expected to be resilient to small habitat losses that may result vegetation management during road operations.
Reversibility	Reversible	The net effect is reversible as vegetation is expected to regrow once vegetation management is completed.
Likelihood of Occurrence	Unlikely	Any additional negative effects because of road operation is unlikely to occur.

12.7.8.2 Habitat Alteration or Degradation

Habitat Structural Change

Construction

Vegetation removal, creation of the ROW, and construction of the paved and gravel road surfaces may alter or degrade waterfowl habitat near the Project Footprint, extending into the LSA by generating habitat structural changes that change vegetation height, density, and community composition. Certain waterfowl species, including Canada Goose and Mallard, are highly adaptable when it comes to nesting site preferences (e.g., vegetation and substrate) (Mowbray et al., 2020; Drilling et al., 2020) and may be resilient to edge effects; however, others have more specialized microhabitat requirements like tree cavities or over water nesters. Avoidance appears to be minor and often clearances such as those caused by forestry can be positive for many species. Roads can have a positive effect on waterfowl, but this is dependant on wetland habitats being preserved. Dust during construction can cause earlier melting of ponds and this may alter habitat use.

Predictive RSF modeling that converts existing habitats into upland disturbance habitat predicts for Canada Goose a decrease of 14.53% in the Project Footprint a 13.45% decrease in the LSA and an 4.54% decrease in the RSA. For Mallard the modeling predicts an increase of 19.31% in the Project Footprint a 1.35% increase in the LSA and an 0.28% increase in the RSA. The shorebird group as a whole has a decrease in the Project Footprint and an increase in the LSA. This suggests a small degradation of habitat for shorebirds in the Project Footprint from conversion of wetlands to uplands along the ROW that may be offset in other areas and be species specific.

Overall, the edge effect on waterfowl, including Canada Goose and Mallards is expected to be relatively low due to the more open and lower vegetation structure of their preferred wetland communities compared to forested habitats which experience large changes due to edge effects. After the implementation of mitigation measures, construction of the road may lead to abiotic, direct biotic, and indirect biotic effects on the habitat. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to habitat alteration and degradation due to edge effects during the construction phase based on the Characterization Criteria is presented in **Table 12-184**.

Table 12-184: Criteria Results for Habitat Alteration or Degradation of Waterfowl Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, increased edge effects are expected because of vegetation clearing.
Magnitude	Low	The magnitude of the effect is predicted to be low, as waterfowl habitat structure will be affected but have both gains and losses.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure could occur during any period.
Duration	Long-term	The changes in vegetation structure will be present even beyond the operations phase.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.

Characterization Criteria	Result	Rationale
Context	Resilient	Effects will be low as the vegetation changes will be minimal, and waterfowl can use disturbed habitats.
Reversibility	Reversible	The effect is reversible once the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations its possible the changes in vegetation structure may affect some individual waterfowl during construction activities.

Operations

Changes to habitat structure will continue to be present throughout the operations phase. Maintenance of vegetation during road operations will create periodic disturbances and sustain edge effects along the ROW. While mitigations will keep vegetation removals to a minimum, removals for line-of-sight and other safety concerns will maintain the edge in many locations. Ducks may respond positively, at least initially, in terms of nesting success to vegetation along the ROW not being mowed during maintenance. Decisions on mowing and removal of vegetation will have to consider safety as well as habitat management. While restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, it is possible even after mitigation there will be a net negative effect during the operations phase. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase based on the Characterization Criteria is presented in **Table 12-185**.

Table 12-185: Criteria Results for Habitat Alteration or Degradation of Waterfowl Habitat Due to Changes in Vegetation Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, increased edge effects are expected as a result of vegetation clearing.
Magnitude	Low	The magnitude of the effect is predicted to be low, as waterfowl habitat structure will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present even beyond the operations phase.
Frequency	Continuous	The changes in vegetation structure will be present continuously while maintenance activities are occurring.
Context	Resilient	Impact will be low as the vegetation changes will be minimal and waterfowl can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations its possible the edge effect may affect some individual waterfowl during operational activities.

Hydrological Changes

Construction

Waterfowl habitat may be altered hydrologically, with construction activities such as grading for road installation resulting in changes to both surface and groundwater water causing flooding or drying of vegetation communities. Overall, it is probable there will be a net negative effect in the LSA. Based on the Groundwater assessment of alteration to groundwater level and flow direction (Section 8.5) these changes are certain and permanent. Changes to hydrology will alter use of the area by waterfowl, with some areas potentially drying while others getting wetter. This may lead to losses of nesting habitats in some areas while expanding in other areas. Creation of borrow pits and quarries may create waterfowl habitat if inundated. Mitigation is mainly through road design which will aim to maintain both surface and subsurface hydrologic flows. A summary of the net effect assessment relating to hydrological changes during the construction phase based on the Characterization Criteria is presented in **Table 12-186**.

Table 12-186: Criteria Results for Waterfowl Habitat Alteration or Degradation Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as it is undesirable and considered the be adverse relating to alteration of waterfowl habitat.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect will cause a measurable alteration of waterfowl habitat but both positive and negative changes could occur and will be unlikely to affect the local waterfowl populations.
Geographic Extent	LSA	The effect will extend into the LSA.
Timing	All Time Periods	Hydrological changes are expected to occur through the year during the construction phase.
Duration	Permanent	Recovery to baseline hydrological conditions following construction is unlikely.
Frequency	Continuous	The effect of hydrological changes resulting from construction will occur continually.
Context	Resilient	In the context of habitat alteration resulting from minor hydrological changes, waterfowl are resilient to change and have capacity to adapt.
Reversibility	Irreversible	Hydrological changes will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Hydrological changes will occur during construction.

Operations

Operation of the road is not anticipated to result in further changes to hydrology. It is possible that changes to hydrology may occur during the operations phase due to culvert and drainage maintenance. Blockages may lead to habitat alteration that may be both positive and negative. Repairs would restore the existing hydrology and a responsive maintenance program, including reporting mechanisms would limit the area affected. Mallards are known to rely on seasonal ponds as principal habitat before and

during the breeding season, preferred over semipermanent ponds and deeper lakes (Krapu et al., 1997), which would be more easily affected by hydrological changes.

Overall, the net effect is expected to be neutral but low in magnitude. A summary of the net effect assessment relating to hydrological changes during the operations phase based on the Characterization Criteria is presented in
Table 12-187.

Table 12-187: Criteria Results for Waterfowl Habitat Alteration or Degradation Due to Hydrological Changes – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as changes to hydrology may be both positive and negative relating to alteration of waterfowl habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect is not expected to measurable during the operations phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Hydrological changes are expected to occur throughout the waterfowl active season.
Duration	Short-term	Hydrological changes during road operations will be temporary until maintenance and repair activities are completed.
Frequency	Infrequent	Hydrological changes during road operations are expected to be rare.
Context	Resilient	Waterfowl are expected to be resilient to small habitat alterations that may result from hydrological changes that may occur during road operations.
Reversibility	Reversible	Hydrological changes should be restored once maintenance activities are concluded.
Likelihood of Occurrence	Possible	Additional hydrological effects during operations should be rare but have a small chance to occur if mitigations are ignored.

Sensory Disturbance

Construction

The net effect of increased sensory disturbance during construction is expected to be minor. Sensory disturbances resulting from road construction, including movement of equipment and vehicles, noise, lighting, and other human activities may degrade habitat for waterfowl adjacent to the Project Footprint. Disturbance may be considerable during impulsive activities such as blasting or quarrying, or during activities such as hauling which may occur during all hours causing stress to waterfowl and avoidance the ROW and surrounding area. Noise abatement mitigation measures will not entirely prevent daytime noise, which has the potential to degrade use of suitable breeding and foraging as waterfowl may experience difficulty communicating. Human presence may also cause waterfowl to decrease areas around the ROW as humans are viewed more negatively than vehicles. Artificial light from construction may attract waterfowl as it could extend feeding period. Light abatement mitigation measures are expected to be effective as the area impacted will be small. The effect is expected to be short-term and reversible within the LSA as it would stop when the operation phase ends and the road is no longer in use. A summary of

the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-188**.

Table 12-188: Criteria Results for Waterfowl Habitat Alteration or Degradation Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of waterfowl habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of waterfowl habitat but is unlikely to affect local populations.
Geographic Extent	LSA	Sensory disturbances altering waterfowl habitat will occur beyond the Project Footprint into the Local Study Area.
Timing	All Time Periods	Sensory disturbances altering waterfowl habitat are expected to occur through the year during the construction phase.
Duration	Short-term	Sensory disturbances generated by construction activities that alter waterfowl habitat are expected to stop after the construction phase.
Frequency	Frequent	Sensory disturbances that alter waterfowl habitat are expected to occur intermittently during construction.
Context	Resilient	In the context of habitat alteration due to sensory disturbances, waterfowl are generally resilient to change and have capacity to adapt.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the Project Footprint.
Likelihood of Occurrence	Certain	Sensory disturbances altering waterfowl habitat during construction are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Operations

The net effect of increased sensory disturbance during operations is expected to be minimal. For operations most sensory effects will be related to traffic noise which may degrade waterfowl habitat causing avoidance of areas near roads or decreased habitat value. It is expected that the road will mainly be used during daylight hours when waterfowl are primarily active, which may cause sensory disturbances that can degrade breeding and foraging habitat. Areas where humans exit their vehicles including water crossings and pull-offs may be particularly impacted. Low traffic levels are likely to result in minimal effects on waterfowl including Canada Geese and Mallard. While Canada Geese and Mallards use urban environments with high traffic levels, this tolerance may not be seen in local populations that have not habituated to urban environments.

Overall, it is possible there will be a small net negative effect due to sensory disturbances during operations. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-189**.

Table 12-189: Criteria Results for Waterfowl Habitat Alteration or Degradation Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of waterfowl habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of waterfowl habitat but is unlikely to affect overall waterfowl species populations.
Geographic Extent	LSA	Sensory disturbances altering waterfowl habitat will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering waterfowl habitat are expected to occur throughout the bird active season.
Duration	Medium-term	Sensory disturbances altering waterfowl habitat are expected to extend through road operations.
Frequency	Frequent	Sensory disturbances are expected to occur frequently during daylight hours during the bird active season.
Context	Resilient	In the context of habitat alteration due to sensory disturbances, generally waterfowl have shown little response to sensory disturbances at low levels.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Possible	Sensory disturbances altering waterfowl habitat use during road operations are probable as mitigation measures cannot entirely minimize traffic sensory impacts.

12.7.8.3 Alteration in Movement

Sensory Disturbance

Construction

Waterfowl movement is likely to be altered by sensory disturbances associated with Project construction and operations. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of waterfowl as they avoid the ROW and supportive infrastructure areas. Loud sudden noises could also cause waterfowl to abandon an area temporarily; however, habituation to these noises may occur. While both Mallards and Canada Goose are adaptable to urban environments the birds within the RSA are likely not as tolerant and may flush when human activity is present. Mitigation measures focused on sensory disturbance including timing of activities, and noise and light abatements are expected to mitigate most of the potential effects but there is a predicted net effect from sensory disturbance on waterfowl movement. A summary of the net effect assessment relating to alteration in waterfowl movement due to sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-190**.

Table 12-190: Criteria Results for Alteration in Movement of Waterfowl Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected to result from Project operation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few breeding pairs.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen at any period during the waterfowl active season.
Duration	Short-term	Any alteration of waterfowl movement will be short-term, during the construction phase of the Project.
Frequency	Infrequently	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes in behavior would only be temporary.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once the construction phase ends.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some waterfowl during construction.

Operations

During operations, noise will be the primary sensory impact on waterfowl. Traffic noise has been found to lower abundance and promote avoidance in many in many bird species, for waterfowl this may include shifting activity away from active roads. The Project is predicted to have only 500 vehicles per day but some species of waterfowl may change patterns of use at much lower levels. While Canada Geese and Mallards use urban environments with high traffic levels, this tolerance may not be seen in local populations that have not habituated to urban environments.

While traffic levels are expected to be low, it is possible that a few individual shorebirds will experience a negative alteration in movement in the LSA. A summary of the net effect assessment relating to alteration in movement due to sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-191**.

Table 12-191: Criteria Results for Alteration in Waterfowl Movement Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to alteration of waterfowl movement.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in waterfowl movement but is unlikely to affect overall waterfowl species populations.

Characterization Criteria	Result	Rationale
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All Time Periods	The effect of sensory disturbance on waterfowl movement will occur throughout their active season.
Duration	Medium-term	Alteration in waterfowl movement due to sensory disturbances is expected to extend through the operations phase.
Frequency	Frequent	Sensory disturbances that alter waterfowl movement are expected to occur intermittently during the operations phase.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and impacts would be intermittent.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once operation of the road ceases.
Likelihood of Occurrence	Possible	Alteration in movement due to sensory disturbances during the operations phase may occur but is unlikely as traffic levels are expected to be low and will mainly travel during daylight hours.

Loss of Connectivity

Construction

Vegetation removal and construction activities that could created gaps that affect habitat connectivity are not expected to result in major changes to waterfowl movement. Many boreal duck species show habitat preferences for areas of that are more structurally complex and may avoid gaps like those created by clearance activities. Waterfowl can rapidly move large distances, for example Mallard daily forage flight distances can be multiple kilometres (McDuie et al., 2019). For Canada Goose, given their use of open areas, clearance activities may create suitable habitats and be a positive effect. After implementation of mitigation methods, a small negative effect on waterfowl movement will likely remain. A summary of the net effects relating to alteration of movement through loss of connectivity during the construction phase based on the Characterization Criteria is presented in **Table 12-192**.

Table 12-192: Criteria Results for Alteration in Movement of Waterfowl Due to Changes in Connectivity – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur as a result of construction activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the barrier effect would be minimal for waterfowl.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the waterfowl active season.
Duration	Medium-term	Any alteration of waterfowl movement will be medium-term, as the effect will continue into the operations phase of the Project.

Characterization Criteria	Result	Rationale
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Changes in connectivity should be end once the operation phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some waterfowl during construction.

Operations

Connectivity is not expected to be affected for waterfowl during road operations. The structural similarity between the ROW and preferred waterfowl habitat will be unlikely to be treated as a barrier and no studies have shown that waterfowl are reluctant to cross over road gaps, and the effect of water crossing structures likely negligible given the small number and uncertain affect. While some bird species treat high traffic roads as a barrier, given that large bodied birds like waterfowl are generally less effected by roads and the predicted maximum vehicles travelling on the proposed road is 500 per day, with the majority of travel anticipated to take place during daylight hours, any barrier effect is likely to be minimal as there will be long periods of time with little to no traffic. After implementation of mitigation methods, a negligible negative effect on waterfowl movement will likely remain. A summary of the net effects relating to alteration of movement because of changes in connectivity during the operations phase based on the Characterization Criteria is presented in **Table 12-193**.

Table 12-193: Criteria Results for Alteration in Movement of Waterfowl Due to Changes in Connectivity – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as decreased connectivity may occur as a result of operation activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the barrier effect would be minimal for waterfowl.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the edge of Local Study Area.
Timing	All time periods	Changes in habitat connectivity that cause movement alterations would happen at any period during the waterfowl active season.
Duration	Medium-term	Any alteration of waterfowl movement will be medium-term, lasting the operations phase of the Project.
Frequency	Continuous	Changes in habitat connectivity are continuous.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Changes in connectivity should be end once the operations phase ends.
Likelihood of Occurrence	Possible	Changes in connectivity may affect some waterfowl during operations.

12.7.8.4 Injury or Death

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures, such as vehicle speed limits, during the construction phase is expected to keep the number of collisions and fatalities between waterfowl and vehicles and equipment low. Low numbers of vehicles will travel between camps and construction locations, collision risk will be minimized by effect enforcement of speed limits and wildlife training for personal. Within construction sites vehicles will be traveling at low speeds and environmental monitors will watch for any roosting or nesting birds and initiate mitigations if appropriate. As waterfowl are often seen crossing roads by walking, the risk of collisions between construction vehicles and water cannot completely be eliminated. Personnel on the ground and in the air will monitor for any large congregations of waterfowl that may become hazards for aircraft. It is expected there will be a net negative effect on waterfowl injury and death from collisions during the construction phase. A summary of the net effect assessment relating to injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-194**.

Table 12-194: Criteria Results for Waterfowl Injury or Death Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, collisions with construction vehicles are undesirable and considered to be adverse relating to waterfowl injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in waterfowl injury and death but is unlikely to affect overall waterfowl species populations.
Geographic Extent	LSA	The effect will extend to birds moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the active season for waterfowl.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures will limit the number of collisions between construction vehicles and waterfowl.
Context	Resilient	waterfowl are expected to be resilient to a small number of mortalities that may result from collisions with construction vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Possible	Collisions between construction vehicles and shorebirds may occur, despite mitigation measures.

Operations

Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the waterfowl active season near foraging and breeding habitats. As stated earlier, waterfowl comprise a relatively small number of avian casualties attributed to collisions with vehicles in

Canada but are likely under reported and the effect on waterfowl populations including Canada Goose and Mallard is unknown. The predicted maximum vehicles travelling on the road is 500 per day, with most travel anticipated to take place during daylight hours. Mitigations will likely be not as effective during operations as the construction phase as enforcement will be more difficult. Overall, a net negative effect is expected due to vehicle traffic. A summary of the net effect assessment relating to waterfowl injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-195**.

Table 12-195: Criteria Results for Waterfowl Injury or Death Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as collisions between waterfowl and vehicles are undesirable and considered the be adverse relating to waterfowl injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in waterfowl injury and death but is unlikely to affect overall waterfowl species populations.
Geographic Extent	LSA	The effect will extend to birds moving between habitats in the LSA on either side of the Project Footprint.
Timing	All Time Periods	Collisions between waterfowl and vehicles are expected to occur throughout the active season for waterfowl.
Duration	Medium-term	Collisions between waterfowl and vehicles are expected to occur through road operations.
Frequency	Infrequent	As road use will mainly occur during daylight hours, collisions between waterfowl and vehicles are expected to be rare.
Context	Resilient	waterfowl are expected to be resilient to a low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Probable	While waterfowl make up 1.06% of reported avian road mortalities in Canada, even with mitigations its probable some collisions with waterfowl will occur during operations phase due to the length of the operations phase.

Incidental Take

Construction

Vegetation clearing in waterfowl habitat during road construction may result in injury or death to waterfowl, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season. The characteristics of many waterfowl nests and hatchlings can make them difficult to detect although Canada Goose chose exposed sites that provide unobstructed views. Vulnerability to incidental take will depend on nesting habitat, with upland nesters more vulnerable than overwater nesters. Behaviour will also play a role as some species like mallards are more likely to abandon nests. After mitigation measures have been applied, including timing windows avoiding vegetation clearing in shorebird habitat during the breeding season (May 1 – July 31), it is less likely that bird injury or death will occur. Overall, a minor negative effect is likely. A summary of the net effect assessment relating to injury and death resulting from incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-196**.

Table 12-196: Criteria Results for Waterfowl Injury or Death Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of waterfowl may occur because of vegetation clearing during the breeding period.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the active season for waterfowl.
Duration	Short-term	Incidental take from construction activities will cease at the end of the construction phase.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Resilient	Waterfowl populations are expected to be resilient to a small number of mortalities that may result from incidental take during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Probable	Even with mitigations its probable some incidental take may occur during construction some nests likely be impacted.

Operations

Vegetation clearing in waterfowl habitat during road operation may result in injury or death to birds if conducted during the breeding season, even after mitigation measures have been applied. While Canada Goose nest sites are generally in the open and visible, the characteristics of other waterfowl nests can make them difficult to detect if a visual inspection is conducted prior to vegetation clearing. Given that work would solely occur in previously cut areas ground nesters like mallard may be the most affected and cavity nester habitat is unlikely to be affected directly although disturbances that could cause nest abandonment may be experienced by a few waterfowl. Though smaller in scale compared to construction activities, periodic clearing of the ROW and other repairs may occur during operations as part of required road maintenance. Overall, a net negative effect is possible if vegetation clearing occurs during the active season. A summary of the net effect assessment relating to injury and death resulting from incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-197**.

Table 12-197: Criteria Results for Waterfowl Injury or Death Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Waterfowl may occur due to incidental take during vegetation management conducted as a result of road operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Waterfowl injury and death but is unlikely to affect overall Waterfowl species populations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.

Characterization Criteria	Result	Rationale
Timing	Sensitive periods	Incidental take would primarily occur during the waterfowl breeding season.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Incidental take is expected to be rare with the implementation of mitigation measures such as timing windows.
Context	Resilient	Mitigations will limit any impacts on most waterfowl populations.
Reversibility	Reversible	The net effect is reversible once road operation concludes.
Likelihood of Occurrence	Possible	Even with mitigations its possible some incidental take may occur during operations given the extended lifetime of the road.

Changes to Predator-Prey Dynamics

Construction

Creation of the ROW by vegetation clearing during construction may improve access for predators of waterfowl, increasing predation pressures on these species. Mitigation involving reclamation/blockage of any temporarily disturbed areas and access roads after construction will minimize the effect as these actions will reduce open areas and linear features; however, the effects of increased predation cannot be completely eliminated.

Possible predators of adult waterfowl include a variety of predators, larger predators like coyote, black bear and Bald Eagle may take Canada Geese while meso-predators such as red fox and mustelids target ducks. Nest predators for waterfowl include small and medium sized mammals like red fox and mustelids as well as corvids. Conversely while the road may allow predators access to waterfowl habitats, nest survival has been found to be higher near roads as predators may show some avoidance of the areas closest to the road.

Effects on waterfowl from predator encounters from construction of the road are predicted to be long term in duration as predators are known to use linear features well beyond their operational lifetime. Overall, there will be a net negative effect on waterfowl survival in the LSA. A summary of the net effect assessment relating to injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-198**.

Table 12-198: Criteria Results for Waterfowl Injury or Death Due to Altered Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of waterfowl may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in waterfowl injury and death, but mitigations will limit the number of individuals.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.

Characterization Criteria	Result	Rationale
Timing	All Time Periods	Predation may occur at any time during active season for waterfowl.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are expected to be rare.
Context	Resilient	Waterfowl are expected to be resilient to a small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Several different species of waterfowl predators are known in the RSA which will likely take advantage of the ROW to access prey.

Operations

Injury and/or death from predation is probable during the operations phase for waterfowl. Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur throughout the wetland waterfowl active season where the road crosses breeding and foraging habitats. Predators may be attracted to the road during operations due to increased prey availability, such as rodents using habitat in the managed ROW. Roads may also cause an increase of food through roadkill and litter, which may facilitate expansion of boreal scavenging species, such as the red fox which prey on waterfowl (Frey and Conover, 2006). It is probable there will be a net negative effect on waterfowl survival in the LSA during road operation due to increased predation. A summary of the net effects relating to injury and death through increased predation during the operations phase based on the Characterization Criteria is presented in **Table 12-199**.

Table 12-199: Criteria Results for Waterfowl Injury or Death Due to Altered Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as predation of waterfowl is undesirable and considered to be adverse relating to waterfowl injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in waterfowl injury and death but is unlikely to affect overall waterfowl species populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the waterfowl active season.
Duration	Long-term	Effects from operational activities would last past the operational lifetime of road.
Frequency	Infrequent	Increases in nest predation due to building of the road are expected to occur occasionally.

Characterization Criteria	Result	Rationale
Context	Resilient	Waterfowl are expected to be resilient to a small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Increased predation is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Several different species of waterfowl predators are known in the RSA which may be attracted by road operations.

Increased Access

Construction

Injury and/or death from increased access is possible during the construction phase for waterfowl. Opening new areas to human development can often result in increased hunting and Mallard and Canada Goose are often targeted for harvest. Increased harvest may originate from workers or other people entering the construction site; however, strict site controls and workplace policies are expected to effectively eliminate the risk of hunting and poaching of waterfowl during the construction phase. Overall, there will be a negligible negative effect on waterfowl survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the construction phase based on the Characterization Criteria is presented in **Table 12-200**.

Table 12-200: Criteria Results for Waterfowl Injury or Death Due to Increased Access – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of waterfowl may occur because of increased access.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as mitigations are expected to limit waterfowl harvest during the construction phase.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Increased access to waterfowl may occur throughout most of the active waterfowl season.
Duration	Short-term	The control of access by the proponent will cease at the end of the construction phase.
Frequency	Infrequent	Waterfowl harvest during road construction is expected to be rare.
Context	Resilient	Waterfowl populations are expected to be resilient to the small number of mortalities that may result from harvest during construction.
Reversibility	Reversible	The net effect is reversible once construction concludes.
Likelihood of Occurrence	Possible	Even with mitigations, it's possible some harvest may occur during construction.

Operations

Injury and/or death from increased access is certain during the operations phase for waterfowl. Canada Goose and Mallard are the most harvested waterfowl species in Canada. Once the road opens waterfowl will be exposed to increased hunting pressure. Access constraints are often limiting factors for waterfowl harvest. The potential for harvest is also likely greater during the operations phase as it will operate over a long period of time and access will not be controlled unlike the construction phase. Mitigations will depend on community input and reporting mechanisms. Harvest of a few individuals is likely certain to occur. Some areas may see limited increases harvest pressure due to distance. Overall, there will be a moderate negative effect on waterfowl survival in the LSA. A summary of the net effect assessment relating to injury and death due to increased access during the construction phase based on the Characterization Criteria is presented in **Table 12-201**.

Table 12-201: Criteria Results for Waterfowl Injury or Death Due to Increased Access – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative; death of waterfowl may occur because of increased access.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in waterfowl injury and death and may locally affect waterfowl populations.
Geographic Extent	LSA	The effect will be limited primarily to the Project Footprint but may extend into the Local Study Area.
Timing	All Time Periods	Harvest of waterfowl may occur throughout the year.
Duration	Long-term	Access will likely continue past the operations phase as hunters will likely maintain access along the route.
Frequency	Frequent	Waterfowl harvest during road operations is expected to occur at regular intervals with increased access to new habitats.
Context	Resilient	Waterfowl populations are expected to be resilient to the small number of mortalities that may result from harvest during operations and may alter behavior to avoid the road.
Reversibility	Reversible	The net effect is reversible once operations conclude.
Likelihood of Occurrence	Certain	Harvest of some waterfowl along the road can be considered certain to happen.

Table 12-202 and **Table 12-203** provide summaries of the characterized predicted net effects for waterfowl during the construction and operations phases.

Table 12-202: Summary Table of the Predicted Net Effects for Waterfowl During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Low	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Hydrological Change	Negative	Negligible	LSA	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Resilient	Reversible	Certain
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Infrequently	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All Time Periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Incidental Take	Negative	Low	Project Footprint	All Time Periods	Short-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All Time Periods	Long-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Increased Access	Negative	Negligible	LSA	All Time Periods	Short-term	Infrequent	Resilient	Reversible	Possible

Table 12-203: Summary Table of the Predicted Net Effects for Waterfowl During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Low	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Hydrological Change	Negative	Low	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Possible
Alterations in Movement – Loss of Connectivity	Negative	Negligible	LSA	All time periods	Medium-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	Project Footprint	All Time Periods	Medium-term	Frequent	Resilient	Reversible	Possible
Injury or Death – Collisions with Vehicles	Negative	Low	Project Footprint	All Time Periods	Medium-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Incidental Take	Negative	Low	Project Footprint	Sensitive periods	Medium-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All Time Periods	Long-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Increased Access	Negative	Moderate	LSA	All Time Periods	Medium-term	Frequent	Resilient	Reversible	Certain

12.7.9 Raptors (Red-tailed Hawk, Great Grey Owl)

12.7.9.1 Habitat Loss

Raptor habitat loss is expected due to site preparation and construction activities as well as terrestrial vegetation changes during road construction and operation. There is a predicted net effect of habitat loss after implementation of mitigation measures.

Clearance Activities

Construction

Loss of raptor habitat by clearance activities is certain as a result of construction activities. Raptor habitat loss is expected due to site preparation and construction activities as well as terrestrial vegetation changes during road construction and operation. There is a predicted net effect of habitat loss after implementation of mitigation measures.

Both Red-tailed hawk and Great Grey Owls use mature forest for nesting habitats. For Red-tailed hawk deciduous and mixedwoods forest containing large aspen are frequently used but tall conifers are also potential nest sites with Great Grey Owl using all forest types where other large birds build stick nests.

Based on the results of habitat modelling via Ecological Land Classification (refer to Section 11), construction activities will remove 86.96 ha of habitat, representing approximately 4.2% of the most suitable Bald Eagles breeding habitat in the LSA. At the RSA level 213.52 ha of habitat will be removed, or 2.39% of suitable habitat. Overall, suitable Red-tailed hawk and Great Grey Owl nesting habitat is somewhat uncommon throughout the study area with 8.33% of the LSA and 7.66% of the RSA consisting of these vegetation communities.

For foraging habitat, estimated construction activities will result in the removal of 74.8 ha of Red-tailed hawk foraging habitat in the LSA and RSA or 1.15% in the LSA and 0.23% in the RSA. For Great Grey Owl removals total 213.79 ha in the LSA and 215.63 ha in the RSA or 1.37% and 0.28%, respectively. Overall, given the small amount of breeding habitat removed, and the availability of foraging habitat the net effect on both raptors is moderate. A summary of the net effects relating to the habitat loss during the operations phase is presented in **Table 12-204**.

Table 12-204: Criteria Results for Loss of Raptor Habitat Due to Clearance Activities – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of raptor habitat is expected as a result of Project construction.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of both Red-tailed hawk and Great Grey Owl habitat, and moderately low levels of prime breeding habitat are available in the area.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	Construction activities, including habitat removal are expected to occur through the year.

Characterization Criteria	Result	Rationale
Duration	Permanent	Any loss of raptor habitat is expected to permanent as the roadbed will remain on the landscape for the foreseeable future.
Frequency	Continuous	Raptor habitat once removed from the Project Footprint will remain removed for the forceable future.
Context	Low	Effects are likely to habitat types that are common throughout the RSA and throughout the larger region.
Reversibility	Irreversible	The roadbed is unlikely to be removed hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Certain	The loss of habitat during construction is certain.

Operations

Loss of Raptor habitat by clearance activities is not expected as a result of roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in loss of Raptor habitat. Overall, the effect on Raptor would be negligible. The effect is negative and the likelihood unlikely. A summary of the net effects relating to habitat loss during the operations phase is presented in **Table 12-205**.

Table 12-205: Criteria Results for Loss of Raptor Habitat Due to Clearance Activities – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as while no loss of additional habitat is expected, if it occurs it would be a net negative for raptors.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to occur during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All time periods	Additional loss of raptor habitat is not expected during operations.
Duration	Medium-term	Any loss of raptor habitat will be short-term, during repairs or maintenance and undergo restoration.
Frequency	Infrequent	Additional loss of raptor habitat during operations is not expected.
Context	Resilient	Effects are likely to affect habitats that are common throughout the RSA As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Unlikely	Additional net effects of the Project during operations are unlikely.

12.7.9.2 Habitat Alteration or Degradation

Hydrological Changes

Construction

It is probable hydrological changes may result in the alteration or degradation of raptor habitat during the construction phase. Raptor habitat used for foraging may be altered hydrologically, with construction activities such as grading for road installation resulting in changes to both surface and groundwater water causing flooding or drying of aquatic communities. Raptor nesting habitat may also be affected through the death of trees, both Red-tailed hawks and Great gray Owls use large trees for nesting sites and suitable nesting locations can often be limiting. The effects of roads on hydrology and wetland habitat may occur up to 250 m from the ROW. Mitigation measures implemented will assist in maintaining sufficient flow of both surface and groundwater through existing streams. Surface flow rates or water depths should not be significantly affected, and raptors should be able to utilize the same locations as habitat once construction is completed. After implementation of mitigation methods, a minor negative effect on raptor habitat will likely remain. A summary of the net effects relating to the changes in hydrology during the construction phase is presented in **Table 12-206**.

Table 12-206: Criteria Results for Habitat Alteration or Degradation of Raptor Habitat Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as some alteration of hydrology is expected because of project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect could cause a measurable alteration of raptor habitat, but the change is likely minimal.
Geographic Extent	LSA	The effect extends into the Local Study Area up to 250m
Timing	All Time Periods	Alteration of hydrology could occur during in any period.
Duration	Permanent	Hydrological changes originating in the construction phase are likely to be permanent as the roadbed will remain even after the operations phase ends.
Frequency	Continuous	Hydrological changes will be continuous.
Context	Resilient	Only a small fraction of raptor breeding habitat is likely to be affected.
Reversibility	Irreversible	The roadbed is unlikely to be removed hence the effect should be thought of as irreversible.
Likelihood of Occurrence	Probable	The alteration of wetland habitat during construction is likely to occur but mitigations should limit any changes.

Sensory Disturbance

Construction

It is probable sensory disturbance may result in the alteration or degradation of raptor habitat during the construction phase. Sensory disturbances generated during construction activities such as blasting, quarrying, hauling and clearing may occur during all hours, degrading raptor habitat. Construction noise is less continuous and more impulsive than traffic noise, so less habituation is expected. This is especially true of raptors that have not previously been exposed to anthropogenic noise (Andersen and Rongstad, 1989). Noise during construction may mask prey movements and reduce foraging efficiency, thereby degrading Great Grey Owl habitat near construction areas. This degradation is expected to be short-term as construction locations will move during the construction phase. While Red-tailed hawk is generally thought to be one of the most disturbance tolerant species it has shown avoidance of some industrial disturbances suggesting the response to disturbance is context dependant. After implementation of mitigation methods, a minor negative effect on raptor habitat is probable for the construction phase. A summary of the net effects relating to habitat alteration through sensory disturbance during the construction phase is presented in **Table 12-207**.

Table 12-207: Criteria Results for Habitat Alteration or Degradation of Raptor Habitat Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected to result from project construction activities.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could cause a measurable alteration of raptor habitat, but the change is likely small.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area approximately 125 m.
Timing	All time periods	Impacts on raptors could occur during any point of the active season.
Duration	Short-term	Any alteration of raptor habitat due to sensory impacts will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary.
Reversibility	Reversible	Sensory disturbance changes should be restored once construction activities are concluded.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some raptor during construction.

Operations

Effects of sensory disturbance on degradation or alteration of raptor habitat is possible during the operations phase. The main sensory effect will be traffic noise as road lighting will not exist of the community. While traffic noise has been found to degrade bird habitat this is primarily associated with high traffic volumes. During the operations phase, it is predicted that only 500 vehicles per day are

anticipated to use the road, primarily during daylight hours. Red-tailed hawks can often be found near higher traffic roads suggesting they are not sensitive to traffic and traffic noise. Great Gray Owls are largely considered to be crepuscular or nocturnal and would therefore be less impacted by sensory disturbances. Overall, it is predicted that there will be a small net negative effect during the operations phase. A summary of the net effects relating to habitat alteration through sensory disturbance during the operations phase is presented in **Table 12-208**.

Table 12-208: Criteria Results for Habitat Alteration or Degradation of Raptor Habitat Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected to result from project construction activities.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as raptors can often be seen roadside and negative effects are primarily seen along high-volume roads.
Geographic Extent	LSA	The effect will be extended past the Project Footprint into the Local Study Area approximately 125 m.
Timing	All time periods	Impacts on raptors would occur during any point of the active season.
Duration	Medium-term	Any alteration of raptor habitat due to sensory impacts will be medium-term, lasting the length of the operations phase.
Frequency	Frequent	Sensory disturbances will occur primarily during daytime when traffic occurs and not occur during most of the night.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and foraging habitat, affecting few individuals who may habituate.
Reversibility	Reversible	Sensory disturbance changes should be restored once use of the road concludes.
Likelihood of Occurrence	Possible	Sensory disturbances may affect some raptor but responses to low levels of traffic are generally minimal, and some habituation may occur.

Habitat Structural Change

Construction

It is possible changes in vegetation structure may result in the alteration or degradation of raptor habitat during the construction phase. Vegetation removals during road construction may alter or degrade raptor habitat near the Project Footprint including conversion to early seral habitats and creation of habitat edges. It is anticipated that restoration of temporary supportive infrastructure such as construction camps, aggregate source areas and access roads will reverse some of the habitat alteration or degradation caused by construction. For both Red-tailed hawk and Great Grey Owl, in terms of habitat degradation, a large component of the effect is associated with removal of mature forests and replacement with early seral communities in temporary supportive infrastructure areas and within the road ROW. Both Red-tailed hawks and Great Grey Owls are unlikely to be affected by the edge creation as they often preferentially chose edges and use early seral habitat. While large openings are poor habitat for Great Grey Owls almost all clearances will be narrow along the footprint apart from the quarry areas. Overall, it is predicted

that there will be a small net negative effect. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the construction phase is presented in **Table 12-209**.

Table 12-209: Criteria Results for Habitat Alteration or Degradation of Raptor Habitat Due to Changes in Vegetation Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as the low habitat value for early seral habitat outweighs positive edge effects.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as raptor habitat structure will be minimally affected.
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure could occur during any period.
Duration	Long-term	The changes in vegetation structure will be present as long as the road remains active and won't be of value to raptor as breeding habitat long past the operations phase ends.
Frequency	Continuous	The changes in vegetation structure will be present continuously once vegetation removal occurs.
Context	Resilient	Impact will be low as the vegetation changes will be minimal and raptor can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations its possible the changes in vegetation structure may affect some individual raptor during construction activities.

Operations

It is possible changes in vegetation structure may result in the alteration or degradation of raptor habitat during the operations phase. While it is anticipated that restoration of laydown areas and access roads will reverse some of the habitat alteration or degradation caused by road construction, these areas would not be used by most raptors for nesting for the foreseeable future. Maintenance activities, including removal of roadside vegetation during road operations, will create periodic disturbances and sustain edge effects along the ROW. For both Red-tailed hawks and Great Grey Owls creation of the edge is likely a positive change as Bald Eagles would be expected to use trees along any created edge if suitable perching trees are available. Given the narrow nature of the ROW increased windthrow is considered unlikely. A summary of the net effects relating to habitat alteration by changes in vegetation structure during the operations phase is presented in **Table 12-210**.

Table 12-210: Criteria Results for Habitat Alteration or Degradation of Raptor Habitat Due to Changes in Vegetation Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as the low habitat value for early seral habitat outweighs positive edge effects.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as raptor habitat structure will be minimally affected.

Characterization Criteria	Result	Rationale
Geographic Extent	LSA	The edge effect will extend into the LSA adjacent to the Project Footprint.
Timing	All time periods	The changes in vegetation structure will occur during all periods.
Duration	Long-term	The changes in vegetation structure will be present as long as the road remains active and won't be of value to raptor as breeding habitat long past the operations phase ends.
Frequency	Continuous	The changes in vegetation structure will be present continuously as long as maintenance activities occur.
Context	Resilient	Impact will be low as the vegetation changes will be minimal and raptors can use disturbed habitats.
Reversibility	Reversible	The effect is reversible one the roadway is removed.
Likelihood of Occurrence	Possible	Even with mitigations it's possible the changes in vegetation structure may affect some individual raptors during operations.

12.7.9.3 Alteration in Movement

Sensory Disturbances

Construction

It is probable sensory disturbance may result in the alteration in movement of raptors during the construction phase. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of raptors, as they avoid the road ROW and supportive infrastructure areas. Raptors responding negatively to loud sporadic noise using the areas less during noise events. For chronic noise both Great Grey Owls and Red-tailed Hawks show some habituation by being able to use noisy environments. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effects, and both Red-tailed hawk and Great Grey Owl have been shown to return to habitats once human activity stops but there is a predicted net effect from road construction activities on raptor movement. Artificial light may have both positive and negative affects for owls. Lighting during construction may act as an attractant for Owls for improved hunting. (Oliveira et al., 2024) A summary of the net effects relating to alteration of movement through sensory disturbance during the construction phase is presented in **Table 12-211**.

Table 12-211: Criteria Results for Alteration in Movement of Raptors Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected as a result of Project operation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect a few breeding pairs.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area, approximately 125 m.

Characterization Criteria	Result	Rationale
Timing	All time periods	Sensory disturbances that cause movement alterations could happen at any time of the year.
Duration	Short-term	Any alteration of raptor movement will be short-term, during the construction phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary with raptor adaptable to anthropogenic noise.
Reversibility	Reversible	Changes in movement due to sensory disturbance should end once the construction phase ends.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some raptors during construction.

Operations

It is probable sensory disturbance may result in the alteration in movement of raptors during the operations phase. Vehicle noise is anticipated be the primary sensory impact on raptors during operations. Traffic noise has been found to lower abundance and promote avoidance in many in many bird species. The Project is predicted to have only 500 vehicles per day and the noise study indicates only a small area may exceed these decibel limits (Appendix J – Noise and Vibration Impact Assessment Report). While traffic levels are expected to be low, it is possible that a few individual raptors will experience sensory impacts. Both Red-tailed Hawks and Great Grey Owls show little evidence of change in movement behavior around roads as they both seen along roadways. A subtle shift in movement behavior shown by raptors is to fly higher above active roadways but this does not limit their use of the area. A summary of the net effects relating to alteration of movement through sensory disturbance during the operations phase is presented in **Table 12-212**.

Table 12-212: Criteria Results for Alteration in Movement of Raptors Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is expected as a result of Project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as only slight shifts in movement behavior might be expected.
Geographic Extent	LSA	The effect will extend past the Project Footprint into the Local Study Area, approximately 125 m.
Timing	All time periods	Sensory disturbances that cause movement alterations would happen at any period during the year.
Duration	Medium-term	Any alteration of raptor movement will be medium-term, during the operations phase of the Project.
Frequency	Frequent	Sensory disturbances will occur during periods of construction activities, location and intensity will vary temporally.

Characterization Criteria	Result	Rationale
Context	Resilient	Effects are likely to affect only a small amount of breeding habitat and changes would only be temporary with raptor adaptable to anthropogenic noise.
Reversibility	Reversible	Sensory disturbance changes should be restored once operation of the road ends.
Likelihood of Occurrence	Probable	Sensory disturbances are likely to affect some raptors during the operations phase.

12.7.9.4 Injury or Death

Collisions with Vehicles

Construction

Injury and/or death from collisions is possible during the construction phase for raptors. Strictly enforcing mitigation measures during the construction phase around equipment, and vehicle travel speed are expected to keep the number of collisions between raptors and vehicles and equipment low. Raptors can be susceptible to collisions due to their feeding behaviors, either through hunting near roads or feeding on roadkill. Red-tailed Hawks are known to feed on carrion and Great Grey Owls can be particularly susceptible due to their low flying hunting behavior. Removal of roadkill, low traffic levels (maximum 500 a day) traveling mostly during the day and speed controls should mitigate but not eliminate the effect. Overall, after implementation of mitigation methods, a negative effect on raptors will likely remain. A summary of the net effects relating to Injury and death through collisions during the construction phase is presented in **Table 12-213**.

Table 12-213: Criteria Results for Injury or death of Raptors Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths due to collisions with construction vehicles may occur during the construction phase.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as only a couple individuals may be affected.
Geographic Extent	LSA	The effect will extend to raptors moving between habitats in the LSA on either side of the Project Footprint.
Timing	All time periods	Collisions could happen during any period during the raptor active season.
Duration	Short-term	Collisions with construction vehicles will only occur during the construction phase of the Project.
Frequency	Moderate	Raptor behavior near roads may make them susceptible to collisions.
Context	Resilient	Low number of collisions will limit any impacts on raptor populations.
Reversibility	Reversible	Collisions will stop once construction activities are concluded.
Likelihood of Occurrence	Possible	Even with mitigations its possible some collisions with raptors may occur during construction.

Operations

Injury and/or death from collisions is possible during the operations phase for raptors. Mortality during the operations phase is not expected to be eliminated by mitigations and potentially occurring all year except for winter but peak in summer as juvenile raptors are more susceptible to road-based mortality (Hanmer and Robinson, 2021). Low traffic levels (maximum 500 a day) traveling mostly during the day and speed controls should mitigate but not eliminate the effect. Mitigations are expected to be less effective during operations than the construction phase. Controls over vehicle speed, which is of particular importance for mitigating wildlife collisions, will be less enforceable when the road is operating. Additionally, roadkill is likely to remain on the road longer. Overall, a small net negative effect is predicted due to vehicle traffic during operations. A summary of the net effects relating to Injury and death through collisions during the operations phase is presented in **Table 12-214**.

Table 12-214: Criteria Results for Injury or death of Raptors Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, deaths due to collisions may occur as a result of road operation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect could potentially affect only a few individuals.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All time periods	Collisions could happen during any period during the raptor active season.
Duration	Medium-term	These collisions will occur through the lifetime of the operations phase of the Project.
Frequency	Infrequent	Low volume and minimal night travel will limit the number of collisions between vehicles and raptors.
Context	Moderate	Raptor behavior near roads may make them susceptible to collisions.
Reversibility	Reversible	Collisions will stop once operational activities are concluded.
Likelihood of Occurrence	Probable	Even with mitigations its probable some collisions with raptors will occur during operations phase as road users may not be aware of raptor behavior.

Incidental Take

Construction

Injury and/or death from incidental take is possible during the construction phase for raptors. Mitigations related to avoiding vegetation removal during the critical breeding period of raptors are expected to minimize the potential effect of incidental take. Vegetation clearing in raptor habitat during road construction may result in injury or death to birds, hatchlings, and/or eggs if management of vegetation is carried out during the breeding season, even after mitigation measures have been applied. Incidental nest removal is unlikely as both Red-tailed hawk and Great Grey Owl mainly use large stick nests that are relatively conspicuous on the landscape. Great Grey Owls can also use broken tops of trees and snag which are less obvious but detectible by trained observers. Indirect mortality could occur if construction activities take place within close proximity to active nest but is unlikely as know nest are not within a 1km

radius of the Project Footprint. After implementation of mitigation methods, including timing windows, pre-clearance surveys and buffer establishment, any remaining effects will be negligible. A summary of the net effects relating to Injury and death through incidental take during the construction phase is presented in **Table 12-215**.

Table 12-215: Criteria Results for Injury or death of Raptors Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of raptor may occur because of incidental take.
Magnitude	Low	The magnitude of the effect is predicted to be low, as raptor nests are generally conspicuous and known within the Project Footprint.
Geographic Extent	LSA	The effect could extend out into the Local Study Area due to nest abandonment.
Timing	Sensitive periods	If it occurs, incidental take will primarily occur during the raptor breeding season as nestlings or eggs may be affected.
Duration	Short-term	Incidental take from construction activities will stop at the end of the construction phase of the Project.
Frequency	Infrequent	Timing mitigation will limit the number deaths due to clearance activities.
Context	Resilient	Mitigations will limit any impacts on raptor populations.
Reversibility	Reversible	Incidental take would stop once construction activities are concluded.
Likelihood of Occurrence	Possible	With mitigations it's possible incidental take may occur during construction.

Operations

Injury or death from incidental take is unlikely during the operations phase for raptors. Though smaller in scale, periodic clearing of the ROW may occur during operations as part of line-of-sight maintenance, while timing windows will be enforced this maintenance may be required inside of the breeding season. Given that work would solely occur in previously cut areas, raptor habitat is unlikely to be affected directly although disturbances that could cause nest abandonment may be experienced by a few raptors. While no existing nests occur near the road, during the lifetime of the road new nests could be built that may be impacted by maintenance activities. A small chance exists that large trees adjacent to the roadway may be removed due to safety concerns. After implementation of mitigation methods, including timing windows, pre-clearance surveys and buffer establishment, any remaining effects will be negligible. A summary of the net effects relating to Injury and death through incidental take during the operations phase is presented in **Table 12-216**.

Table 12-216: Criteria Results for Injury or death of Raptors Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of raptor may occur as a result of incidental take.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as raptor nests are conspicuous and well known in the project vicinity.

Characterization Criteria	Result	Rationale
Geographic Extent	LSA	The effect could extend out into the LSA due to nest abandonment.
Timing	Sensitive periods	If it occurs, incidental take will primarily occur during the raptor breeding season as nestlings or eggs may be affected.
Duration	Medium-term	The potential for incidental take would occur over the operating lifetime of the road.
Frequency	Infrequent	Timing mitigation will limit the number deaths due to clearance activities.
Context	Resilient	Mitigations will limit any impacts on raptor populations.
Reversibility	Reversible	Incidental take would stop once road operations are concluded.
Likelihood of Occurrence	Unlikely	With mitigations it's unlikely incidental take will occur during operations even given the extended lifetime of the road.

Changes to Predator-Prey Dynamics

Construction

Injury and/or death from predation is possible during the construction phase for raptors. Roads that traverse raptor breeding habitat may favour predators and increase predation risk. For adults birds Red-tailed Hawks will likely experience few attempts while Great Grey Owls may be more exposed to Great Horned Owls. Nestlings and eggs from both species can be predated by a number of species that may take advantage of the road for access or increased exposure of the nest. Mitigation involving reclamation/blockage of any temporarily disturbed areas and access roads will reduce the effect as these actions will reduce open areas and linear features; however, the effects of increased predation cannot be eliminated. Effects on raptors from increased predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. After implementation of mitigation methods, a negative impact on raptors will remain. A summary of the net effects relating to Injury and death through predation during the construction phase is presented in **Table 12-217**.

Table 12-217: Criteria Results for Injury or death of Raptors Due to Predation – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of raptor may occur because of increased predation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as some predation attempts will occur as a result of increased access.
Geographic Extent	LSA	The effect will extend into the Local Study Area.
Timing	All time periods	Predation could occur throughout the raptor active season.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are likely to be low in frequency due to the location of raptor nests and their ability to defend most predation attempts.

Characterization Criteria	Result	Rationale
Context	Resilient	Raptors, especially adults are rarely targets of predation.
Reversibility	Reversible	The effect of increased predation would end once the linear features have regenerated sufficiently.
Likelihood of Occurrence	Possible	With mitigations it's possible predation rates will increase due to construction of the road.

Operations

Injury and/or death from predation is possible during the construction phase for raptors. The effect during the operations phase will be a continuation of the same impacts as the construction phase. Maintenance clearing during operations will maintain openness along the ROW increasing predator access to areas adjacent to the road. Effects on raptors from predator encounters are predicted to be long-term in duration as predators are known to use linear features well beyond their operational lifetime. Some shifting of nest locations away from roads may occur as this has been found in some species of hawks and owls as a response to disturbance (Strasser et al., 2013; Rodriguez et al., 2006). If nest locations shift away from the road exposure to predation would be lower. After implementation of mitigation methods, a negative impact on Short-eared Owl will remain. A summary of the net effects relating to injury and death through incidental take during the operations phase is presented in **Table 12-218**.

Table 12-218: Criteria Results for Injury or death of Raptors Due to Predation – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as deaths of raptor may occur because of increased predation.
Magnitude	Low	The magnitude of the effect is predicted to be low, as mitigations will limit the number of affected individuals.
Geographic Extent	LSA	The effect will extend into the Local Study Area.
Timing	All time periods	Predation would occur throughout the raptor active season.
Duration	Long-term	The effect that originated as part of construction would last past the operational lifetime of road.
Frequency	Infrequent	Predation events are likely to be low in frequency due to the location of raptor nests and their ability to defend most predation attempts.
Context	Resilient	Raptors, especially adults are rarely targets of predation.
Reversibility	Reversible	The effect of increased predation would end once the linear features have regenerated sufficiently.
Likelihood of Occurrence	Probable	Even with mitigations its possible that increased predation could occur given known use of linear edges by predators.

Table 12-219 and **Table 12-220** provide summaries of the characterized predicted net effects for raptors during the construction and operations phases.

Table 12-219: Summary Table of the Predicted Net Effects for Raptors During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Certain
Habitat Alteration or Degradation – Hydrological Changes	Negative	Negligible	LSA	All Time Periods	Permanent	Continuous	Resilient	Irreversible	Probable
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Frequent	Moderate	Reversible	Probable
Habitat Alteration or Degradation – Changes in Vegetation Structure	Neutral	Negligible	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Low	LSA	All time periods	Short-term	Infrequent	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Negligible	LSA	All time periods	Short-term	Infrequent	Moderate	Reversible	Possible
Injury or Death – Incidental Take	Negative	Low	LSA	Sensitive periods	Short-term	Infrequent	Resilient	Reversible	Possible
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Possible

Table 12-220: Summary Table of the Predicted Net Effects for Raptors During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All time periods	Medium-term	Infrequent	Resilient	Reversible	Unlikely
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Negligible	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Possible
Habitat Alteration or Degradation – Changes in Vegetation Structure	Negative	Negligible	LSA	All time periods	Long-term	Continuous	Resilient	Reversible	Possible
Alterations in Movement – Sensory Disturbance	Negative	Negligible	LSA	All time periods	Medium-term	Frequent	Resilient	Reversible	Probable
Injury or Death – Collisions with Vehicles	Negative	Low	LSA	All time periods	Medium-term	Infrequent	Moderate	Reversible	Probable
Injury or Death – Incidental Take	Negative	Negligible	LSA	Sensitive periods	Medium-term	Infrequent	Resilient	Reversible	Unlikely
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All time periods	Long-term	Infrequent	Resilient	Reversible	Possible

12.7.10 Reptiles and Amphibians

12.7.10.1 Habitat Loss

Herptile habitat loss is expected due to site preparation and construction activities as well as hydrological changes during road construction and operations. There is a predicted net effect of habitat loss after implementation of mitigation measures.

Clearance Activities

Construction

Reptile and amphibian habitat loss is expected due to site preparation and construction activities, such as vegetation clearing and quarry creating, as well as hydrological changes resulting from road construction. Construction of the Project Footprint will directly and permanently remove habitat suitable for reptiles and amphibians to overwinter, breed, and thermoregulate for the duration of road operations. Overall, the net effect to herptiles will be negative due to loss of suitable habitats. A summary of the net effect assessment relating to habitat loss during the construction phase based on the Characterization Criteria is presented in **Table 12-221**.

Table 12-221: Criteria Results for Loss of Reptile and Amphibian Habitat – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as loss of habitat is undesirable and considered the be adverse.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable loss of Reptile and Amphibian habitat but the habitat loss experienced is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of habitat loss will occur throughout the Reptile and Amphibian active season.
Duration	Permanent	Recovery to baseline habitat conditions following construction is unlikely.
Frequency	Continuous	Once Reptile and Amphibian habitat is removed, the effect will occur continuously.
Context	Moderate	In the context of habitat loss due to road construction, Reptiles and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Irreversible	Habitat loss from the road construction will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Habitat loss will occur as a result of road construction.

Operations

Maintenance of the road including vegetation trimming and repairs to road infrastructure may be required over time, which may result in the removal of suitable Reptile and Amphibian habitat that has temporarily regenerated in the Project Footprint. Overall, it is probable there will be a neutral effect on herptiles. A summary of the net effect assessment relating to habitat loss during the operations phase based on the Characterization Criteria is presented in **Table 12-222**.

Table 12-222: Criteria Results for Loss of Reptile and Amphibian Habitat – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no loss of additional habitat is expected due to road operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, there will be no additional measurable loss of Reptile and Amphibian habitat during operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Additional loss of Reptile and Amphibian habitat is not expected during operations, but road maintenance may occur at any time during the year.
Duration	Short-term	Any additional loss of Reptile and Amphibian habitat will be short-term, until vegetation management activities are completed.
Frequency	Infrequent	Additional loss of Reptile and Amphibian habitat during operations is not expected, with road maintenance activities occurring rarely.
Context	Low	Habitat loss as a result of vegetation management along the road is expected to be minimal and selective. Reptiles and Amphibians are expected to be resilient to small habitat losses that may result vegetation management during road operations.
Reversibility	Reversible	The net effect is reversible as vegetation is expected to regrow once vegetation management and road maintenance is completed.
Likelihood of Occurrence	Unlikely	An additional negative effect as a result of road operation is unlikely to occur.

12.7.10.2 Habitat Alteration or Degradation

There is a predicted net effect due to vegetation removal after implementation of mitigation measures. Vegetation removals during construction are certain to alter habitat composition in Project Footprint areas where temporary laydown areas, temporary camps, access roads are created and proposed rehabilitation.

Habitat *Structural Change*

Construction

Construction of the road may result in a change in Reptile and Amphibian habitat structural change, such as reduced connectivity (movement corridors) between overwintering habitat and breeding habitat, or a reduction in size of overwintering and breeding habitats due to loss of vegetation, changes in vegetation community structure, hydrological changes, and construction of the roadbed. To the degree possible,

connectivity will be maintained through eco-passages installed in high potential wetland habitat that is fragmented by the construction of the road and temporary exclusion fencing; however, it is probable there will be a negative net effect of habitat alteration after implementation of mitigation measures.

A summary of the net effect assessment relating to degradation and alteration in habitat due to change in habitat structure during the construction phase based on the Characterization Criteria is presented in **Table 12-223**.

Table 12-223: Criteria Results for Alteration in Reptile and Amphibian Habitat Due to Change in Habitat Structure – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as change in habitat structure is undesirable and considered the be adverse relating to alteration of Reptile and Amphibian habitat.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the change in habitat structure will cause a measurable change in Reptile and Amphibian use of habitat but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Alteration in Reptile and Amphibian habitat due to a change in habitat structure is expected to happen throughout the Reptile and Amphibian active season.
Duration	Medium-term	Effects to change in habitat structure are expected to extend through the operations phase.
Frequency	Continuous	The construction of the road, including vegetation removals and hydrological changes, will generate continuous effects to habitat structure.
Context	Moderate	In the context of alteration in habitat due to change in habitat structure, Reptiles and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Irreversible	Effects to Reptile and Amphibian habitat due to change in habitat structure are likely permanent due to hydrological changes and the presence of the roadbed.
Likelihood of Occurrence	Certain	Alteration in Reptile and Amphibian habitat due to change in habitat structure is certain to occur.

Operations

Habitat alteration or degradation due to change in habitat structure initiated during the construction phase from vegetation clearing and changes to vegetation community structure is expected to continue during the operations phase. These vegetation changes will be maintained during road operations, but no new changes to habitat structure are expected to be generated as a result. Overall, the net effect is expected to be neutral. A summary of the net effect assessment relating to degradation and alteration in habitat due to change in habitat structure during the operations phase based on the Characterization Criteria is presented in **Table 12-224**.

Table 12-224: Criteria Results for Alteration in Reptile and Amphibian Habitat Due to Change in Habitat Structure – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no additional changes to habitat structure are expected during road operation, resulting in no change compared with baseline conditions.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable change in Reptile and Amphibian habitat during operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Alteration in Reptile and Amphibian habitat due to changes in habitat structure may occur throughout the Reptile and Amphibian active season.
Duration	Short-term	Alteration in Reptile and Amphibian habitat due to changes in habitat structure during operations will be temporary should they occur because of road maintenance and repair activities.
Frequency	Infrequent	Changes in habitat structure due to required road maintenance and repair activities are expected to be rare.
Context	Low	Reptiles and Amphibians are expected to be resilient to small alterations in habitat that may result from temporary changes in habitat structure that may occur during road operations.
Reversibility	Reversible	Effects to Reptile and Amphibian habitat due to changes in habitat structure are reversible once maintenance activities are concluded.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur.

Hydrological Changes

Construction

Herpetofaunal habitat may be altered hydrologically, with construction activities such as grading for road installation resulting in changes to both surface and groundwater water causing flooding or drying of vegetation communities. Based on the Groundwater assessment of alteration to groundwater level and flow direction (Section 8.5) these changes are certain in the RSA. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to hydrological changes during the construction phase based on the Characterization Criteria is presented in **Table 12-225**.

Table 12-225: Criteria Results for Reptile and Amphibian Habitat Alteration or Degradation – Due to Hydrological Changes – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as it is undesirable and considered the be adverse relating to alteration of Reptile and Amphibian habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of Reptile and Amphibian habitat but will be unlikely to affect the local Reptiles and Amphibians populations.

Characterization Criteria	Result	Rationale
Geographic Extent	LSA	The effect will extend into the LSA.
Timing	All Time Periods	Hydrological changes are expected to occur through the year during the construction phase.
Duration	Permanent	Recovery to baseline hydrological conditions following construction is unlikely.
Frequency	Continuous	The effect of hydrological changes resulting from construction will occur continually.
Context	Moderate	In the context of habitat alteration resulting from hydrological changes, Reptiles and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Irreversible	Hydrological changes will persist beyond project operations and the net effect is unlikely to be reversed.
Likelihood of Occurrence	Certain	Hydrological changes will occur during construction.

Operations

Operation of the road is not anticipated to result in further changes to hydrology. It is possible that changes to hydrology may occur during the operations phase due to culvert and drainage maintenance. Overall, the net effect is expected to be negative. A summary of the net effect assessment relating to hydrological changes during the operations phase based on the Characterization Criteria is presented in **Table 12-226**.

Table 12-226: Criteria Results for Reptile and Amphibian Habitat Alteration or Degradation Due to Hydrological Changes – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as changes to hydrology are undesirable and considered the be adverse relating to alteration of Reptiles and Amphibians habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as drainage issues during operations are expected to be rare but may occur at times critical to amphibian development.
Geographic Extent	LSA	Hydrological changes will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	Hydrological changes are expected to occur throughout the active season for Amphibians and Reptiles.
Duration	Short-term	Hydrological changes during road operations will be temporary until maintenance and repair activities are completed.
Frequency	Infrequent	Hydrological changes during road operations are expected to be rare.
Context	Low	Reptiles and Amphibians are expected to be resilient to small habitat alterations that may result from hydrological changes that may occur during road operations.
Reversibility	Reversible	Hydrological changes should be restored once maintenance activities are concluded.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur during the operations phase.

Sensory Disturbance

Construction

During construction, activities such as blasting at quarries/pits, earth hauling and vegetation clearing, and the use of lighting around facilities, may reduce the ability of Reptiles and Amphibians to use habitat along the ROW and supportive infrastructure due to sensory disturbances. Mitigation measures around timing (hours of work) for construction activities are expected to mitigate most of the potential effects but there is a predicted net effect from noise due to construction activities. Overall, it is probable there will be a net negative effect due to sensory disturbance.

Overall, it is certain there will be a net negative effect due to sensory disturbance. The effect is expected to be medium term and reversible within the LSA as it would stop when the operation phase ends and the road is no longer in use. It is low in magnitude and moderate in context, with the effect occurring frequently and at any time.

A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-227**.

Table 12-227: Criteria Results for Reptile and Amphibian Habitat Alteration or Degradation – Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of Reptile and Amphibian habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of Reptile and Amphibian habitat but is unlikely to affect overall Reptile and Amphibian species populations.
Geographic Extent	LSA	Sensory disturbances altering Reptile and Amphibian habitat will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering Reptile and Amphibian habitat are expected to occur through the year during the construction phase.
Duration	Short-term	Sensory disturbances altering Reptile and Amphibian habitat from road construction will cease once construction is complete.
Frequency	Frequent	Sensory disturbances that alter Reptile and Amphibian habitat are expected to occur intermittently during construction.
Context	Moderate	In the context of habitat alteration due to sensory disturbances, Reptiles and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Certain	Sensory disturbances altering Reptile and Amphibian habitat during construction are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Operations

Overall, high traffic periods are not anticipated to overlap with the primarily nocturnal calling periods for anuran species in the RSA, therefore a small (low) net effect is expected. A summary of the net effect assessment relating to habitat alteration and degradation caused by sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-228**.

Table 12-228: Criteria Results for Reptile and Amphibian Habitat Alteration or Degradation Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbance is undesirable and considered the be adverse relating to alteration of Reptile and Amphibian habitat.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable alteration of Reptile and Amphibian habitat but is unlikely to affect overall Reptile and Amphibian species populations.
Geographic Extent	LSA	Sensory disturbances altering Reptile and Amphibian habitat will occur beyond the Project Footprint into the LSA.
Timing	All Time Periods	Sensory disturbances altering Reptile and Amphibian habitat are expected to occur throughout their active season.
Duration	Medium-term	Sensory disturbances altering Reptile and Amphibian habitat are expected to extend through road operations.
Frequency	Infrequent	Sensory disturbances that alter Reptile and Amphibian habitat are expected to be rare as peak traffic will avoid overnight periods when anurans are calling.
Context	Low	In the context of habitat alteration due to sensory disturbances, Reptiles and Amphibians are resilient to low-level, infrequent noise and light.
Reversibility	Reversible	Sensory disturbances are reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Certain	Sensory disturbances altering Reptiles and Amphibians habitat during road operations are certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

12.7.10.3 Alteration in Movement

There is a predicted net effect of alteration in herptile movement after implementation of mitigation measures. Vegetation clearing, blasting, contouring activities and the use of fencing to demarcate construction areas are likely to create short-term physical barriers to movement during the construction phase.

Loss of Connectivity

Construction

Herptile movement is likely to be altered by the road due to the open space, and due to paved and gravel substrates. Mitigation measures such as culvert crossings may provide some mitigation to allow for movement; however, there is a predicted net effect from road operations on herptile movement. Overall, a

net negative effect is probable due to the construction of the road. A summary of the net effect assessment relating to alteration in movement due to physical barriers during the construction phase based on the Characterization Criteria is presented in **Table 12-229**.

Table 12-229: Criteria Results for Alteration in Reptile and Amphibian Movement Due to Physical Barriers – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as physical barriers are undesirable and considered the be adverse relating to alteration of Reptile and Amphibian movement.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as physical barriers will cause a measurable change in Reptile and Amphibian movement but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Alteration in Reptile and Amphibian movement due to physical barriers is expected to happen throughout their active season.
Duration	Medium-term	Effects to movement are expected to extend through the operations phase.
Frequency	Continuous	The presence of the roadbed will generate continuous effects to movement.
Context	Moderate	In the context of alteration in movement due to physical barriers, Reptiles and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Effects to Reptile and Amphibian movement due to physical are reversible if the roadbed surface is reclaimed by natural vegetation.
Likelihood of Occurrence	Certain	Alteration in Reptile and Amphibian movement due to physical barriers is certain to occur.

Operations

No additional physical barriers are anticipated to occur during the operations phase. Overall, the effect will be neutral. A summary of the net effect assessment relating to physical barriers during the operations phase based on the Characterization Criteria is presented in **Table 12-230**.

Table 12-230: Criteria Results for Alteration in Reptile and Amphibian Movement Due to Physical Barriers – Operations

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no additional physical barriers are expected during road operation, resulting in no change compared with baseline conditions.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as there will be no additional measurable change to Reptile and Amphibian movement during operations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.

Characterization Criteria	Result	Rationale
Timing	All Time Periods	Alteration in Reptile and Amphibian movement due to loss of physical barriers may happen throughout their active season.
Duration	Short-term	Alteration in Reptile and Amphibian movement due to physical barriers during operations will be temporary should they occur because of road maintenance and repair activities.
Frequency	Infrequent	Additional physical barriers due to required road maintenance and repair activities expected to be rare.
Context	Low	Reptile and Amphibians are expected to be resilient to small alterations in movement that may result from temporary physical barriers that may occur during road operations.
Reversibility	Reversible	Effects to Reptiles and Amphibians movement due to physical barriers are reversible once maintenance activities are concluded.
Likelihood of Occurrence	Unlikely	A negative effect is unlikely to occur.

Sensory Disturbances

Construction

Herptile movement is also likely to be altered by sensory disturbances. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of herptiles as they avoid the project ROW and supportive infrastructure. Mitigation measures focused on sensory disturbance including timing, noise and light abatement are expected to mitigate most of the potential effect but there is a predicted net effect from construction activities on herptile movement. A summary of the net effect assessment relating to alteration in Reptile and Amphibian movement due to sensory disturbance during the construction phase based on the Characterization Criteria is presented in **Table 12-231**.

Table 12-231: Criteria Results for Alteration in Reptile and Amphibian Movement Due to Sensory Disturbance – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to alteration of Reptile and Amphibian movement.
Magnitude	Low	The magnitude of the effect is predicted to be low, as sensory disturbances are not expected to cause a measurable change in Reptile and Amphibian movement and are unlikely to affect their populations.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of sensory disturbance on Reptile and Amphibian movement will occur throughout their active season.
Duration	Short-term	Construction-related sensory disturbances altering Reptile and Amphibian movement will conclude after the completion of the construction phase.
Frequency	Continuous	Sensory disturbances altering Reptile and Amphibian movement are expected to occur continually during construction.

Characterization Criteria	Result	Rationale
Context	Moderate	In the context of alteration in movement due to sensory disturbances, Reptile and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Alteration in movement due to sensory disturbances is reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Certain	Alteration in movement due to sensory disturbances during construction is certain as mitigation measures cannot entirely minimize light and noise generated to baseline levels.

Operations

After the implementation of mitigation measures, road operations are also expected to be some alterations in herptile movement. While traffic levels are expected to be low, herptiles are still certain to experience a negative alteration in movement in the Project Footprint. A summary of the net effect assessment relating to alteration in Reptile and Amphibian movement due to sensory disturbance during the operations phase based on the Characterization Criteria is presented in **Table 12-232**.

Table 12-232: Criteria Results for Alteration in Reptile and Amphibian Movement Due to Sensory Disturbance – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as sensory disturbances are undesirable and considered the be adverse relating to alteration of Reptile and Amphibian movement.
Magnitude	Low	The magnitude of the effect is predicted to be low, as sensory disturbances are not expected to cause a measurable change in Reptile and Amphibian movement and are unlikely to affect their populations.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	All Time Periods	The effect of sensory disturbance on Reptile and Amphibian movement will occur throughout their active season.
Duration	Medium-term	Alteration in Reptile and Amphibian movement due to sensory disturbances is expected to extend through the operations phase.
Frequency	Continuous	Sensory disturbances altering Reptile and Amphibian movement are expected to occur continually during operations.
Context	Moderate	In the context of alteration in movement due to sensory disturbances, Reptile and Amphibians are moderately resilient to change and have capacity to adapt.
Reversibility	Reversible	Alteration in movement due to sensory disturbances is reversible when noise and light cease to be generated in the ROW.
Likelihood of Occurrence	Certain	Alteration in movement due to sensory disturbances during operations is certain.

12.7.10.4 Injury or Death

It is expected that, even with mitigation measures, herptile mortality could increase during the construction and operation phases due to collisions with vehicles, vegetation clearing, potential introduction of harmful pathogens, and higher predation levels.

Collisions with Vehicles

Construction

Strictly enforcing mitigation measures during the construction phase is expected to keep the number of collisions between herptiles and vehicles and equipment low and the magnitude low. While mitigation measures are generally effective, certain species such as spring peeper and boreal chorus frog may be capable of evading wildlife fencing due to their natural ability to climb and cling to surfaces. Overall, a net negative effect is likely due to construction. A summary of the net effect assessment relating to Reptile and Amphibian injury and death resulting from collisions during the construction phase based on the Characterization Criteria is presented in **Table 12-233**.

Table 12-233: Criteria Results for Reptile and Amphibian Injury or Death Due to Collisions – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, collisions with construction vehicles are undesirable and considered to be adverse relating to Reptile and Amphibian injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as collisions are not expected to cause a measurable change in Reptile and Amphibian injury and death and are unlikely to affect their populations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Collisions may occur at any time during the Reptile and Amphibian active season.
Duration	Short-term	Collisions with construction vehicles and equipment would only occur during the construction phase.
Frequency	Infrequent	Strict enforcement of mitigation measures, including the use of wildlife fencing, will limit the number of collisions between construction vehicles and Reptile and Amphibians.
Context	Low	Reptile and Amphibians are expected to be resilient to a small number of mortalities that may result from collisions with construction vehicles.
Reversibility	Reversible	Collisions with construction vehicles and equipment will cease once construction activities conclude.
Likelihood of Occurrence	Probable	Collisions between construction vehicles and Reptile and Amphibians will likely occur, despite mitigation measures, as certain species such as spring peepers and boreal chorus frogs are capable of circumventing wildlife exclusion fencing.

Operations

During operations, the predicted maximum vehicles travelling on the road is 500 per day, with most of the travel anticipated to take place during daylight hours. Mortality during the operations phase is not expected to be eliminated by mitigations but is expected to occur at low levels throughout the amphibian active season, primarily at nighttime during the sensitive spring breeding period; during seasonal dispersal or migration; and after periods of heavy rain. Overall, a net negative effect is expected due to vehicle traffic. A summary of the net effect assessment relating to Reptile and Amphibian injury and death resulting from collisions during the operations phase based on the Characterization Criteria is presented in **Table 12-234**.

Table 12-234: Criteria Results for Reptile and Amphibian Injury or Death Due to Collisions – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as collisions between Reptile and Amphibians and vehicles are undesirable and considered the be adverse relating to Reptile and Amphibian injury and death.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in Reptile and Amphibian injury and death but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	Collisions between Reptile and Amphibians and vehicles will be limited to the Project Footprint.
Timing	All Time Periods	Collisions between Reptile and Amphibians and vehicles are expected to occur throughout their active season.
Duration	Medium-term	Collisions between Reptile and Amphibians and vehicles are expected to occur through road operations.
Frequency	Frequent	Collisions between Reptile and Amphibians and vehicles are expected to occur frequently when Reptiles and Amphibians are dispersing and migrating between seasonal habitats.
Context	Moderate	Reptile and Amphibians are expected to be moderately resilient to a low number of mortalities that may result from collisions with vehicles during road operations.
Reversibility	Reversible	Collisions will cease once road operation concludes.
Likelihood of Occurrence	Certain	Vehicles travelling between during the Reptile and Amphibian active season will collide with Reptile and Amphibians as they disperse and migrate between seasonal habitats.

Changes to Predator-Prey Dynamics

Construction

Effects on herptile survival from improved predator access and movement rates due to the construction of the road are probable. Mitigation involving reclamation/blockage of any temporarily disturbed areas and access roads after construction will reduce the effect as these actions will reduce open areas and linear features; however, the effects of increased predation cannot be completely eliminated. Effects on herptiles from predator encounters are predicted to be long term in duration as predators are known to use linear features well beyond their operational lifetime. Overall, a net negative effect is expected due to increased predation. The effect is expected to be infrequent, low in context, long term and reversible once the linear features have been naturalized or reclaimed.

A summary of the net effect assessment relating to Reptile and Amphibian injury and death due to predators during the construction phase based on the Characterization Criteria is presented in **Table 12-235**.

Table 12-235: Criteria Results for Reptile and Amphibian Injury or Death Due to Changes in Predator-Prey Dynamics – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Reptile and Amphibians may occur due to improved predator access during construction.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Reptile and Amphibian injury and death but is unlikely to affect overall Reptile and Amphibian species populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the Reptile and Amphibian active season.
Duration	Long-term	Improved predator access is expected to remain beyond the operations phase.
Frequency	Infrequent	Predation events are expected to be rare as there are no predators that specialize on Reptile and Amphibians in the region.
Context	Low	Reptile and Amphibians are expected to be resilient to a small number of mortalities that may result from predation during the construction phase.
Reversibility	Reversible	Improved predator access is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Improved predator access will likely result in increased predation of Reptile and Amphibians.

Operations

Predators may be attracted to the road during operations due to increased prey availability, such as rodents using roadside habitat in the managed ROW. It is probable there will be a net negative effect on Reptile and Amphibian survival in the LSA during road operation due to increased predation. A summary of the net effect assessment relating to Reptile and Amphibian injury and death due to predators during the operations phase based on the Characterization Criteria is presented in **Table 12-236**.

Table 12-236: Criteria Results for Reptile and Amphibian Injury or Death Due to Changes in Predator-Prey Dynamics – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as predation of Reptile and Amphibians is undesirable and considered to be adverse relating to Reptile and Amphibian injury and death.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Reptile and Amphibian injury and death but is unlikely to affect overall Reptile and Amphibian species populations.
Geographic Extent	LSA	Predators are not expected to remain in the Project Footprint and will travel into the LSA.
Timing	All Time Periods	Predation may occur at any time during the Reptile and Amphibian active season.
Duration	Medium-term	Increased predation is expected to continue beyond the operations phase.
Frequency	Infrequent	Predation events are expected to be rare as there are no predators that specialize on Reptile and Amphibians in the region.
Context	Low	Reptile and Amphibians are expected to be resilient to a small number of mortalities that may result from predation during the operations phase.
Reversibility	Reversible	Increased predation is expected to end once vegetation has re-established in the linear features following operations.
Likelihood of Occurrence	Probable	Predators attracted to the ROW during road operations will likely predate Reptile and Amphibians.

Introduction of Disease

Construction

Increased anthropogenic activity during road construction may result in the introduction of disease such as ranavirus to reptiles and amphibians and their aquatic habitats. During site preparation and construction, mitigation measures such as cleaning vehicles and equipment prior to arrival on site and properly containing and disposing of wastewater should be effective at preventing indirect transmission via contaminated sediments. Overall, a net negative effect is possible due to increased anthropogenic activity introducing disease. A summary of the net effect assessment relating to Reptile and Amphibian injury and death due to disease introduced during the construction phase based on the Characterization Criteria is presented in **Table 12-237**.

Table 12-237: Criteria Results for Reptile and Amphibian Injury or Death Due to Disease – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Reptile and Amphibians may occur due to introduced disease during construction.
Magnitude	High	The magnitude of the effect is predicted to be high, as introduced disease will cause a measurable change in Reptile and Amphibian injury and death and may exceed the ability of these species to continue sustained existence within the area.
Geographic Extent	LSA	The effect will extend to the LSA.
Timing	All Time Periods	Disease may be introduced at any time during the Reptile and Amphibian active season.
Duration	Permanent	Recovery to baseline conditions is unlikely once disease is introduced.
Frequency	Infrequent	Opportunities to introduce disease to Reptile and Amphibians during construction are expected to be rare.
Context	Moderate	Reptile and Amphibian populations are expected to be moderately resilient to disease (ranavirus) introduced during road construction and have the capacity to assimilate the change.
Reversibility	Irreversible	Once a disease such as ranavirus is introduced into Reptile and Amphibian populations it is unlikely to be eradicated.
Likelihood of Occurrence	Possible	Disease may be introduced during construction but is unlikely to occur due to the steps and mechanisms required for transmission into Reptile and Amphibian populations.

Operations

Increased anthropogenic activity during road operation may result in the introduction of ranavirus to reptiles and amphibians and their aquatic habitats. This may occur from vehicles on the road shedding contaminated sediments, or from recreational activities taking place in adjacent habitats with boats and recreational vehicles (i.e., utility terrain vehicle, all-terrain vehicle) that have previously been in areas with ranavirus. Overall, a net negative effect is possible due to increased anthropogenic activity introducing disease A summary of the net effect assessment relating to Reptile and Amphibian injury and death due to disease introduced during the operations phase based on the Characterization Criteria is presented in **Table 12-238**.

Table 12-238: Criteria Results for Reptile and Amphibian Injury or Death Due to Disease – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Reptile and Amphibians may occur due to introduced disease during construction.
Magnitude	High	The magnitude of the effect is predicted to be high, as introduced disease will cause a measurable change in Reptile

Characterization Criteria	Result	Rationale
		and Amphibian injury and death and may exceed the ability of these species to continue sustained existence within the area.
Geographic Extent	LSA	The effect will extend to the LSA.
Timing	All Time Periods	Disease may be introduced at any time during the Reptile and Amphibian active season.
Duration	Permanent	Recovery to baseline conditions is unlikely once disease is introduced.
Frequency	Infrequent	Opportunities to introduce disease to Reptile and Amphibians during construction are expected to be rare.
Context	Moderate	Reptile and Amphibian populations are expected to be moderately resilient to disease (ranavirus) introduced during road construction and have the capacity to assimilate the change.
Reversibility	Irreversible	Once a disease such as ranavirus is introduced into Reptile and Amphibian populations it is unlikely to be eradicated.
Likelihood of Occurrence	Possible	Disease may be introduced during operations but is unlikely to occur due to the steps and mechanisms required for transmission into Reptile and Amphibian populations.

Incidental Take

Construction

Vegetation clearing in reptile and amphibian habitat during road construction and operation may result in injury or death to these species groups, even after mitigation measures have been applied. Species such as spring peepers and boreal chorus frogs are typically very small as adults (3-4 cm in body length) while a newly metamorphosed American toad may be even smaller (2 cm) and easily missed during a wildlife rescue conducted within a contained area. Overwintering amphibians are likewise very challenging to detect and may be present in wetlands during construction activities such as vegetation clearing. Additionally, spring peepers and boreal chorus frogs are able to climb vegetation and may be camouflaged among foliage or in cracks, crevices and knot holes. Overall, a net negative effect is probable. A summary of the net effect assessment relating to Reptile and Amphibian injury and death resulting from incidental take during the construction phase based on the Characterization Criteria is presented in **Table 12-239**.

Table 12-239: Criteria Results for Reptile and Amphibian Injury or Death Due to Incidental Take – Construction

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Reptile and Amphibians may occur due to incidental take during construction activities.
Magnitude	Moderate	The magnitude of the effect is predicted to be moderate, as the effect will cause a measurable change in Reptile and Amphibian injury and death but is likely within the adaptive capability of these species.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.

Characterization Criteria	Result	Rationale
Timing	All Time Periods	Incidental take may occur at any time during the year.
Duration	Short-term	The potential for incidental take during construction would end once construction is completed.
Frequency	Frequent	Incidental take is expected to occur intermittently during construction.
Context	Moderate	Reptile and Amphibians are expected to be moderately resilient to mortalities that may result from incidental take during construction.
Reversibility	Reversible	The net effect is reversible once road operation concludes.
Likelihood of Occurrence	Probable	Incidental take of Reptile and Amphibians will likely occur, despite mitigation measures, as certain species will be difficult to detect during both the active season and overwintering period.

Operations

Vegetation management activities in reptile and amphibian habitat during road operation may result in injury or death to these species groups, even after mitigation measures have been applied. Species such as spring peepers and boreal chorus frogs are typically very small as adults (3-4 cm in body length) while a newly metamorphosed American toad may be even smaller (2 cm) and easily missed during a wildlife rescue conducted within a contained area. Overwintering amphibians are likewise very challenging to detect and may be present in vegetation management areas, including roadside ditches. Additionally, spring peepers and boreal chorus frogs are capable of climbing vegetation and may be camouflaged among foliage or in cracks, crevices and knot holes. Overall, a net negative effect is possible. A summary of the net effect assessment relating to Reptile and Amphibian injury and death resulting from incidental take during the operations phase based on the Characterization Criteria is presented in **Table 12-240**.

Table 12-240: Criteria Results for Reptile and Amphibian Injury or Death Due to Incidental Take – Operations

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as injury or death of Reptile and Amphibians may occur due to incidental take during vegetation management and road maintenance conducted as a result of road operations.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable change in Reptile and Amphibian injury and death but is unlikely to affect overall Reptile and Amphibian species populations.
Geographic Extent	Project Footprint	The effect will be limited to the Project Footprint.
Timing	All Time Periods	Incidental take may occur at any time during the year.
Duration	Medium-term	Incidental take is expected to occur over the operating lifetime of the road.
Frequency	Infrequent	Incidental take is expected to be rare as road maintenance and vegetation management will be infrequent.

Characterization Criteria	Result	Rationale
Context	Low	Reptile and Amphibians are expected to be resilient to a small number of mortalities that may result from incidental take during road operation.
Reversibility	Reversible	The net effect is reversible once road operation concludes.
Likelihood of Occurrence	Possible	While it expected to be rare, vegetation management activities and road maintenance may result in incidental take, causing Reptile and Amphibian injury or death.

Table 12-241 and **Table 12-242** provide summaries of the characterized predicted net effects for amphibians and reptiles during the construction and operations phases.

Table 12-241: Summary Table of the Predicted Net Effects for Amphibians and Reptiles During the Construction Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Negative	Moderate	Project Footprint	All Time Periods	Permanent	Continuous	Moderate	Irreversible	Certain
Habitat Alteration or Degradation – Habitat Structural Change	Negative	Moderate	Project Footprint	All Time Periods	Medium-term	Continuous	Moderate	Irreversible	Certain
Habitat Alteration or Degradation – Hydrological Changes	Negative	Low	LSA	All Time Periods	Permanent	Continuous	Moderate	Irreversible	Certain
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All Time Periods	Short-term	Frequent	Moderate	Reversible	Certain
Alterations in Movement – Loss of Connectivity	Negative	Moderate	Project Footprint	All Time Periods	Medium-term	Continuous	Moderate	Reversible	Certain
Alterations in Movement – Sensory Disturbance	Negative	Low	Project Footprint	All Time Periods	Short-term	Continuous	Moderate	Reversible	Certain
Injury or Death – Collisions with Vehicles	Negative	Low	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Probable
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All Time Periods	Long-term	Infrequent	Low	Reversible	Probable
Injury or Death – Introduction of Disease	Negative	High	LSA	All Time Periods	Permanent	Infrequent	Moderate	Irreversible	Possible
Injury or Death – Incidental Take	Negative	Moderate	Project Footprint	All Time Periods	Short-term	Frequent	Moderate	Reversible	Probable

Table 12-242: Summary Table of the Predicted Net Effects for Amphibians and Reptiles During the Operations Phase

Predicted Net Effect	Net Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
Habitat Loss – Clearance Activities	Neutral	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Habitat Alteration or Degradation – Habitat Structural Change	Neutral	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Habitat Alteration or Degradation – Changes in Hydrological Changes	Negative	Low	LSA	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Habitat Alteration or Degradation – Sensory Disturbance	Negative	Low	LSA	All Time Periods	Medium-term	Infrequent	Low	Reversible	Certain
Alterations in Movement – Loss of Connectivity	Neutral	Negligible	Project Footprint	All Time Periods	Short-term	Infrequent	Low	Reversible	Unlikely
Alterations in Movement – Sensory Disturbance	Negative	Low	Project Footprint	All Time Periods	Medium-term	Continuous	Moderate	Reversible	Certain
Injury or Death – Collisions with Vehicles	Negative	Moderate	Project Footprint	All Time Periods	Medium-term	Frequent	Moderate	Reversible	Certain
Injury or Death – Changes to Predator-Prey Dynamics	Negative	Low	LSA	All Time Periods	Medium-term	Infrequent	Low	Reversible	Probable
Injury or Death – Introduction of Disease	Negative	High	LSA	All Time Periods	Permanent	Infrequent	Moderate	Irreversible	Possible
Injury or Death – Incidental Take	Negative	Low	Project Footprint	All Time Periods	Medium-term	Infrequent	Low	Reversible	Possible

12.8 Determination of Significance

Several methodologies can be used to determine whether an adverse environmental effect is significant or not significant, as outlined in the Interim Technical Guidance Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act (CEA Agency, 2018). Adverse consequences on the Wildlife and Wildlife Habitat VC would include:

- Habitat Loss;
- Habitat Alteration or Degradation;
- Alteration in Movement; and
- Injury or Death.

As presented in Section 5.2.6 (Environmental Assessment/Impact Assessment Approach: Determination of Significance), a qualitative aggregation method was used to determine significance based on the sequential interaction among the magnitude, geographic extent, duration, frequency, reversibility, and likelihood of occurrence criteria for effects. The net effects criteria were presented in **Table 12-47**. Consideration has also been given to potential management concerns, and concerns expressed by Indigenous communities and groups, the public, government agencies and stakeholders during engagement and consultation activities conducted for the Project (**Table 12-2 and Table 12-3**).

As described in Table 5-6, the following sequential interactions form the basis for determination of significance of adverse net effects on the Wildlife and Wildlife Habitat VC:

A predicted net effect is considered significant if it is:

- High in magnitude, local or regional in extent, long-term to permanent in duration, represents a management concern (i.e., net effects would alter the sustainability of the VC beyond a manageable level, or result in change not in accordance with provincial and federal guidelines) and has been identified as a key concern or interest by Indigenous communities and groups. In other words, Project effects would alter biological diversity and/or ecosystem function to such a degree that species and/or vegetation communities could not sustain themselves.

A predicted net effect is considered not significant if the effect is:

- Low to moderate in magnitude, local in extent, short-term in duration, does not represent a management concern, and has not been identified as a key concern or interest by Indigenous communities and groups.

12.8.1 Moose

In Ontario the primary drivers of Moose population changes have be found to be habitat loss, along with hunting and predatory prey relationships (Street et al. 2015; Timmermann et al. 2002; MNR 2017). Moose are relatively resilient to changes in their environment. Although net effects on moose and moose habitat are expected to occur, the Project's net effects are predicted to be not significant.

12.8.1.1 Habitat Loss

The net net effect of loss of habitat are predicted to be moderate in magnitude for the construction phase and negligible for operations phase. The loss of moose habitat is primarily expected to result from the construction phase. Moose habitat is common in the region as little development has occurred within the Moose LSA, forestry activities are not present, mining activities are limited to the easternmost areas of the LSA and disturbances from the community only effecting areas on the far west side. Moose Late wintering habitat is the most limited moose habitat with only 3.8% of the Moose LSA classified as suitable, so removal of even a small amount may affect moose use of an area. The loss of habitat is predicted to be not significant for either the construction or operations phase.

12.8.1.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including structural change to vegetation, hydrological changes and sensory disturbances.

The net effects of alteration of habitat due to changes in vegetation structure is low in magnitude for the construction phase. Construction activities will convert some areas of mature coniferous forest to early seral, which will reduce the amount of Late Winter Habitat but may provide additional areas of high-quality moose browse. The effect on moose is expected from alteration of vegetation structure is predicted to be not significant in either the construction or operations phase.

The net effects of alteration of habitat due to hydrological changes is moderate in magnitude for the construction phase. Construction of roadways through peatlands have a history of altering hydrology obstructing surface and subsurface water flows. Based on the groundwater assessment these changes will extend into the LSA and persist as long as the roadway remain in place. While rated as moderate, the net effect from hydrological changes are expected to be not significant.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude for the construction and operations phases. In terms of habitat alteration from noise, light, human activity during construction the effects are temporary in nature and will be mitigated through noise, light and dust abatement. Based on the short-term nature of the effect and the application of mitigation measures the effect during construction is expected to be not significant. Sensory disturbance during operations will be related to traffic noise and visual presence. Moose generally avoid high traffic roads but still use areas around roads with low traffic levels like forecasted for the WSR. Given the low levels of traffic, net effects on moose is expected to be not significant for either the construction or operations phase.

12.8.1.3 Alterations in Movement

Alterations in movement resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including sensory disturbances and effects on connectivity.

The net effects of alteration in movement due to changes in connectivity are construction and operations phaselow in magnitude during the construction and operations phases. Barriers during construction could alter how Moose move within the construction footprint. The presence of human activity many also alter moose movement in the area; however, the mitigation measures selected including breaks and minimizing the construction footprint, should limit any movement effects. Wide linear features may impede moose crossing but the narrow ROW is not expected to restrict moose crossing. Changes in movement due to connectivity are expected to be not significant.

The net effects of alteration in movement due to sensory disturbance are construction and operations phase low in magnitude during construction and operations Phases. Noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of moose as they avoid the Project ROW. Mitigations centered on timing, noise and light mitigation are expected to be effective. During operations, vehicle noise is anticipated be the primary sensory effect on moose. Traffic levels are also known to influence moose movement as multiple studies have found road avoidance increases with increased disturbance. Given the low traffic volume expected along the WSR, sensory disturbance is expected to cause a not significant effect on movement.

12.8.1.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, increased access, and changes to predator-prey dynamics, are predicted to be not significant.

The net effect for collisions is negligible in magnitude during the construction phase and a low in magnitude during the operations phase. Effective enforcement of vehicle use is expected during the construction phase and the effects are expected to be not significant. While mitigations may be less effective during operations, collisions with vehicles will be rare as traffic volume is expected to remain low at 500 vehicles per day and most travel will be during daylight.

The net effect for increased access is predicted to be negligible in magnitude during construction phase and a low in magnitude during operations phase. Strict site controls and workplace policies are expected to effectively eliminate the risk of hunting and poaching of moose during the construction phase and the effect is expected to be not significant. During operations the potential for harvest is likely greater as it will operate over a long period of time and access will not be controlled. This will somewhat be mitigated by low traffic along the road and few access points leading from the road. While rated as moderate, the net effect of increased access during operations is expected to be not significant.

The net effects for changes to predator-prey dynamics is low in magnitude during both the construction and operations phases. Construction of the road will allow moose predators, in particular gray wolves, to move more quickly through the area. While wolves will likely display some avoidance of the road, the low traffic levels will still allow for predator use. Additionally, mitigations around food storage, garbage removal and roadkill will limit predator attraction to the ROW. While the effect of increased predation will likely result in some moose deaths, it is expected to be not significant on survival and reproduction of moose.

12.8.2 Furbearers (American Marten)

For American marten population impacts are often related to forest fragmentation and disturbance often linked to timber harvest which reduces the availability of their preferred mature forest habitats (Thompson et al. 2012). Although net effects on marten and marten habitat are expected to occur, the Project's net effects are predicted to be not significant.

12.8.2.1 Habitat Loss

The net effects of loss of habitat is moderate in magnitude during construction phase and negligible during operations phase. The loss of American marten habitat will persist past the operations phase as it will be generally difficult to reverse due to the permanent nature of the roadway. American marten habitat

is common in the region as little development has occurred within the RSA, forestry activities are not present, mining activities are limited to the easternmost areas of the RSA and disturbances from the community only impacting areas on the far west side. Based on ELC communities, suitable marten habitat is common throughout the study areas with 48.42% of the LSA and 51.78% of the RSA. Based on the RSF modeling, only 1.9% of winter high use habitat is removed by the road in the LSA. The loss of habitat is predicted to be not significant for either the construction or operations phase.

12.8.2.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including structural change to vegetation, hydrological changes and sensory disturbances.

The net effects of alteration of habitat due to changes in vegetation structure are low in magnitude for the construction and operations phases. Most of the impact is associated with removal of mature upland forests and replacement with early seral communities in temporary areas and along the edges of the ROW. While many areas will be scheduled for restoration, regrowth of forests in the boreal is slow and any subsequent anthropogenic disturbance could slow recovery. Mitigations that target keeping the footprints of work areas small and minimizing additional access and temporary laydowns/clearings will reduce conversion to early seral communities. Additionally, the construction phase will create areas that are devoid of woody vegetation and are of limited use by marten. The alteration of vegetation structure is predicted to be not significant for either the construction or operations phases.

The net effects of alteration of habitat due to hydrological changes is moderate in magnitude for the construction phase. Roadways constructed through peatlands have a history of altering hydrology obstructing surface and subsurface water flows. Based on the groundwater assessment these changes will extend into the LSA and persist as long as the roadway remain in place. Alteration to hydrology could affect vegetation including canopy cover an important characteristic for marten. While rated as moderate, the hydrological changes are not expected to be not significant.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude during the construction and operations phases. In terms of habitat alteration from noise, light, human activity during construction the effects are temporary in nature and will be mitigated through noise, light and dust abatement. Based on the short-term nature of the effect and the application of mitigation measures the effect during construction is expected to be not significant. Sensory disturbance during operations phase will be related to traffic noise and visual presence of humans. While marten reduce their use of areas around roads, its unclear if noise plays a factor and marten can use areas around human habitation. Given the low levels of traffic, the net effect on marten is expected to be not significant for either the construction or operations phases.

12.8.2.3 Alterations in Movement

Alterations in movement resulting from the construction and operations phases are likely to extend beyond the project footprint to the LSA, including sensory disturbances and effects on connectivity.

The net effects of alteration in movement due to changes in connectivity are low in magnitude during construction and operations phases. The net effects regarding alteration of movement of American marten from physical barriers is considered negligible in magnitude and will only occur during construction. American marten has been found to avoid open areas including linear features like road ROWs, and while larger openings may act as a greater barrier, narrow feature can cause avoidance.

Avoidance of these areas may be due to risk of predation and marten may also avoid younger regenerating areas in the ROW as they likely lack structural complexity like large CWD. Changes to connectivity are predicted to be not significant for either the construction or operations phases.

The net effects of alteration in movement due to sensory disturbance are low in magnitude during construction and operations phases. during construction, noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of marten as they avoid the project ROW. During operations, traffic could also cause sensory disturbances that cause marten to move away or avoid the area around the road; however, American marten avoidance of roads due to sensory impacts from vehicles has not been clearly linked. Mitigation measures will reduce the impacts and the temporary nature of many of these impacts will allow Marten to reoccupy the areas when disturbances aren't present. Overall, changes due to sensory disturbance is predicted to be not significant for either the construction or operations phases.

12.8.2.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, harvest and changes to predator-prey dynamics, are predicted to be not significant.

The net effects for collisions negligible in magnitude during the construction phase and low in magnitude during the operations phase. effective enforcement of vehicle use is expected during the construction phase and are expected to be not significant. While mitigations may be less effective during operations, the number of reported collisions with American marten is very low and will not affect the local or regional populations as marten often avoid roads except when dispersing. Overall, death or injury due to collisions is predicted to be not significant for either the construction or operations phases.

The net effect for incidental take is negligible in magnitude during construction and operations phases. While dens could be damaged or destroyed during clearance activities, mitigation measures including identification of occupied logs/snags, not clearing suitable marten denning areas during sensitive periods will limit impacts on marten. While vegetation management will occur during operations, this will take place in early seral vegetation adjacent to the ROW which is not suitable marten habitat. Overall, death or injury due to incidental take is not deemed significant for either the construction or operations phases.

The net effects for changes to predator-prey dynamics low in magnitude during construction and operations phases. Construction of the road will allow marten predators like coyotes, lynx and fox to move more quickly through the Project area. As American marten generally avoid roadways and will minimize the time spent within the open areas associate with the ROW road use by predators. Marten may be exposed to these areas seasonally or if attracted to the road by roadkill. Overall, death or injury due to increased predation is predicted to be not significant for either the construction or operations phases.

The net effects for increased access is negligible in magnitude during the construction phase and moderate in magnitude during operations phase. The American marten is a heavily trapped furbearer, in Canada it accounts for about 20% of fur sales. Increased access has been known to lead to higher levels of trapping. The road will be tightly controlled during construction which will limit harvest impacts. While traffic along the road is expected to be low and only the immediate area around the ROW will be accessible as few access roads/cutlines exist and restoration will take place on those that are created for the Project. Overall, death or injury due to increased access is predicted to be not significant for either the construction or operations phases.

12.8.3 Furbearers (North American Beaver)

For North American beaver, the principal drivers of beaver populations are habitat loss and habitat degradation (Boyle and Owens, 2007). Beavers are relatively resilient to changes in their environment. Although net effects on beaver and beaver habitat are expected to occur, the Project's net effects are predicted to be not significant.

12.8.3.1 Habitat Loss

The net effects of loss of habitat is moderate in magnitude during construction phase and negligible in magnitude during operations phase. The loss of North American beaver habitat will persist past the operations phase of the Project as it will be generally difficult to reverse due to the permanent nature of the roadway. Beaver habitat is primarily the small rivers, lakes and ponds that are scattered throughout the RSA. Loss of habitat resulting from the construction of the Project are largely expected to be limited in geographic extent to the Project Footprint. High and medium quality beaver habitat occupies 8,227.5 ha in the RSA or 6.14%. The amount of high and medium quality beaver habitat lost to construction of the road is 9.8 ha representing 0.12% of the available high quality North American beaver habitat. Overall, the loss of habitat is predicted to be not significant for either the construction or operations phases.

12.8.3.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including structural change to vegetation.

The net effects of alteration of habitat due to changes in vegetation structure are low in magnitude during the construction and operations phases. While beavers can make use of early seral areas as they often regenerate as deciduous shrubs and trees which are preferred browse for beavers, the return of intermediate and large sized aspen and other preferred deciduous tree species in mixedwood and deciduous areas will take 20-40 years. Additionally, the construction phase will create areas that are devoid of woody vegetation and are of limited use by beavers. Overall, the alteration of vegetation structure is predicted to be not significant for either the construction or operations phases.

12.8.3.3 Alteration in Movement

Alterations in movement resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including effects on connectivity.

The net effects of alteration in movement due to changes in connectivity are low in magnitude during the construction and operations phases. Construction activities could create short-term negative physical barriers to North American beaver movement. With the mitigation measures planned, including breaks, minimized construction footprints and maintaining water flow, the magnitude will be negligible for the effect of physical barriers. Beavers may avoid risky habitats such as large open areas as they are more likely to encounter a predator, while some areas will be restored following construction the road and shoulders of the road will remain clear and may limit some beaver movement. Overall, changes to connectivity are predicted to be not significant.

12.8.3.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, harvest and changes to predator-prey dynamics, are predicted to be not significant.

The net effects for collisions is negligible in magnitude during the construction phase and low in magnitude during the operations phase. Effective enforcement of vehicle use is expected during the construction phase and the effects are expected to be not significant. While mitigations may be less effective during operations, the number of reported collisions with North American beavers is very low and will not affect the local or regional populations.

The net effects for incidental take is negligible in magnitude during the construction phase. Dams and lodges may need to be removed or damaged as part of clearance activities for construction of the roadbed and water levels could fluctuate when in water work takes place. Active beaver lodges are easily located allowing for effective mitigations to be applied. Overall, death or injury due to incidental take is not deemed significant for either the construction or operations phases.

The net effects for changes to predator-prey dynamics is low in magnitude during the construction and operations phases. Construction of the road will allow beaver predators, in particular gray wolves, to move more quickly through the Project area. The risk will be mitigated as access roads will be reclaimed and blocked and some beaver predators such as grey wolves and wolverines avoid areas of active human use. Additionally, predation has not been shown to have an effect on beaver populations, with populations quickly responding to predation. Overall, changes to predator-prey dynamics are predicted to be not significant for either the construction or operations phases.

The net effects for increased access is negligible in magnitude during the construction phase and low in magnitude during the operations phase. As stated earlier, historically North American beavers have been the most trapped furbearer in North America and human trapping/hunting activities continues to be the largest mortality factor for adults. The road will be tightly controlled during construction which will limit impacts, and while the roadway will provide improved access to the area during operations the remoteness is expected to minimize increases in trapping effort. Overall, death or injury of beavers from increased access is predicted to be not significant for either the construction or operations phases.

12.8.4 Bats

Big Brown Bat occurs widely throughout Ontario and is considered the most commonly encountered bat, in part due to population declines experienced by the other seven (7) species that occur in the province. Hoary Bat, Eastern Red Bat and Silver-haired Bat populations in North America have been declining for decades (COSEWIC, 2023) but are not yet considered species at risk under the SARA; however, on January 27, 2025, they were listed as Endangered under the ESA. In Ontario, the decline of these species was evident by decreasing numbers of carcasses found under wind turbines during the late summer and autumn migration, where over seven (7) years Hoary Bats experienced a 21% per year decline; Eastern Red Bats a 27% per year decline; and Silver-haired Bats a 29% per year decline (Davy et al. 2020). Wind turbines are broadly accepted as a major cause of mortality in bats, having a high to very high effect, and in Ontario, turbine activity is curtailed when the fatality rates exceed a threshold of more than 10 bats per turbine per year (COSEWIC, 2023; MNR, 2011). It is estimated that over the next three generations, all three species will experience a 31% to 100% decline because of encountering wind turbines (COSEWIC, 2023). Decline in prey availability is also identified as having a medium to high effect on Hoary Bat, Eastern Red Bat and Silver-haired Bat populations, although it can be challenging to quantify, and is associated with loss of insect-producing habitats such as wetlands, as well as widespread use of pesticides in agriculture, forestry, and urban settings (COSEWIC, 2023). Although net effects on bat habitat are expected to occur, the Project's net effects are predicted to be not significant.

12.8.4.1 Habitat Loss

The net effects of habitat loss is moderate in magnitude during the construction phase and negligible in magnitude during the operations phase.

Hardwood forest and mixed forest vegetation communities, which contain the most suitable maternity roosting habitat for Bats, are rare in the RSA, comprising just 0.45% (189.61 ha and 343.99 ha, respectively) of the RSA. It is predicted that 0.85% (1.60 ha) of hardwood forest and 1.24% (4.21 ha) of mixed forest will be permanently removed in the RSA, representing 3.06% of the most suitable maternity roosting habitat. Foraging habitat in the RSA, which is typically over open wetlands, mixed swamps and along river corridors, comprises 3.75% (4,373.91 ha) of the RSA. Approximately 2.08% (9.08 ha) of this habitat assemblage is predicted to be permanently removed in the RSA. With effective implementation of mitigation, the Project is likely to have a moderate negative effect on habitat availability and distribution. Overall Bat habitat use is projected to decline by 30.4% in the Project Footprint; decline by 11.8% in the LSA; and decline by 0.5% in the RSA as a result of habitat loss. Overall, the habitat loss is predicted to be not significant.

12.8.4.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including changes in vegetation structure, hydrological changes and sensory disturbances.

The net effects of alteration of habitat due to changes in vegetation structure is moderate in magnitude during construction phase and negligible in magnitude during operations phase. Construction of the road will lead to edge effects and creation of early seral environments. These vegetation changes will be maintained during road operations, but no new habitat structural changes are expected to be generated as a result.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude during the construction and operations phases. Sensory disturbance and degradation of habitat during the construction phase is expected to be mitigated by noise and light abatement policies. Low traffic levels are likely to limit effects on foraging bats. Overall, alteration in habitat due to sensory disturbance is predicted to be not significant.

The net effects of alteration of habitat due to hydrological changes are moderate in magnitude during construction phase and a negligible in magnitude during operations phase. During construction, hydrological changes will occur as a result of road construction. Based on the groundwater assessment these changes will extend into the LSA and persist as long as the roadway remain in place. While prey species of bats are strongly associated with surface water features, foraging habitat is likely not limiting. Overall, changes in habitat due to changes in hydrology are predicted to be not significant.

12.8.4.3 Alteration in Movement

Alterations in movement resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including sensory disturbances and effects on connectivity.

The net effects of alteration in movement due to changes in connectivity are low in magnitude during construction phase and negligible in magnitude during operations phase. As bats are highly mobile species and coexisted in human-altered environments including fragmented forested habitat, the effects are predicted to be not significant.

The net effects of alteration in movement due to sensory disturbance are low in magnitude during both the construction and operations phases and are predicted to be not significant.

12.8.4.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, and changes to predator-prey dynamics, are predicted to be not significant.

The net effects for collisions with vehicles is negligible in magnitude during the construction and operations phases. Collisions with vehicles will be rare as most travel is anticipated to occur during daylight periods when bats are not active. Net effects on bats are predicted to be not significant.

The net effects for incidental take is negligible in magnitude during the construction and operations phases. Vegetation clearing during the active season may be necessary but should be a rare occurrence and may not include suitable roosting habitat. Net effects on bats are predicted to be not significant.

The net effect for changes to predator-prey dynamics is low in magnitude during the construction and operations phases. Construction of the road will allow some predators, in particular predators that prefer edge environments to increases their movement. Predators, such as owls, are expected to maintain similar population sizes and rates of predation. Net effects on bats are predicted to be not significant.

The net effect for increased energy expenditure is low in magnitude during the construction and operations phases. Increased energy expenditures may decrease over time as bats potentially acclimatize to the effects of the road. Net effects on bats are predicted to be not significant.

12.8.5 Forest Songbirds (Tennessee Warbler and Orange-crowned Warbler)

In Canada, migratory forest songbirds include long-distance migrant species such as the Tennessee Warbler, which primarily migrate to tropical regions for the winter, as well as short-distance migrant species such as the Orange-crowned Warbler, which migrate to temperate regions in North America. Canada hosts a very large proportion of the breeding population of these two (2) species: nearly 100% of the global Tennessee Warbler population and approximately 52% of the global Orange-crowned Warbler population (Birds Canada and ECCC, 2024). Provincially, breeding populations for both species are considered to be “Secure” (S5B) (NatureServe, 2024). Although net effects on forest songbirds and forest songbird habitat are expected to occur, the net effects are predicted to be not significant.

12.8.5.1 Habitat Loss

Conifer forest, hardwood forest and mixed forest vegetation communities, which contain migratory forest songbird habitat, are rare in the RSA, comprising just 7.7% (8,405.38 ha, 189.61 ha and 343.99 ha, respectively) of the RSA. It is projected that 7.58% of the available migratory forest songbird habitat will be permanently removed in the LSA. The effect of habitat loss is considered to be negative in the Project Footprint but neutral in the LSA and RSA for migratory forest birds and is therefore not significant.

12.8.5.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including edge effects and sensory disturbances, resulting in low magnitude for net effects related to increased early successional habitat, and low

magnitude for edge effects and sensory disturbance. Overall, based on RSF modelling, Tennessee Warbler habitat use is predicted to increase by 7.8% in the Project Footprint, increase by 0.4% in the LSA, and decline by 0.2% in the RSA, while Orange-crowned Warbler habitat utilization is projected to decline by 24.7% in the Project Footprint, decline by 11.4% in the LSA, and decline by 2.6% in the RSA as a result of habitat loss.

12.8.5.3 Alteration of Movement

Alterations in movement due to sensory disturbance and habitat fragmentation caused by road construction and operation are expected to affect migratory forest songbirds in the Project Footprint and LSA, respectively, resulting in low magnitude for effects related to sensory disturbance and moderate magnitude for habitat fragmentation. As migratory forest songbirds are highly mobile and have demonstrated varied responses to fragmentation and sensory disturbances, the net effects are expected to be not significant.

12.8.5.4 Injury/Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, disturbance or loss of occupied habitat, and predators, are likely to have a low magnitude negative impact in the LSA as there is a lower likelihood for these effects to occur. Collisions with vehicles will be rare as traffic volume is expected to remain low at 500 vehicles per day, and vegetation clearing during the active season may be necessary but should be a rare occurrence and may not include suitable nesting habitat. With appropriate mitigation measures such as timing windows, mortalities due to disturbance or loss of migratory forest songbird nesting habitat are less likely to occur. While predators, including Canada Jay and Sharp-shinned Hawk are expected to use the road corridor to travel and hunt, it is unlikely that predator species would exceed their carrying capacity without additional fitness drivers (e.g., human-subsidized food and shelter). Additionally, besides Canada Jay, the potential predator species identified in **Section 12.7.5.4** do not specialize on forest songbirds nor their nests as a major source of prey. These effects are expected to have a not significant impact on survival and reproduction of migratory forest songbirds.

12.8.6 Wetland Songbirds (Palm Warbler and Alder Flycatcher)

Like many wetland songbirds Palm Warbler and Alder Flycatcher are long-distance migrant species which primarily migrate to tropical regions for the winter. Canada hosts a very large proportion of the breeding population of these two species: 98% of the global Palm Warbler population and approximately 63% of the global Alder Flycatcher population (Boreal songbird initiative and ECCC, 2024). Compared to the 1970s, populations of both species in Canada are within their respective population goal ranges and are considered to be “Secure” (N5B) nationally in their breeding habitat (NatureServe, 2024). Although net effects on wetland songbird habitat are expected to occur, the Project’s net effects are predicted to be not significant.

12.8.6.1 Habitat Loss

The net effects of loss of habitat is moderate in magnitude during construction phase and negligible in magnitude during operations phase. The loss of wetland songbird habitat is primarily expected to result from the construction phase of the Project. Wetland bird habitat is common in the region as little

development has occurred within the LSA and RSA, forestry activities are not present, mining activities are limited to the easternmost areas of the RSA and disturbances from the community only affecting areas on the far west side. Overall, approximately 91% of the terrestrial communities in the RSA are wetlands, so foraging and breeding habitats are not expected to be limited. Overall, the loss of habitat is predicted to be not significant.

12.8.6.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including structural change to vegetation, hydrological changes and sensory disturbances.

The net effects of alteration of habitat due to changes in vegetation structure are low in magnitude during the construction and operations phases. Edge effects on wetland birds are expected to be low in magnitude, many wetland birds including palm warbler and Alder Flycatcher use shrubby low vegetation similar to the vegetation structure following clearance for construction. Net effects on wetland songbirds is expected to be not significant.

The net effects of alteration of habitat due to hydrological changes are moderate in magnitude for wetland songbirds resulting from construction phase and a negligible in magnitude during the operations phase. During construction, hydrological changes will occur as a result of road construction. Based on the groundwater assessment these changes will extend into the LSA and persist as long as the roadway remain in place. While rated as moderate in magnitude, they are expected to be not significant. During operations small changes in hydrology may occur due to plugged culverts or temporary diversions; however, with implementation of effective maintenance the effects should be short-term and reversible with a negligible effect.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude during the construction and operations phases. Sensory disturbance and degradation of habitat during the construction phase is expected to be mitigated by noise and light abatement policies. Based on the short-term nature of the effect and the application of mitigation measures the effect during construction is expected to be not significant. Sensory disturbance and degradation of habitat during the operations phase is related to traffic noise, many songbird species have been shown to lower use of areas with high traffic noise or modify their behaviors; however, given the low levels of traffic, net effects on wetland songbirds is expected to be not significant.

12.8.6.3 Alteration in movement

Alterations in movement resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including sensory disturbances and effects on connectivity.

The net effects of alteration in movement due to sensory disturbance are low in magnitude during the construction and operations phases. While some wetland songbirds have shown some avoidance of roads many others, like Alder Flycatcher use the road verge as habitat. With mitigation measures during construction, and in consideration of the low levels of vehicle traffic during operations, sensory disturbance is expected to cause a not significant effect on movement.

The net effects of alteration in movement due to changes in connectivity are low in magnitude during the construction and operations phases. Linear features have been found to act as barriers to movement for some songbirds but in most cases the linear feature is much wider and the bird species that treated it as

a barrier were generally forest specialists. Most wetland songbirds use early seral vegetation, and many can make use of open habitats that created through clearing. Changes in movement due to connectivity are expected to be not significant.

12.8.6.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, and changes to predator-prey dynamics, are predicted to be not significant.

The net effects for collisions is low in magnitude during the construction and operations phases. Effective enforcement of vehicle use is expected during the construction phase and the effects are expected to be not significant. While mitigations may be less effective during operations, and low flying wetland songbirds are susceptible to vehicular traffic, collisions with vehicles will be rare as traffic volume is expected to remain low at 500 vehicles per day. Overall, death or injury due to collisions is predicted to be not significant for either the construction or operations phases.

The net effect for incidental take is negligible in magnitude during the construction phase and a low magnitude during operations phase. Vegetation clearing during the active season may be necessary but should be a rare occurrence and may not include suitable nesting habitat. Maintenance activities will take place over a longer time but will likely be smaller in scale. Wetland songbirds often nest in early seral vegetation, for example Palm Warbler nest under small conifers and Alder Flycatcher in thick low shrubs, so they may nest in habitats which will undergo maintenance clearing during the operations phase. With appropriate mitigation measures such as timing windows, mortalities will remain rare and the effect are predicted to be not significant.

The net effect for changes to predator-prey dynamics is low in magnitude during the construction and operations phases. Construction of the road will allow some predators, in particular predators that prefer edge environments to increases their movement. For wetland songbirds these include Canada Jay, Sharp-shinned Hawk, Common Raven and Red Squirrel. Only a few individuals close to the ROW may be exposed to the increased predation, and some species like Palm Warbler may mitigate exposure to predators by avoiding the ROW. Additionally, mitigations around food storage, garbage removal and roadkill will limit predator attraction to the ROW. The effect of increased predation is expected to have a not significant effect on survival and reproduction of wetland birds.

12.8.7 Shorebirds (Greater Yellowlegs)

Ontario’s Boreal Forest hosts a wide range of shorebird species, including Boreal Forest obligates like the Greater Yellowlegs. Canada hosts a very large proportion of the breeding population of these two species: approximately 78% of the global Greater Yellowlegs population (Birds Canada and ECCC, 2024). Compared to the 1970s, populations of Greater Yellowlegs in Canada are within their respective population goal ranges and are considered to be “Secure” (N5B) nationally in their breeding habitat (Birds Canada and ECCC, 2024; NatureServe, 2024). In the Boreal Softwood Shield (BCR 8), according to Ontario Breeding Bird Atlas data, the Greater Yellowlegs populations are increasing 1.3% to 3.0% (Birds Canada, 2024). Provincially, breeding populations for Greater Yellowlegs are “Apparently Secure” (S4B) (NatureServe, 2024). Although net effects on shorebird habitat are expected to occur, the Project’s net effects are predicted to be not significant.

12.8.7.1 Habitat Loss

The net effects of loss of habitat is moderate in magnitude during construction phase and a negligible in magnitude during operations phase. Greater yellowlegs use open wetland vegetation communities including open and Sparse Treed Bogs and Fens, are not limiting in the RSA, comprising over 26% (35,234 ha) of the RSA. Overall, approximately 91% of the vegetative communities in the RSA are wetlands, so foraging and breeding habitats for shorebirds not expected to be limited. Overall, the loss of habitat is predicted to be not significant.

12.8.7.2 Habitat Alteration or Degradation

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including structural change to vegetation, hydrological changes and sensory disturbances.

The net effects of alteration of habitat due to changes in vegetation structure are low in magnitude during the construction and operations phases. Edge effects on shorebirds are expected to be low, many shorebirds including Greater Yellowlegs use shrubby, open early seral vegetation similar to the habitat structure following clearance for construction. Net effect on shorebirds is expected to be not significant.

The net effects of alteration of habitat due to hydrological changes are moderate in magnitude during construction phase and negligible in magnitude during operations phase. During construction, hydrological changes will occur because of road construction. While these changes may extend up to 250 m into the LSA the changes are not predicted to be major although some permanent alteration of hydrology could occur. While rated as moderate in magnitude, they are expected to be not significant. During operations changes in hydrology are related to the implementation of effective crossing maintenance program. If culverts are maintained and blockages cleared efficiently, the effects should be short-term and reversible with negligible magnitude.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude during the construction and operations phases. Sensory disturbance and degradation of habitat during the construction phase is expected to be mitigated by noise and light abatement policies. Based on the short-term nature of the effect and the application of mitigation measures the effect during construction is expected to be not significant. Sensory disturbance and degradation of habitat during the operations phase is related to traffic noise, while shorebird species have been shown to lower use of areas with high traffic noise, given the low levels of traffic, net effect on shorebirds is expected to be not significant.

12.8.7.3 Alteration in Movement

The net effects of alteration in movement due to sensory disturbance are low in magnitude during the construction and operations phases. While shorebirds have been shown to avoid and abandon areas when exposed to sudden sensory disturbances, sensory disturbance is expected to cause a not significant effect on movement during construction as mitigations and the temporary nature of these disturbances will keep the effect low in magnitude. During operations sensory effects will be low in magnitude due to the modest levels of vehicle traffic and is expected to cause a not significant effect on movement.

The net effects of alteration in movement due to changes in connectivity are low in magnitude during the construction and operations phases. Linear features have been found to act as barriers to movement for some songbirds but in most cases the linear feature is much wider and the bird species that treated it as

a barrier were generally forest specialists. Greater Yellowlegs does show some lower use of transportation corridors which could indicate the road could be a potential barrier; however, given the low traffic levels and its use of open habitats, changes in movement due to connectivity are expected to be not significant.

12.8.7.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, and changes to predator-prey dynamics, are predicted to be not significant.

The net effect for collisions is negligible in magnitude during the construction phase and low in magnitude during the operations phase. Effective enforcement of vehicle use is expected during the construction phase and the effects are expected to be not significant. While mitigations may be less effective during operations, collisions with vehicles will be rare as traffic volume is expected to remain low at 500 vehicles per day and shorebirds are not known to be susceptible to vehicle collisions except on beaches wintering or migration.

The net effect for incidental take is negligible in magnitude during the construction phase and low in magnitude during the operations phase. Vegetation clearing during the active season may be necessary during construction but should be a rare occurrence and may not include suitable nesting habitat. Maintenance activities will take place over a longer time but will likely be smaller in scale. Maintenance activities will like take place in early seral vegetation including shrubs and young trees which may contain nests for shorebirds. This coupled with cryptic behavior may lead to incidental take; however, with appropriate mitigation measures such as timing windows, mortalities will remain rare and the effect is predicted to be not significant.

The significance score for changes to predator-prey dynamics is 8 and 9 for the construction and operations phases of the Project, respectively. These indicate a low effect resulting from both the construction and operations phases. Construction of the road will allow some predators, in particular predators that prefer edge environments to increases their movement. While predators, including Northern Harrier and red fox are expected to use the road corridor to travel and hunt, it is unlikely that predator species would exceed their carrying capacity without additional fitness drivers (e.g., roadkill and garbage). The net effect of increased predation on survival and reproduction of shorebirds is expected to be not significant.

12.8.8 Waterfowl (Canada Goose, Mallard)

Ontario's Boreal Forest hosts numerous waterfowl species, including Canada Goose and mallard. Canada hosts a very large proportion of the breeding population of these two (2) species: approximately 73% of the global Canada Goose population and approximately 27% of the global mallard population (Birds Canada and ECCC, 2024). Compared to the 1970s, populations of both species in Canada are within their respective population goal ranges and are considered to be "Secure" (N5B) nationally in their breeding habitat (Birds Canada and ECCC, 2024; NatureServe, 2024). In the Boreal Softwood Shield (BCR 8), according to Ontario Breeding Bird Atlas (Birds Canada, 2024) data, the Canada Goose population is increasing by more than 3%, while the mallard population is increasing 1.3% to 3.0%. Provincially, breeding populations for both species are considered "Secure" (S5) (NatureServe, 2024). Although net effects on waterfowl habitat are expected to occur, the Project's net effects are predicted to be not significant.

12.8.8.1 Habitat Loss

The net effects of loss of habitat is moderate in magnitude during the construction phase and negligible in magnitude during operations phase. Wetland vegetation communities including Conifer Swamp, Poor Conifer Swamp, Sparse Treed Bog, Sparse Treed Fen, and Thicket Swamp, which contain waterfowl habitat, are not limiting in the RSA, comprising approximately 59% of the RSA. Rock Barren, which is often used by Canada Goose, is rare in the LSA, comprising just 9.07 ha, with 3.34 ha projected for removal. Overall, approximately 92% of the vegetative communities in the RSA are wetland, so foraging and breeding habitats for waterfowl not expected to be limited. Overall, the loss of habitat is expected to be not significant.

12.8.8.2 Habitat Alteration or Degradation

The net effects of alteration of habitat due to changes in vegetation structure are low in magnitude during the construction and operations phases. Certain waterfowl species, including Canada Goose and mallard, are highly adaptable when it comes to nesting site preferences. RSF modeling showed that the effect is species-specific, but overall, a slight degradation near the ROW. During operations ground nesting ducks may use the early seral areas near roads, but not if it is mowed at frequent levels. Net effects on waterfowl is expected to be not significant.

The net effects of alteration of habitat due to hydrological changes are moderate in magnitude during construction phase and negligible in magnitude during operations phase. Changes to hydrology will alter use of the area by waterfowl, with some areas potentially drying while others getting wetter. While these changes may extend up to 250 m into the LSA, the changes are not predicted to be major although some permanent alteration of hydrology is expected. During operations, changes in hydrology are related to the implementation of effective crossing maintenance program, any changes during operations may also be both positive and negative for waterfowl. Overall, the net effect on waterfowl is expected to be not significant.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude during the construction and operations phases. Sensory disturbance and degradation of habitat during the construction phase is expected to be mitigated by noise and light abatement policies. Based on the short-term nature of the effect and the application of mitigation measures the effect during construction is expected to be not significant. Sensory disturbance and degradation of habitat during the operations phase is related to traffic noise, which some species are sensitive to. Areas where humans exit their vehicles including water crossings and pull-offs may be particularly impacted. Low traffic levels are likely to result in minimal effects on waterfowl including Canada Geese and Mallard. Given the low levels of traffic, the net effect on shorebirds is expected to be not significant.

12.8.8.3 Alteration in Movement

The net effects of alteration in movement due to sensory disturbance are low in magnitude during the construction and operations phases. Loud sudden noises could also cause waterfowl to abandon an area temporarily; however, habituation to these noises may occur and mitigations and the temporary nature of these disturbances will keep the effect low. Also, while Canada Geese and Mallards use urban environments with high traffic levels, this tolerance may not be seen in local populations. Traffic levels will also be low, limiting any impacts. Net effect on waterfowl is expected to be not significant.

The net effects of alteration in movement due to changes in connectivity are low in magnitude during both the construction and operations phases. While some bird species treat high traffic roads as a barrier, given that large-bodied birds like waterfowl are generally less effected by roads, and no studies have

shown that waterfowl are reluctant to cross the roads, the effect of water crossing structures is likely negligible given the small number. As waterfowl are highly mobile, changes in movement due to connectivity are expected to be not significant.

12.8.8.4 Injury or Death

The net effect for collisions is negligible in magnitude during the construction phase and low in magnitude during the operations phase. Effective enforcement of vehicle use is expected during the construction phase and the effects are expected to be not significant. While mitigations may be less effective during operations waterfowl are not expected to be killed in large numbers, although the exact degree of the effect on waterfowl populations including Canada Goose and Mallard is unknown. Given the low number of vehicles on the road per day the effect is expected to be not significant.

The net effect for incidental take is negligible in magnitude during the construction and operations phases. Vegetation clearing during the active season may be necessary during construction but should be a rare occurrence and may not include suitable nesting habitat. Maintenance activities will take place over a longer time but will likely be smaller in scale. Maintenance activities will like take place in early seral vegetation including shrubs and young trees which may contain nests of some upland ducks but other species like cavity nesters, over water nesters and open nesters like Canada Goose. With appropriate mitigation measures such as timing windows, mortalities will remain rare and the net effect is predicted to be not significant.

The net effect for changes to predator-prey dynamics is low in magnitude during the construction phase and operations phase. Construction of the road will allow some predators, in particular predators that prefer edge environments to increases their movement. While waterfowl predators like fox and coyotes are expected to use the road corridor to travel and hunt, other predators may avoid the road margin. The net effect of increased predation on survival and reproduction is predicted to be not significant.

The net effect for increased access is negligible in magnitude during the construction phase and moderate in magnitude during operations phase. Strict site controls and workplace policies are expected to effectively eliminate the risk of hunting and poaching of waterfowl during the construction phase and is expected to be not significant. During operations the potential for harvest is likely greater as it will operate over a long period of time and access will not be controlled. Distance may limit some harvest, but Mallard and Canada goose are often targeted for harvest. While rated as moderate in magnitude, the net effect of increased access during operations is expected to be not significant.

12.8.9 Raptors (Red-tailed Hawk, Great Grey Owl)

For raptors, the principal drivers of most raptor populations in Canada are habitat loss human caused mortality including shooting, collisions and electrocution (Birds Canada, 2024). Although net effects on raptors and raptor habitat are expected to occur, the Project's net effects are predicted to be not significant.

12.8.9.1 Habitat Loss

The net effects of loss of habitat is moderate in magnitude during construction phase and negligible in magnitude during operations phase. The loss of raptor habitat will persist past the operations phase of the Project as it will be generally difficult to reverse due to the permanent nature of the roadway. Coniferous forest, deciduous forest and mixed forest vegetation communities, which support most of the nesting habitat for Red-tailed hawk and Great Grey Owl are rare in the RSA, comprising just 7.7% (8,405.38 ha,

189.61 ha and 343.99 ha, respectively) of the RSA. It is projected that 1.83% (150.80 ha) of conifer forest, 0.85% (1.60 ha) of deciduous forest and 1.24% (4.21 ha) of mixed forest communities will be permanently removed in the RSA, representing 1.75% of the available raptor nesting habitat. Both species use open areas, such as roadside clearances, for foraging. Creation of openings may increase available foraging habitat, particularly for Red-tailed hawk. Overall, the loss of habitat is predicted to be not significant for either the construction or operations phases.

12.8.9.2 Alteration and Degradation of Habitat

Alteration and degradation of habitat resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including structural change to vegetation, hydrological changes and sensory disturbances.

The net effects of alteration of habitat due to hydrological changes is moderate in magnitude during the construction phase. Roadways with through peatlands have a history of altering hydrology obstructing surface and subsurface water flows. Based on the groundwater assessment these changes will extend into the LSA and persist as long as the roadway remain in place Raptor nesting habitat may be affected through the death of trees, both Red-tailed hawks and Great Grey Owls use large trees for nesting sites and suitable nesting locations can be limiting in peatlands. Mitigation measures implemented are expected to maintain sufficient flow of both surface and groundwater. While rated as moderate in magnitude, the hydrological changes are expected to be not significant.

The net effects of alteration of habitat due to sensory disturbance are low in magnitude during the construction and operations phases. In terms of sensory disturbance mitigation measures during construction and low traffic levels are expected to result in low sensory disturbance. The low disturbance levels during operations are also based on the ability of both Red-tailed hawk and Great Grey Owl to use areas with traffic noise. Overall, the alteration of vegetation structure is predicted to be not significant for either the construction or operations phase.

The net effects of alteration of habitat due to changes in vegetation structure are low in magnitude during the construction and operations phases. For both Red-tailed hawk and Great Grey Owl, in terms of habitat degradation, a large component of the effect is associated with removal of mature forests and replacement with early seral communities. Large trees located in mature forest areas are key to both species. The effect of edge habitat creation on raptors is expected to be minimal in magnitude, many raptors including Red-tailed hawks and Great Grey Owls use habitat edges for foraging. Red-tailed hawks have been shown to gain habitat from forest fragmentation. The effects of edge effects on raptors are estimated to be of negligible magnitude. Overall, the alteration of vegetation structure is predicted to be not significant for either the construction or operations phase.

12.8.9.3 Alteration of Movement

Alterations in movement resulting from the construction and operations phases are likely to extend beyond the Project Footprint to the LSA, including sensory disturbances.

The net effects of alteration in movement due to sensory disturbance are low in magnitude during the construction and operations phases. During Construction noise, lighting and other human actions during construction activities such as blasting, clearing, hauling and grading will create disturbances that could alter movement of raptors. Raptors have shown leave areas when exposed to anthropogenic noise, both have been shown to return to habitats once human activity stops. During operations, traffic could also cause sensory disturbances that cause raptors to move away or avoid the area around the road. Both

Red-tailed hawk and Great Grey Owl have been shown to use traffic affected environments. Overall, changes due to sensory disturbance is predicted to be not significant for either of the construction or operations phases.

12.8.9.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, and changes to predator-prey dynamics, are predicted to be not significant.

The net effect for collisions is low in magnitude during the construction phase and operations phase. Collisions with vehicles is among the top three causes of bird mortalities in Canada and raptors can be susceptible to collisions due to their feeding behaviors. Effective enforcement of vehicle use is expected during the Construction Phase. While mitigations may be less effective during operations, collisions with vehicles will be rare as traffic volume is expected to remain low at 500 vehicles per day. Overall, death or injury due to collisions is predicted to be not significant for either of the construction or operations phases.

The net effect for incidental take is negligible in magnitude during the construction phase and operations phase. While vegetation clearing during the active season may be necessary, it should be a rare occurrence and will not likely include suitable nesting habitat. With appropriate mitigation measures such as timing windows, mortalities due to disturbance or loss of raptor nesting habitat are less likely to occur. Many raptors including Red-tailed Hawks and Great Grey Owls use large stick nests that are relatively conspicuous on the landscape making accidental removal unlikely. Maintenance activities during operations are unlikely to result in incidental take as they will be primarily removing early seral growth. Overall, death or injury due to incidental take is not predicted to be not significant for either the construction or operations phase.

Terrestrial predators are not known to target either Great Grey Owl or Red-tailed hawk. While great-horned owl, which is one of the few known predators for both species, does use linear features, few nests of either Great Grey Owl or Red-tailed hawk are likely to occur near the road and therefore be affected by increased use by great-horned owl. These effects are expected to have a not significant effect on survival and reproduction of raptors.

12.8.10 Reptiles & Amphibians

Eastern garter snake is a habitat generalist that occurs widely throughout Ontario, with a “Secure” (S5) conservation status rank (NatureServe, 2024). Its most limiting type of habitat critical for overwinter survival are hibernacula, which are usually comprised of burrows, rock crevices, or other natural locations that extend below the frost line. The four (4) amphibian species, American toad, boreal chorus frog, spring peeper, and wood frog, also all have a “Secure” (S5) conservation status rank in Ontario (NatureServe, 2024). These amphibians require a mix of wetland and terrestrial habitats to carry out their lifecycles, in particular requiring fish-free waterbodies (e.g., vernal pools) for breeding purposes. Although net effects on herptile habitat are expected to occur, the Project’s net effects are predicted to be not significant.

12.8.10.1 Habitat Loss

With effective implementation of mitigation, the Project is likely to have a low magnitude to moderate magnitude negative effect on Reptile and Amphibian habitat availability and distribution. Most of the identified effects to Reptiles and Amphibians are expected to be limited to the Project Footprint. The

effect of habitat loss is considered negative in the Project Footprint but neutral in the LSA and RSA for reptiles and amphibians and is therefore predicted to be not significant.

12.8.10.2 Habitat Alteration or Degradation

Alteration and degradation of Reptile and Amphibian habitat resulting from the Construction and operations phases are largely expected to be limited in geographic extent to the Project Footprint, and low to moderate in magnitude and predicted to be not significant.

12.8.10.3 Alteration in Movement

Alterations in movement due to sensory disturbance and physical barriers caused by road construction and operation will be limited to the Project Footprint. RSF modelling predicts habitat use by amphibians as a group will decline by 40.6% in the Project Footprint and by 16.6% in the LSA due to habitat loss; however, habitat is not limiting in the RSA and habitat use decline is only projected to decrease by 3.0%. Reptiles and amphibians in this region are generally considered mobile and coexist in human-altered environments, including habitats fragmented by roads; therefore, these effects are predicted to be not significant.

12.8.10.4 Injury or Death

With effective implementation of mitigation measures, mortalities due to collisions with vehicles, incidental take, predators, and disease are likely to have a low to moderate negative effect in the LSA as there is a lower likelihood for these effects to occur. Collisions with vehicles during the operations phase are certain as this is a commonplace occurrence in both urban and rural areas where roads traverse reptile and amphibian habitat; however, given the projected declines in occupancy within the Project Footprint due to habitat loss, and the likely avoidance or alterations in movement as a result of physical barriers and sensory disturbances, there will be fewer reptiles and amphibians crossing the road and risking collisions. With appropriate mitigation measures such as timing windows, mortalities due to incidental take are less likely to occur. While predators including red fox and common raven are expected to use the road corridor to travel and hunt, it is unlikely that predators would exceed their carrying capacity without additional fitness drivers (e.g., human-subsidized food and shelter). Additionally, these species are omnivores and do not specialize on reptiles and amphibians. While there is potential for ranavirus to be introduced into amphibian habitats, ranavirus is already widely prevalent in southern Ontario (Vilaça et al., 2019) and the recent Ontario Reptile and Amphibian Atlas (Ontario Nature, 2024) found that square occupancy between 1998 (pre-ranavirus) and 2018 (post-ranavirus) remained relatively consistent for American toad, spring peeper, and wood frog (note: boreal chorus frog was only assessed in the Atlas for Northern Ontario). Lastly, accidental spills and releases can be prevented from causing injury or death to reptiles and amphibians during the construction phase, but there is little that can be done to prevent these events from occurring during the operations phase. These effects on survival and reproduction of Reptiles and Amphibian populations in the RSA are expected to be not significant.

12.9 Cumulative Effects

In addition to assessing the net environmental effects of the Project, the assessment for Wildlife and Wildlife Habitat also evaluates and assesses the significance of net effects from the Project that overlap temporally and spatially with effects from other past, present and reasonably foreseeable developments (RFDs) and activities (i.e., cumulative effects).

For a valued component that has identified net effects where the magnitude was determined to be higher than low, it is necessary to determine if the effects from the Project interact both temporally and spatially with the effects from one or more past, present RFDs or activities, since the combined effects may differ in nature or extent from the effects of individual Project activities. Where information is available, the cumulative effects assessment estimates or predicts the contribution of effects from the Project and other human activities on the criteria, in the context of changes to the natural, health, social or economic environments.

For this Wildlife and Wildlife Habitat assessment, the net effects in **Section 12.7** that are characterized as having a likelihood of occurrence of “probable” or “certain” and a “moderate” to high magnitude” have been carried forward to the cumulative effects assessment. Net effects with this characterization are most likely to interact with other RFD and activities.

The predicted net effects of the Project on the Wildlife and Wildlife Habitat VC that are carried forward for the assessment of cumulative effects within the Wildlife and Wildlife Habitat RSA include:

Moose

- Habitat Loss – Clearance Activities;
- Injury or Death – Increased Access; and
- Injury or Death – Changes to Predator-Prey Dynamics.

American Marten

- Habitat Loss – Clearance Activities; and
- Injury or Death – Increased Access.

North American Beaver

- Injury or Death – Increased Access.

Bats

- Habitat Loss – Clearance Activities;
- Habitat Alteration or Degradation – Changes in Vegetation Structure;
- Alterations in Movement – Sensory Disturbance; and
- Alterations in Movement – Loss of Connectivity.

Forest Songbirds

- Habitat Loss – Clearance Activities;
- Habitat Alteration or Degradation – Changes in Vegetation Structure; and
- Habitat Alteration or Degradation – Sensory Disturbance.

Wetland Songbirds

- Habitat Loss – Clearance Activities;
- Injury or Death – Changes to Predator-Prey Dynamics; and
- Injury or Death – Vehicle Collisions.

Shorebirds

- Injury or Death – Changes to Predator-Prey Dynamics.

Waterfowl

- Injury or Death – Increased Access.

Raptors

- Habitat Loss – Clearance Activities.

Herptiles

- Habitat Loss – Clearance Activities;
- Habitat Alteration or Degradation – Changes in Vegetation Structure;
- Alterations in Movement – Loss of Connectivity;
- Injury or Death – Incidental Take;
- Injury or Death – Vehicle Collisions; and
- Injury or Death – Disease.

Results of the cumulative effects assessment for the Wildlife and Wildlife Habitat VC with consideration of RFDs and activities are presented in Section 21.

12.10 Prediction Confidence in the Assessment

12.10.1 Moose

The level of confidence in the predictions for Project-related net effects on Moose is moderate to high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. The level of confidence for the habitat net effects (habitat loss and habitat alteration or degradation) predictions is moderate because habitat requirements, locations, and use in the RSA are not fully understood for Moose. For example, it is not known where Moose Calving Areas or Mineral Licks exist within the LSA and RSA. A quantitative analysis of Moose activity during the winter period was modelled based on resource selection functions (RSFs) to estimate probability of use at the Project Footprint, LSA, and RSA scales, which eliminates some uncertainty. There is a high level of confidence in the alternations in movement and Injury or Death net effects predictions for Moose as these are better understood/well documented in the context of roads with examples in scientific literature. Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.2 Furbearers (American Marten)

The level of confidence in the predictions for Project-related net effects on American marten is moderate to high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding

of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. The level of confidence for the habitat net effects (i.e., habitat loss and habitat alteration or degradation) predictions is high for marten because habitat requirements, locations, and use in the RSA are understood. For example, high quality marten habitat consists of dense mature coniferous forest and based on vegetation surveys the locations of these areas are known within the LSA and RSA. Additionally, a quantitative analysis of marten activity during the winter period was modelled based on resource selection functions (RSFs) to estimate probability of use at the Project Footprint, LSA, and RSA scales, which eliminates additional uncertainty. There is a moderate level of confidence in the alternations in movement and injury or death net effects predictions for marten as these are only somewhat understood/well documented in the context of roads and marten interaction with roads, with some examples in scientific literature. Marten are known to avoid roads but the reason for avoidance is somewhat unclear and many of the studies are from the southern edge of marten range. Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.3 Furbearers (North American Beaver)

The level of confidence in the predictions for Project-related net effects on North American beaver is moderate to high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. The level of confidence for the habitat net effects (i.e., habitat loss and habitat alteration or degradation) predictions is moderate for beaver because habitat requirements, locations, and use in the RSA are not fully understood. No targeted surveys for beaver were completed, North American beaver lodges and dams were noted incidentally during other studies. A habitat suitability analysis was completed that quantifies the amount of suitable North American beaver habitat within the Project Footprint, LSA, and RSA, which eliminates some uncertainty. There is a high level of confidence in the alternations in movement and injury or death net effects predictions for beaver as these are better understood/well documented in the context of roads and beaver interaction with roads, with examples in scientific literature. Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.4 Bats

The level of confidence in the predictions for Project-related net effects on Bats is moderate to high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. The level of confidence for the habitat net effects (i.e., habitat loss and habitat alteration or degradation) predictions is moderate because habitat requirements, locations, and use in the RSA are not fully understood for all Bat species. A quantitative analysis of Bat activity was modelled with a Poisson regression to estimate probability of use at the Project Footprint, LSA, and RSA scales, which eliminates some uncertainty. There is a high level of confidence in the alternations in movement and injury or death net effects predictions as these are better understood/well documented in the context of roads with examples in scientific literature. Ultimately, the effects on Bats may be difficult to assess post-construction given the migratory nature of Silver-haired Bat, Eastern Red Bat, and Hoary Bat, and the external threats to survival faced by these species such as

wind turbines which may occur along their migratory routes; as such, any changes in the presence of these species detected in the Project Footprint, LSA or RSA should be examined in that context and compared with other local regional data pools. Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.5 Birds

12.10.5.1 Forest Songbirds (Tennessee Warbler and Orange-crowned Warbler)

The level of confidence in the predictions for Project-related net effects on migratory forest songbirds is high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. Migratory forest songbirds were thoroughly surveyed temporally and spatially and as such there is a high level of understanding of their occurrence, distribution and habitat associations throughout the RSA. A quantitative analysis of migratory forest songbird activity during the breeding period was modelled based on RSFs to estimate probability of use at the Project Footprint, LSA, and RSA scales, which assists in eliminating uncertainty. There is a high level of confidence in the alternations in movement and injury or death net effects predictions for migratory forest songbirds as these are well documented in the context of the boreal forest and human disturbances, including roads, with examples in scientific literature. Many of the mitigation measures identified in **Section 12.4** are standard best management practices and have been implemented and demonstrated to be effective in road and highway construction.

12.10.5.2 Wetland Songbirds (Palm Warbler and Alder Flycatcher)

The level of confidence in the predictions for Project-related net effects on migratory forest songbirds is high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions.

Migratory forest songbirds were thoroughly surveyed temporally and spatially and as such there is a high level of understanding of their occurrence, distribution and habitat associations throughout the RSA. A quantitative analysis of migratory forest songbird activity during the breeding period was modelled based on RSFs to estimate probability of use at the Project Footprint, LSA, and RSA scales, which assists in eliminating uncertainty.

There is a moderately high level of confidence in the alternations in movement and injury or death net effects predictions for migratory wetland songbirds. Effects on forest songbirds are well documented in the context of the boreal forest and human disturbances, including roads, with examples in scientific literature. While not as well studied, wetland birds show similar patterns in reactions to disturbances and roads.

Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.5.3 Shorebirds (Greater Yellowlegs)

The level of confidence in the predictions for Project-related net effects on shorebirds is moderate. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. Shorebirds were thoroughly surveyed temporally and spatially and as such there is a high level of understanding of their occurrence, distribution and habitat associations throughout the RSA. A quantitative analysis of shorebird activity during the breeding period was modelled based on RSFs to estimate probability of use at the Project Footprint, LSA, and RSA scales, which assists in eliminating uncertainty. There is a moderate level of confidence in the habitat alteration/degradation, alternation in movement, and injury or death net effects predictions for shorebirds as these species are not well documented in scientific literature or other publications the context of the Boreal Forest and human disturbances, including roads. Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.5.4 Waterfowl (Canada Goose, Mallard)

The level of confidence in the predictions for Project-related net effects on waterfowl is high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. Waterfowl were thoroughly surveyed temporally and spatially and as such there is a high level of understanding of their occurrence, distribution and habitat associations throughout the RSA A quantitative analysis of waterfowl activity during the breeding period was modelled based on RSFs to estimate probability of use at the Project Footprint, LSA, and RSA scales, which assists in eliminating uncertainty. There is a moderate level of confidence in the alternations in movement and injury or death net effects predictions for waterfowl as these are not well documented in the context of the Boreal Forest and human disturbances, including roads, with examples in scientific literature. Many of the mitigation measures identified in **Section 12.4** are standard best management practices and have been implemented and demonstrated to be effective in road and highway construction.

12.10.5.5 Raptors (Red-tailed Hawk, Great Grey Owl)

The level of confidence in the predictions for Project-related net effects on Raptors is moderate. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions.

The level of confidence for the habitat net effects (i.e., habitat loss and habitat alteration or degradation) predictions is moderate because habitat requirements, locations, and use in the RSA are not fully understood for Raptors. For example, while the need for large trees for nests is understood, the locations and use of these trees was not fully surveyed throughout the RSA. Unlike other species groups no RSF models were created for raptors due to their low detection rates. There is a high level of confidence in the alternations in movement and injury or death net effects predictions for Raptors as these are better understood/well documented in the context of roads with examples in scientific literature. Many of the

mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.10.6 Reptiles and Amphibians

The level of confidence in the predictions for Project-related net effects on Reptiles and Amphibians is moderate to high. The predictions are based on information collected as part of background information and data gathering, multi-year data collected from existing conditions studies, GIS data analyses, an understanding of Project activities, the known effectiveness of mitigation measures, relevant peer-reviewed studies, experience of the assessment team, and an understanding of existing conditions. The level of confidence for the habitat net effects (i.e., habitat loss and habitat alteration or degradation) predictions is moderate because habitat requirements, locations, and use in the RSA are not fully understood for Reptiles. For example, it is not known if undetected Eastern garter snake hibernacula features exist within the Project Footprint, and Amphibian overwintering habitat was not evaluated as part of the field program. A quantitative analysis of Amphibian activity during the breeding period was modelled based on RSFs to estimate probability of use at the Project Footprint, LSA, and RSA scales, which eliminates some uncertainty. There is a high level of confidence in the alternations in movement and injury or death net effects predictions for Reptiles and Amphibians as these are better understood/well documented in the context of roads with examples in scientific literature. Many of the mitigation measures identified in **Section 12.4** are standard practice and have been implemented and demonstrated to be effective in road and highway construction.

12.11 Predicted Future Condition of the Environment if the Project Does Not Proceed

The Project is located in an area that is currently part of the Ring of Fire development in Northern Ontario. Although no projects are operational at present, it is expected that this area will be developed as the government of Ontario (as well as many First Nations) has identified the area as a key priority for future economic development in Ontario. The roads are also a priority for First Nations in the area, as they connect First Nations communities to the rest of the province more easily.

If this specific project does not proceed, the future condition of wildlife and wildlife habitat in the area is likely to be relatively unchanged. The area remains difficult to access and challenging to develop projects. It is possible that additional roadways as an alternative may be constructed if the Project does not proceed. Current alternatives may consider using the existing winter road route to Webequie for an all-season road, which would have similar environmental effects in a different location. However, none of these have received any approvals that would allow them to proceed at this time.

Long-term effects due to climate change may occur regardless of the Project. It is anticipated that species shifts may occur, both floral and faunal. Forest fires are expected to become more frequent and intense due to climate change, which will affect all species. Disturbance by fire, in combination with warming due to climate change, may eventually change the composition of the Boreal Forest and create more suitable habitat for some species while reducing that of others.

For Moose, the expansion of white-tailed deer into the project area from climate change effects may have a negative effect on their survival as they can spread disease including Brain Worm to the Moose population. Habitat changes from climate change are likely to have low effects on Moose as they adapt to a wide range of habitats and make use of disturbed, fragmented and young landscapes.

For furbearers, climate change is species specific and depends on their tolerance for disturbance. For a wide-ranging species like North American beaver that adapts to a wide range of habitats climate change is likely to have only small, localized effects. There is the possibility that a warmer and drier climate could reduce the size and numbers of wetlands and increase fire intensity, however, North American beaver through their damming activities can mitigate wetland loss (Hood and Baily, 2008) and reduce fire effects by acting as fire breaks (Fairfax and Whittle, 2020). For American marten climate change could have a negative effect as tree species shift in distribution and fire frequency and intensity increases resulting in younger and more fragmented forests (Hagris et al.,1999). American Martens can also be affected by warming temperatures which reduces snowpack (Lawler et al. 2020). However, many of these effects are more likely to be felt at the southern edge of the range for American Marten.

According to the Ontario Provincial Climate Change Impact Assessment (PCCIA) Technical Report (Climate Risk Institute, 2023), the environmental consequences from climate change effects to mammals (including bats) is rated as “high” in Ontario’s Far North Region by mid-century (2050s). Bats are typically associated with deciduous or mixed forests and may benefit from the northward latitudinal shift and occupancy gains of white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*) as a result of climate change (Boisvert-Marsh and de Blois, 2021). However, drier, warmer conditions may also negatively affect many of the insect species bats rely on as prey and also cause a mismatch in timing of prey emergence and bat emergence from hibernacula or return from migration. It is also recognized that Silver-haired Bat, Eastern Red Bat and Hoary Bat are in decline in Ontario, primarily due to wind energy development in their habitats and along migratory routes, which is projected to increase (COSSARO 2023; COSSARO 2024a; COSSARO 2024b). Overall, Bat populations in the RSA are likely to decline regardless of Project construction due in part to climate change, but particularly if the effects of wind turbines are not halted in the short-term.

The environmental consequences from climate change effects on migratory songbirds in Ontario’s Far North Region is rated as “high” by mid-century (2050s) (Climate Risk Institute, 2023). Long-distance migrants such as the Tennessee Warbler may experience a disruption in ecological synchronicities between food and habitat availability with the earlier arrival of spring both along their migratory path and at their breeding grounds (Hoover and Schelsky, 2020). Migratory forest songbirds such as Orange-crowned Warbler are likely to experience indirect effects of climate change, including changes to vegetation communities driven by plant-herbivore interactions that result in reduced availability of preferred nesting sites and reduced reproductive success (Auer and Martin, 2012). Analogous songbird populations in Alberta have also been projected to experience a dramatic northward shift in suitable climates over the next century, which may be accompanied by northward shifts in vegetation (Stralberg and Bayne, 2013). Such northward shifts may additionally be associated with lengthened migratory distances for forest songbird species such as the Tennessee Warbler, resulting in increased physiological costs (Both et al. 2010). Conversely, shifting temperatures may present opportunities for other migratory forest songbird species to thrive, which in turn may result in changes to species assemblages and abundances (Boulderbala et al. 2023). Overall, migratory forest songbird populations in the RSA are likely to change in species composition regardless of Project construction due to the effects of climate change, with certain species populations decreasing, such as the Tennessee Warbler and Orange-crowned Warbler.

For migratory wetland, bog, and fen songbirds, the effects are likely to follow the same pattern as for boreal forest birds. Both Alder Flycatcher and Palm Warbler are long distance migrants and like Tennessee Warbler may experience increased physiological costs due to longer migrations. The disconnect between spring arrival and migration has been shown for Palm Warbler which has not responded with earlier arrival dates despite earlier northern latitude springs (Strode, 2003). The shift in vegetation patterns may affect both Palm Warblers and Alder Flycatcher. Boreal wetlands are among the ecosystems most affected by climate change (Price et al., 2013). Drier conditions with increased fire severity may transform boreal vegetation although changes in peatlands to climate change may be slower than adjacent upland forests (Schneider et al. 2016). In the eastern boreal, conditions are more likely to persist in the north (D'Orangeville et al. 2016). Wetland bird response will vary, for Palm Warbler its ability to adapt to drier conditions may limit negative effects (Whittam, 2015). For Alder Flycatcher its preference for shrubby habitats and use of disturbed habitats may also limit effects. Overall, migratory wetland songbird populations in the RSA are likely to change in species composition regardless of Project construction due to the effects of climate change, with certain species populations not as affected, such as the Palm Warbler, and others potentially more susceptible.

While shorebirds weren't investigated as a category in the Ontario PCCIA Technical Report (Climate Risk Institute, 2023), the climate risk to birds in Ontario's northwest region is scored as "high" by mid-century (2050s). Climate change-induced losses are expected to occur in aquatic ecosystems including bogs, marshes, and mudflats, that will affect shorebird breeding habitat, food sources, and migratory stopover habitats (Climate Risk Institute, 2023). Short-distance migrant shorebirds like Greater Yellowlegs (which can also be a long-distance migrant) have been advancing their spring migration by 0.15 days per year over a period spanning 40 years (1967-2008), corresponding with increasing temperatures over the same period within their winter range (DeLeon et al., 2011). Galbraith et al. (2014) found that Greater Yellowlegs is particularly at risk from climate change affecting ecological synchronicity, migration distance, and specialized habitat requirements. Increasing prevalence and intensity of forest fires may also negatively affect Greater Yellowlegs due to loss of preferred habitat, as this species is rarely found in moderately or highly burned habitats (Knaggs et al., 2020). Overall, shorebird populations in the RSA are likely to decrease in population regardless of Project construction due to the effects of climate change.

According to the Ontario PCCIA Technical Report (Climate Risk Institute, 2023), the environmental consequences from climate change effects to waterfowl is rated as "high" in Ontario's Far North Region by mid-century (2050s). Changes to rainfall and periods of drought pose significant threats to the network and permanence of wetland complexes used by waterfowl for breeding (Dove-Thompson et al., 2011; Galbraith et al., 2014). Additionally, Ontario may experience an extended growing season as a result of changing temperatures and precipitation, creating a mismatch for some species between the timing of waterfowl chicks hatching and the availability of food, affecting survival rates (Adde et al., 2020). Warmer temperatures above 12°C have also been associated with avian influenza virus infections in waterfowl (Kahlon, 2021). Overall, waterfowl populations in the RSA are likely to change in species composition and abundance regardless of Project construction due to the effects of climate change.

For Raptors, climate change is species specific and depends on their tolerance for disturbance. For Red-tailed Hawk, a wide-ranging species that adapts to a wide range of habitats, climate change is likely to have only small, localized effects. Red-tailed Hawks may have decreased physiological cost as research has shown they are migrating shorter distances and wintering further north, although mismatches in prey availability may occur (Paprocki et al., 2017). For Great Grey Owl, climate shifts may lead to extensive range contraction. Langham (2015) predicted up to 94% of existing Great Grey Owl habitat could be lost by 2080 with little new habitat becoming favorable for great grey owls. Overall, raptor populations in the RSA are likely to change in species composition and abundance regardless of Project construction due to the effects of climate change.

The environmental consequences from climate change effects to amphibians is rated as “medium” in northern Ontario by mid-century, elevated to “high” by late century (2080s) (Climate Risk Institute, 2023). Certain species, such as American toad and spring peeper have been documented advancing their breeding season in correlation with warmer spring temperatures, whereas wood frog has trended toward earlier emergence from brumation (Blaustein et al. 2001; Klaus & Lougheed, 2013), and in both these cases a mismatch in timing of prey emergence may negatively affect the fitness and survival of these species. Overall, Reptile and Amphibian populations will likely remain unchanged in the RSA until the late century if the Project does not proceed.

12.12 Follow-up and Monitoring

This section describes the monitoring programs for Wildlife and Wildlife habitat. The purposes of the follow-up and monitoring programs are to:

- Verify environmental effects predictions made during the EA/IA for the Project;
- Provide data with which to evaluate the effectiveness of mitigation measures and modify or enhance these measures, where necessary;
- Provide data with which to implement adaptive management measures for improving future environmental protection activities;
- Document additional measures of adaptive measures to improve future environmental protection activities; and
- Document compliance with required conditions as stipulated in permits, approvals, licenses and/or authorizations.



The Project invites community members to participate in developing and implementing monitoring programs to assess the effectiveness of proposed mitigation measures and potential adverse effects to the environment. Where effects are considered unacceptable and/or based on concerns raised by Indigenous community members or other stakeholders, further mitigation options will be considered by the road operator in consultation with Indigenous communities and stakeholders.

The recommended monitoring program related to Wildlife and Wildlife Habitat VC is outlined in the following subsections.

12.12.1 Pre-Construction Monitoring

Existing conditions monitoring for the WSR project took place between 2019 and 2025. For Moose and Furbearers, winter aerial surveys were conducted in 2018, 2019, and 2021 within the project area. Wolverine run poles we deployed in 2021 and 2022 and also recorded other furbearers. BAT ultrasonic recording units (ARUs) were deployed in 2019, 2020 and 2023. For all Songbirds ARUs were deployed to survey bird presence in 2020 and 2021. Breeding bird point count surveys were conducted in 2019 and 2020. Shorebird and Waterfowl aerial surveys took place during 2019 and 2020, these surveys also recorded the presence of beaver dams and dens. Amphibian surveys were conducted using the ARU data recorded in 2020 and 2021 during songbird surveys. These studies are presumed to meet the requirements for pre-construction monitoring and additional pre-construction monitoring is not required.

12.12.2 Construction Monitoring

During construction the following monitoring programs will be implemented as part of mitigation measures described in **Section 12.4**

Compliance Monitoring

- Developing and implementing a CEMP that includes detailed plans for wildlife management and monitoring
- Qualified EMs are to be present on-site prior-to and during construction activities
- A qualified EM will conduct a daily site inspection prior to commencement of project works and activities to ensure wildlife are absent from work areas. A daily checklist will reflect completion of the inspection.
- Roads secured by exclusion fencing will be monitored daily for wildlife road mortalities and injuries. Wildlife road mortalities documented by EM(s) or others will be submitted to a Qualified Biologist as part of a reporting protocol that will be developed and included in the CEMP and OEMP.
- An incidental wildlife reporting protocol will also be developed and included in the CEMP and OEMP.

All Wildlife Species

- Remote Camera Monitoring will take place along the WSR right-of-way (ROW) and at reference sites to monitor the occurrence and distribution of wildlife. This program will commence during the construction phase and continue during the operations phase.

Moose

- GPS collars will be considered for deployment on female Moose to determine if seasonal movements and habitat use change during road construction. The schedule for surveys in terms of number of collars, and the commencement and duration of the survey program, will be determined in consultation with the Ministry of Environment, Conservation and Parks (MECP) and interested Indigenous communities.

Furbearers

- North American Beaver lodge surveys will be conducted to determine occupancy status prior to any in water activities during construction.
- If clearance is required within the wolverine denning period (February 1 to May 1) target denning surveys will be conducted within a 2 km radius of the proposed work activity.

Bats

- Pre-construction bat maternity roost surveys will be conducted within the Project Footprint to identify potential maternity roosting habitat.
- If potential maternity roosting habitat is identified and clearance activities are scheduled to take place within the bat maternity roosting season (May 1 to August 31) exit surveys or acoustic monitoring may be required. Requirements will be determined in consultation with the MECP.

Birds

- Where vegetation clearing activities are proposed outside of the migratory bird breeding window for nesting zone C6 (between August 30 and April 24) pre-clearing nest sweeps will be conducted by qualified avian biologists with support from Indigenous EMs. If during the surveys birds are found within the proposed clearance area and presenting breeding behaviour, these areas will be flagged and protected with a disturbance buffer which will be maintained until the fledglings have left the nest or the nest becomes unoccupied.
- Pre-clearance surveys for raptor nests will occur along parts of the WSR ROW in forest ecosites containing suitable nesting trees.
- Shorebirds and waterfowl will be part of pre-clearance wildlife surveys to determine the presence of any waterfowl and shorebird significant nesting habitats near the WSR ROW prior to clearing.

Reptiles and Amphibians

- Pre-construction sweeps for reptiles and amphibians will be conducted within the Project Footprint. Any animals discovered within the footprint will be relocated to suitable habitat outside work zones.
- Annual eDNA monitoring conducted pre-construction, during construction and during operation to detect for presence of ranavirus in waterbodies in the Project Footprint.

12.12.3 Operations Monitoring

All Wildlife Species

- The wildlife road mortality program will be conducted during the operations phase of the Project. Road users will be encouraged to report any wildlife-vehicle encounters. When a carcass is present, mortality incidents will be investigated by an EM. Incidents will be tracked to identify locations with multiple encounters/mortalities, implement corrective actions and track effectiveness.
- Remote Camera Monitoring will take place along the proposed ROW and at reference sites to monitor the occurrence and distribution of wildlife within the project area. This program will commence during the construction phase and continue during the operations phase.

Moose

- GPS collars will be considered to be deployed on female moose to during the operations phase to determine if seasonal movements and habitat use change from road construction. The schedule for surveys in terms of number of collars, and the commencement and duration of the survey program, will be determined in consultation with the MECP.

Furbearers

- Any furbearers detected during Wolverine run-pole station surveys (see Section 13 – Assessment of Effects on Species at Risk) will be included as part of reporting on furbearer abundance and distribution during the operations phase.
- Beaver lodge surveys to monitor abundance and distribution of beavers will continue as part of operations monitoring.

Bats

- Bat presence and species diversity will be surveyed post-construction and compared to existing conditions data using acoustic monitoring. The surveys are proposed to occur a minimum of three times in the first five years of operation.

Migratory Songbirds

- Ultrasonic recording units (ARU) and point count surveys along the ROW and at reference sites will be conducted and compared to existing conditions data. The surveys are proposed to occur a minimum of three times in the first five years of operation. The schedule for surveys in terms of frequency of surveys and the number of years following the commencement of road operations will be determined in consultation with Environment and Climate Change Canada.

Shorebirds

- Surveys for shorebirds will follow the Ontario Shorebird Survey Protocol. Surveys are proposed to take place four times a year twice in the spring migration period and twice in the fall migration period. The surveys are proposed to occur during years 1, 3 and 5 in the first five years of operation. The schedule for surveys in terms of frequency of surveys and the number of years following the commencement of road operations will be determined and confirmed in consultation with Environment and Climate Change Canada.

Waterfowl

- Breeding Bird Survey for Waterfowl Nesting Areas will take place using the protocols described in Birds and Bird Habitats: Guidelines for Wind Power Projects. Surveys are proposed to take place four times a year twice in the spring migration period and twice in the fall migration period. The surveys are proposed to occur during years 1, 3 and 5 in the first five years of operation. The schedule for surveys in terms of frequency of surveys and the number of years following the commencement of road operations will be determined and confirmed in consultation with Environment and Climate Change Canada.

Reptiles and Amphibians

- ARU surveys for anurans will be included as part of the same study design for migratory songbirds.

12.13 References

Adde, A., Stralberg, D., Logan, T., Lepage, C., Cumming, S., and Darveau, M. (2020). Projected effects of climate change on the distribution and abundance of breeding waterfowl in Eastern Canada. Climactic Change, 162(4): 2339-2358.

Addison, R.B., Williamson, J.C., Saunders, B.P. and Fraser, D., 1980. Radio-tracking of moose in the boreal forest of northwestern Ontario. Canadian Field-naturalist 94:269-276.

Allen, A.W. (1983). *Habitat suitability index models: beaver. US Fish Wildl. Serv*. FWS/OBS-82/10.30 Revised. 20pp.

Almas, P. (2021). Use of Sound Stimuli to elicit a change in moose (Alces alces) and Red Deer (Cervus elaphus) behavior. [Master's Thesis, Norwegian University of Life Sciences].

Altringham, J., and Kerth, G. (2016). Chapter 3: Bats and Roads *In* Bats in the Anthropocene: Conservation of Bats in a Changing World. *Eds*. Voight, C.C., and Kingston, T. Springer Open, 601 pp.

Andersen, R., Linell, J.D.C., and Langvatn, R. (1996). Short term behavioural and physiological response of moose Alces alces to military disturbance in Norway. Biological Conservation 77:169-176.

Auer, S. K., and Martin, T. E. (2012). Climate change has indirect effects on resource use and overlap among coexisting bird species with negative consequences for their reproductive success. Global Change Biology, 19(2), 411–419. doi:10.1111/gcb.12062

Avocet Research Associates. (2007). North Basin Waterbird Study, Eastshore State Park, Berkeley, California, 2004-2007. Prepared for State of California Department of Parks and Recreation, Eastshore State Park. Revised 30 September 2009.

Baschuk, M. 2007. Effects of Road Type and Distance on Waterfowl Nesting Success. Honours Thesis. Department of Biology, The University of Winnipeg.

Belant, J.L. (2007). Human-Caused Mortality and Population Trends of American Marten and Fisher in a U.S. National Park. Natural Areas Journal, 27(2), 155-160.

Bélisle, M., and St. Clair, C.C. (2001). Cumulative effects of barriers on the movements of forest birds. Ecology and Society, 5(2): 9.

Benitez-Lopez, A., Alkemade, R., and Verweij, P.A. (2010). The impacts of roads and other infrastructure on mammal and bird populations: a meta-analysis. Biological Conservation 143: 1307–1316.

Bennett, V.J., and Zurcher, A.A. (2013). When corridors collide: Road-related disturbance in commuting bats. The Journal of Wildlife Management, 77(1): 93-101.

Berthinussen, A., and Altringham, J. (2012). Do bat gantries and underpasses help bats crossroads safely? PLoS One, 7(6): e38775.

Bildstein, K.L., K.D. Meyer, C.M. White, J.S. Marks, and G.M. Kirwan (2020). Sharp-shinned Hawk (*Accipiter striatus*), version 1.0. In Birds of the World (S.M. Billerman, B.K. Keeney, P.G. Rodewald, and T.S. Schulenberg, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.shshaw.01

Birds Canada. (2024). Ontario Breeding Bird Atlas: NatureCounts Population Trends. Available: https://naturecounts.ca/nc/onatlas/explore.jsp. Accessed: 9 October 2024.

Birds Canada and Environment and Climate Change Canada (ECCC). (2024). The State of Canada's Birds 2024 report. Available: https://naturecounts.ca/nc/socb-epoc/report/2024/en/. Accessed: 9 October 2024.

Bishop, C.A., and Brogan, J.M. (2013). Estimates of Avian Mortality Attributed to Vehicle Collisions in Canada. Avian Conservation and Ecology, 8(2). doi:10.5751/ace-00604-080202.

Blaustein, A.R., Belden, L.K., Olson, D.H., Green, D.M., Root, T.L., & Kiesecker, J.M. (2001). Amphibian Breeding and Climate Change. Conservation Biology, 15(6): 1804–1809.

Boisvert-Marsh, L., and de Blois, S. (2021). Unravelling potential northward migration pathways for tree species under climate change. Journal of Biogeography, 48: 1088-1100.

Both, C., Van Turnhout, C.A.M., Bijlsma, R.G., Siepel, H., Van Strien, A.J., and Foppen, R. P. B. (2010). Avian population consequences of climate change are most severe for long-distance migrants in seasonal habitats. Proceedings of the Royal Society B: Biological Sciences, 277: 1259-1266.

Boreal Songbird Initiative. (2015). Guide to Boreal Birds-Alder Flycatcher. https://www.borealbirds.org/bird/alder-flycatcher

Borgmann, K.L. 2011. A review of human disturbance impacts on waterbirds. *Audubon California*. *376*, 1-23.

Brassard, J.M., Audy, E., Crete, M., & Grenier, P. (1974). Distribution and winter habitat of Moose in Quebec.

Buchanan, J.B. (2011). Collisions and in-flight calamities involving shorebirds in Western Washington. Washington Birds. 11:22-27.

Buss, J., Dabros, A., Higgins, K.L., Hammond, H.E.J., Pinzon, J., and Langor, D.W. (2024). Comparison of edge effects from well pads and industrial roads on mixed upland boreal forest vegetation in Alberta. Plant Ecology 225: 331-343.

Buskirk, S.W. and Ruggiero, L. F. (1994). American Marten. Pages 7-37 in L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, tech. eds. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx and Wolverine in the Western United States. General Technical Report RM-254. U. S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Ft. Collins, Colorado.

Calvert, A.M., Bishop, Elliot, R.D., Krebs, E.A., Kydd, T.M., Machtans, C.S., and Robertson, G.J. (2013). A synthesis of human-related avian mortality in Canada. Avian Conservation and Ecology, 8(2): 11.

Canadian Wildlife Service Waterfowl Committee. (2023). Population status of migratory game birds in Canada – 2023. CWS Migratory Birds Regulatory Report Number 58. 60 pp.

Carlson, J.E., Gilbert, J.H., Pokallus, J.W., Manlick, P.J., Moss, W.E. and Pauli, J.N. (2014). Potential role of prey in the recovery of American martens to Wisconsin. Jour. Wild. Mgmt., 78: 1499-1504.

Claireau, F., Bas, Y., Puechmaille S.J., Julien, J.-F., Allegrini, B., and Kerbiriou, C. (2018). Bat overpasses: an insufficient solution to restore habitat connectivity across roads. Journal of Applied Ecology, 56: 573-584.

Claireau, F., Bas, Y., Julien, J.F., Machon, N., Allegrini, B., Puechmaille, S.J., and Kerbiriou, C. (2019). Bat overpasses as an alternative solution to restore habitat connectivity in the context of road requalification. Ecological Engineering, 131: 34–38.

Climate Risk Institute. (2023). Ontario Provincial Climate Change Impact Assessment Technical Report. Report prepared by the Climate Risk Institute, Dillon Consulting, ESSA Technologies Ltd., Kennedy Consulting and Seton Stiebert for the Ontario Ministry of Environment, Conservation and Parks. 534 pp.

Coffin, A.W. (2007). From roadkill to road ecology: a review of the ecological effects of roads. Journal of Transport Geography 15:396–406.

Collins, W.B., and D.J. Helm. (1997). Moose, Alces alces, habitat relative to riparian succession in the boreal forest, Susitna River, Alaska. Canadian Field-Naturalist 111: 567–574.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). (2023). COSEWIC assessment and status report on the Hoary Bat *Lasiurus cinereus*, Eastern Red Bat *Lasiurus borealis* and Silver-haired Bat, *Lasionycteris noctivagans*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 100 pp.

Committee on the Status of Species at Risk in Ontario (COSSARO). (2023). Ontario Species at Risk Evaluation Report for Silver-haired Bat Chauve-souris argentée (*Lasionycteris noctivagans*). Committee on the Status of Species at Risk in Ontario (COSSARO). Assessed by COSSARO as Endangered. November 2023, Final. 13 pp.

Committee on the Status of Species at Risk in Ontario (COSSARO). (2024a). Ontario Species at Risk Evaluation Report for Hoary Bat Chauve-souris cendrée (*Lasiurus cinereus*). Committee on the Status of Species at Risk in Ontario (COSSARO). Assessed by COSSARO as Endangered. January 2024, Final. 12 pp.

Committee on the Status of Species at Risk in Ontario (COSSARO). (2024b). Ontario Species at Risk Evaluation Report for Eastern Red Bat Chauve-souris rousse d l'Est (*Lasiurus borealis*). Committee on the Status of Species at Risk in Ontario (COSSARO). Assessed by COSSARO as Endangered. January 2024, Final. 13 pp.

Constantini, D., Lindecke, O., Petersons, G., and Voigt, C.C. (2019). Migratory flight imposes oxidative stress in bats. Current Zoology 65(2): 147-153.

Danks, H.V. and Foottit. R.G. (1989). Insects of the Boreal Zone of Canada. The Canadian Entomologist. 1989;121(8):625-690. doi:10.4039/Ent121625-8.

Davy, C.M., K. Squires, and J.R. Zimmerling. (2020). Estimation of spatiotemporal trends in bat abundance from mortality data collected at wind turbines. Conservation Biology 35:227–238.

Day, R.H., Murphy, S.M., Wiens, J.A., Hayward, G.D., Harner, E.J., and Smith, L.N. 1997. Effects of the Exxon Valdez oil Spill on Habitat use by Birds in Prince William Sound, Alaska. *Ecological Applications.* 7(2): 593-613.

DeLeon, R.L., DeLeon, E.E., and Rising, G.R. (2011). Influence of climate change on avian migrants' first arrival dates. The Condor, 113(4): 915-923.

Demarchi, M.W., and Bentley, M.D. (2005). Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia. B.C. Ministry of Environment Ecosystem Standards and Planning Biodiversity Branch.

Dove-Thompson, D., Lewis, C., Gray, P.A., Chu, C., and Dunlop, W.I. (2011). A summary of the effects of climate change on Ontario's aquatic ecosystems. Ministry of Natural Resources Climate Change Research Report 11. Science and Information Resources Division, Ontario Ministry of Natural Resources. 68 pp.

Drapeau, P., Leduc, A., Giroux, J.F., Savard, J.P.L., Bergeron, Y., and Vickery, W.L. (2000). Landscape-scale disturbances and changes in bird communities of Boreal mixed-wood forests. Ecological Monographs, 70(3): 423-444.

Drilling, N., Titman, R.D., and McKinney, F. (2020). Mallard (*Anas platyrhynchos*), version 1.0. In Birds of the World (S.M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.mallar3.01

Duarte, M.H.L., Braga, N.O., Bastos, R.P., Nascimento, L.B. (2023). Acoustic monitoring of anuran communities in road noise disturbed soundscapes. Herpetological Journal, doi: 10.33256/33.2.3442.

Duffus, A.L.J., Pauli, B.D., Wozney, K., Brunetti, C.R., and Berrill, M. (2008). Frog virus 3-like infections in aquatic amphibian communities. Journal of Wildlife Diseases, 44(1): 109-120.

Duffus, A.L.J., and Andrews, A.M. (2013). Phylogenetic analysis of a frog virus 3-like ranavirus found at a site with recurrent mortality and morbidity events in southeastern Ontario, Canada: Partial major caspid protein sequence alone is not sufficient for fine-scale differentiation. Journal of Wildlife Diseases, 49(2): 464-467.

Duncan, J. R. (1987). Movement strategies, mortality, and behavior of radio-marked Great Gray Owls in southeastern Manitoba and northern Minnesota. In *Biology and conservation of northern forest owls: symposium proceedings. US Forest Service Gen. Tech. Rep. RM-142*. pp. 101-107.

Duncan, J.R. (1997). Great Gray Owls (*Strix Nebulosa Nebulosa*) and Forest Management in North America: A Review and Recommendations. Journal of Raptor Research: Vol. 31(2), 160-166.

Dussault, C., Courtois, R., Ouellet, J. P., & Girard, I. (2005). Space use of moose in relation to food availability. *Canadian journal of zoology*, *83*(11), 1431-1437.

Dussault, C., Ouellet, J.P., Laurian, C., Courtois, R., Poulin, M. And Breton, L. (2007). Moose Movement Rates Along Highways and Crossing Probability Models. The Journal of Wildlife Management, 71: 2338-2345.

Dyson, M.E., Slattery, S.M., and Fedy, B.C. (2022). Multiscale nest-site selection of ducks in the western boreal forest of Alberta. *Ecology and Evolution.* 12(8): e9139

Dyson, M.E., Slattery, S.M., and Fedy, B.C. (2024). Effects of oil and gas development on duck nest survival in the Western Boreal Forest. Avian Conservation and Ecology 19(1):12.

Elmhagen, B., Kindberg, J., Hellström, P. and Angerbjörn, A. (2015). A boreal invasion in response to climate change? Range shifts and community effects in the borderland between forest and tundra. AMBIO 44 (Suppl 1), 39–50.

Elphick, C.S. and Tibbitts, T.L. (2020). Greater Yellowlegs (*Tringa melanoleuca*), version 1.0. In Birds of the World (A.F. Poole and F.B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.greyel.01

Environment and Climate Change Canada (ECCC). (2019). Three Quebec hunters fined a total of $11,750 for breaking federal and provincial wildlife laws. Available: https://www.canada.ca/en/environment-climate-change/services/environmental-enforcement/notifications/three-quebec-hunters-fined-breaking-federal-provincial-wildlife-laws.htmlw

Environment and Climate Change Canada (ECCC). (2024). Enforcement notifications. Available: https://www.canada.ca/en/environment-climate-change/services/environmental-enforcement/notifications.html

Fahrig, L., Pedlar, J.H., Pope, S.E., Taylor, P.D., Wegner, J.F. (1994). Effect of road traffic on amphibian density. Biological Conservation, 73: 177-182.

Forman, R.T.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T.Turrentine, and T.C. Winter. (2003). Road ecology: science and solutions. Island Press, Washington, D.C., USA.

Frey, S.N., Conover, M.R. (2006). Habitat Use by Meso-Predators in a Corridor Environment. Journal of Wildlife Management, 70(4): 1111-1118.

Galbraith, H., DesRochers, D.W., Brown, S., and Reed, J.M. (2014). Predicting vulnerabilities of North American shorebirds to climate change. PLoS ONE, 9(9): e108899.

Gigeroff, A.E.S., and Blouin-Demers, G. (2023). Do roads affect the abundance of garter (*Thamnophis sirtalis*) and redbelly snakes (*Storeria occipitomaculata*)? *Canadian Journal of Zoology*. 101(4): 267-275. https://doi.org/10.1139/cjz-2022-0127.

Gilbert, W.M., Sogge, M.K., and van Riper, C. (2020). Orange-crowned Warbler (*Leiothlypis celata*), version 1.0. In Birds of the World (P.G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.orcwar.01

Government of Canada. Species at Risk Act Public Registry. Residence Descriptions. Description of residence for American marten, Newfoundland population (Martes americana atrata) in Canada. https://wildlife-species.canada.ca/species-risk-registry/document/default_e.cfm?documentID=1282. (Accessed 2025).

Greer, A.L., Berrill, M., and Wilson, P.J. (2005). Five amphibian mortality events associated with ranavirus infection in south central Ontario, Canada. Diseases of Aquatic Organisms, 67: 9-14.

Grosholz, E. 2010. Avoidance by grazers facilitates spread of an invasive hybrid plant. *Ecology Letters.* 13(2): 145-153.

Grosman, P.D, Jaeger, J.A.G., Biron, P.M., Dussault, C., and Ouellet, J.P. (2011). Trade-off between road avoidance and attraction by roadside salt pools in moose: An agent-based model to assess measures for reducing moose-vehicle collisions, Ecological Modelling, 222(8): 1423-1435.

Gunson, K.E., Schueler, F.W. (2019). Wildlife on Roads: A Handbook. Eco-Kare International, Peterborough, Ontario. 232 pages.

Gunson, K.E., Mountrakis, G., Quackenbush, L.J. (2011). Spatial wildlife–vehicle collision models: a review of current work and its application to transportation mitigation projects. J Environ Manag 92(4):1074–1082

Hagan, J.M., McKinley, P.S., Meehan, A.L., and Grove, S.L. (1997). Diversity and abundance of landbirds in a Northeastern industrial forest. The Journal of Wildlife Management, 61(3): 718-735.

Hamer, A.J., Barta, B., Bohus, A., Gál, B., Schmera, D. (2006). Roads reduce amphibian abundance in ponds across a fragmented landscape. Global Ecology and Conservation. doi: 10.1016/j.gecco.2021.e01663

Harp, E.M., and Petranka, J.W. (2006). Ranavirus in Wood Frogs (*Rana sylvatica*): Potential Sources of Transmission Within and Between Ponds. Journal of Wildlife Diseases. 42(2): 307-318.

Hels, T., Buchwald, E. (2001). The effect of road kills on amphibian populations. Biological Conservation. 99: 331-340.

Hennigar, B., Ethier, J.P., and Wilson, D.R. (2019). Experimental traffic noise attracts birds during the breeding season. Behavioral Ecology, 30(6): 1591-1601.

Hill, J.E., DeVault, T.L., and Belant, J.L. (2020). A review of ecological factors promoting road use by mammals. Mammal Review, 51(2): 214-227.

Hoover, J.P. and Schelsky, W.M. (2020). Warmer April temperatures on breeding grounds promote earlier nesting in a long-distance migratory bird, the prothonotary warbler. Frontiers in Ecology and Evolution, 8.

Horejsi, B. (1979). Seismic Operations and Their Impact On Large Mammals: Results of a Monitoring Program. Western Wildlife Environments. Calgary, Alberta, Canada.

Ibarzabal, J., and Desrochers, A. (2004). A nest predator's view of a managed forest: Gray Jay (*Perisoreus canadensis*) movement patterns in response to forest edges. The Auk, 121(1): 162-169.

Jacobson, S.L., Bliss-Ketchum, L.L., de Rivera, C.E., and Smith, W.P. (2016). A behavior-based framework for assessing barrier effects to wildlife from vehicle traffic volume. Ecosphere 7(4):e01345.

James Bay Shorebird Project. (2019). Chapter 2: Daily Count, Resight, and Ratio Survey Protocol. 13 pp.

Jeglum, J.K. (1975). Vegetation-habitat changes caused by damming a peatland drainageway in northern Ontario. Canadian Field-Naturalist 89(4):400-412.

Johnsgard, P.A., 1956. Effects of Water Fluctuation and Vegetation Change on Bird Populations, Particularly Waterfowl. *Ecology.* 37(4): 869-701.

Jung, T.S., and Slough, B.G. (2022). Gimme shelter: anthropogenic structures as resting sites for American Marten (Martes americana). Canadian Field Naturalist. 135(4):396-399.

Kahlon, A. S. (2021). Interactions among climate, stress, and avian influenza virus infection, and their implications on survival in migratory waterfowl. [Master's Thesis, University of Saskatchewan]. 151 pp.

Kantrud, H.A. (1986). Effects of vegetation manipulation on breeding waterfowl in prairie wetlands: a literature review.

Kemink, K.M., Gue, C.T., Loesch, C.R., Cressey, R.L., Sieges, M.L., and Szymanski, M.L. 2019. Impacts of oil and gas development on duck brood abundance. *The Journal of Wildlife Management.* 83(7): 1485-1494.

Kiviat E. (2013). Ecosystem services of Phragmites in North America with emphasis on habitat functions. AoB Plants, 5:plt008.

Kitzes, J., and Merenlender, A. (2014). Large roads reduce bat activity across multiple species. PLOS ONE 9(8)L e105388.

Klaus, S.P., and Lougheed, S.C. (2013). Changes in breeding phenology of eastern Ontario frogs over four decades. Ecology and Evolution, 3(4): 835-845.

Knaggs, M., Haché, S., Nielsen, S. E., Pankratz, R. F., and Bayne, E. (2020). Avian response to wildfire severity in a northern Boreal region. Forests, 11(12): 1330.

Knight, R.L., and Kawashima, J.Y. (1993). Responses of raven and red-tailed hawk populations to linear right-of-ways. Journal of Wildlife Management, 57(2): 266-271.

Krapu, G.L., Greenwood, R.J., Dwyer, C.P., Kraft, K.M., and Cowardin, L.M. (1997). Wetland use, settling patterns, and recruitment in Mallards. Journal of Wildlife Management, 61(3): 736.

Kreutzweiser, D., Beall, F., Webster, K., Thompson, D., and Creed, I. (2013). Impacts and prognosis of natural resource development on aquatic biodiversity in Canada's boreal zone. Environmental Reviews, 21(4): 227-259.

Kuskemoen, E. (2020). Fine-scale assessment of responses to roads by red foxes. Masters Thesis. Norwegian University of Life Sciences. 49 pages.

Lagen, T.A., Ogden, K.M., and Schwarting, L.L. (2009). Predicting hot spots of herpetofauna road mortality along highway networks. Journal of Wildlife Management 73(1): 104-114.

Langham, G.M., J.G. Schuetz, T. Distler, C.U. Soykan, and C. Wilsey. (2015). Conservation Status of North American Birds in the Face of Future Climate Change. PLoS One 10: 1–16.

Laurian, C., Dussault, C., Ouellet, J.P., Courtois, R., Poulin, M. And Breton, L. (2008), Behavior of Moose Relative to a Road Network. The Journal of Wildlife Management, 72: 1550-1557.

Leyhe, J.E., & Ritchison, G. (2004). Perch sites and hunting behavior of Red-tailed Hawks (Buteo jamaicensis). *Journal of Raptor Research*, *38*(1), 3.

Li, X., Talbot, J., King, J., and Wang, M. (2023). Effects of road dust on vegetation composition and surface chemistry of three ombrotrophic peatlands in eastern Canada. Geoderma, 439: 116665.

Lemelin, L.V., Imbeau, L., Darveau, M., & Bordage, D. (2007). Local, short-term effects of forest harvesting on breeding waterfowl and common loon in forest-dominated landscapes of Quebec. *Avian conservation and ecology*, 2(2): 10.

Loeb, R.E., King, S., and Helton, J. (2014). Human Pathways Are Barriers to Beavers Damaging Trees and Saplings in Urban Forests. Urban Forestry & Urban Greening, 13: 290–4.

Loos, G. and Kerlinger, P. (1993). Road mortality of Saw-whet and Screech-owls on the Cape May peninsula. Journal of Raptor Research 27(4): 210-213.

Lowther, P. (1999). Alder Flycatcher (Empidonax alnorum). *The birds of North America*, (446), 20.

Markham, B.J. (1982). Waterfowl Production and Water Level Fluctuation. Canadian Water Resources Journal / Revue Canadienne Des Ressources Hydriques, 7(4), 22–36.

Mazerolle, M.J. (2004). Amphibian road mortality in response to nightly variations in traffic intensity. Herpetologica, 60(1): 45-53.

McClure, C.J.W., Ware, H.E., Carlisle, J., Kaltenecher, G., and Barber, J.R. (2013). An experimental investigation into the effects of traffic noise on distributions of birds: avoiding the phantom road. Proceedings of the Royal Society B, 280: 20132290.

McDonald, L.R. (2024). Moose Movement in an Urban Landscape. [Doctoral dissertation. Utah State University].

McDuie, F., Casazza, M.L., Overton, C.T., Herzog, M.P., Hartman, C.A., Peterson, S.H., Feldheim, C.L., Akerman, J.T. (2019). GPS tracking data reveals daily spatio-temporal movement patterns of waterfowl. Mov Ecol 7:6.

Michel, J., and Rutherford, N. (2014). Impacts, recovery rates, and treatment options for spilled oil in marshes. Marine Pollution Bulletin, 82: 19-25.

Miller, V., Abraham, K.F., and Nol., E. (2013). Factors affecting the responses of female Canada Geese to disturbance during incubation. Journal of Field Ornithology, 84(2): 171-180.

Montgomery, R.A., Roloff, G.J., and Millspaugh, J.J. (2012). Importance of visibility when evaluating animal response to roads. Wildlife Biology 18: 393–405.

Moore, L.J., Petrovan, S.O., Bates, A.J., Hicks, H.L., Baker, P.J., Perkins, S.E. and Yarnell, R.W. (2023). Demographic effects of road mortality on mammalian populations: a systematic review. Biol Rev, 98: 1033-1050.

Moorman, C.E., & Chapman, B.R. (1996). Nest-site selection of Red-shouldered and Red-tailed Hawks in a managed forest. *The Wilson Bulletin*, 357-368.

Morris, D.M. (2014). Aquatic habitat use by North American moose (Alces alces) and associated richness and biomass of submersed and floating-leaved aquatic vegetation in north-central Minnesota. Masters Thesis, Lakehead University. 130 pp.

Mowbray, T B., Ely, C.R., Sedinger, J.S., and Trost, R.E. (2020). Canada Goose (*Branta canadensis*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.cangoo.01

Mumma, M.A., Gillingham, M.P., Johnson, C.J., and Parker, K.L. (2018). Where beavers (Castor canadensis) build: testing the influence of habitat quality, predation risk, and anthropogenic disturbance on colony occurrence. Canadian Journal of Zoology, 96(8):897-904.

Mumma, M.A., Gillingham, M.P., Johnson, C.J., and Parker, K.L. (2019). Functional responses to anthropogenic linear features in a complex predator-multi-prey system. Landscape Ecol 34, 2575–2597.

Muñoz, P.T., Torres, F.P., and Megías, A.G. (2015). Effects of roads on insects: a review. Biodiversity and Conservation, 24: 659-682.

NatureServe. (2024). NatureServe Explorer. Accessed from: https://explorer.natureserve.org. Accessed on: August 21, 2024.

Niemi, G.J. and Hanowski, J.M. (1997). Concluding Remarks on Raptor Responses to Forest Management: A Holarctic Perspective. Journal of Raptor Research: Vol. 31(2), 191-196.

Oetting, R.B., and Cassel, J.F. 1971. Waterfowl nesting on interstate highway right-of-way in North Dakota. *The Journal of Wildlife Management*. 774-781.

Olsson, M.P.O. and Widen, P. (2008), Effects of highway fencing and wildlife crossings on moose Alces alces movements and space use in southwestern Sweden. Wildlife Biology, 14: 111-117.

Ontario Ministry of the Environment, Conservation and Parks (MECP). (2023). Best Practice Technical Note: Knowledge of Active Seasons for Species at Risk in Ontario. 12 pp.

Ontario Ministry of the Environment, Conservation and Parks (MECP). (2025). Environmental Occurrences and Spills – Data. Accessed: January 30, 2025. Available: https://data.ontario.ca/dataset/environmental-occurrences-and-spills/resource/df7db83f-30ea-410e-b1d1-629137b6a8c9

Ontario Ministry of Natural Resources (MNR). (2011). Bats and bat habitats: guidelines for wind power projects. Queen's Printer for Ontario. Ottawa, Canada.

Ontario Ministry of Natural Resources and Forestry (MNRF). (2016). Best Management Practices for Mitigating the Effects of Roads on Amphibians and Reptile Species at Risk in Ontario. Queen's Printer for Ontario. 112 pp.

Ontario Nature. (2024). Ontario Reptile and Amphibian Atlas, 2009-2019. Ontario Nature, Toronto. 443 pp.

Ortega, Y.K., and Capen, D.E. (2002). Roads as Edges: Effects on Birds in Forested Landscapes. Forest Science, 48(2): 381-390.

Ortiz-Jiménez, I., Iglesias-Merchan, C., Martínez-Salazar, A.I., Barja, I. (2022). Effect of intensity and duration of anthropic noises on European mink locomotor activity and fecal cortisol metabolite levels, Current Zoology, 68(6), Pages 688–699.

Paprocki, N., Oleyar, D., Brandes, D., Goodrich, L., Crewe, T., and Hoffman, S.W. (2017). Combining migration and wintering counts to enhance understanding of population change in a generalist raptor species, the North American Red-tailed Hawk. The Condor: Ornithological Applications 119(1): 98-107.

Pasitschniak-Arts, M., Clark, R.G., and Messier, F. (1998). Duck nesting success in a fragmented prairie landscape: Is edge effect important? Biological Conservation 85:55-62.

Patching, R., McCleave, L.N., Radulescu, A. (2015). Traffic and industrial vibrations and a snake hibernaculum. Proceedings of the Acoustics Week in Canada. 43(3).

Paterson, J.E., Pulfer, T., Horrigan, E., Sukumar, S., Vezina, B., Zimmerling, R., and Davy, C.M. (2021). Individual and synergistic effects of habitat loss and roads on reptile occupancy. Global Ecology and Conservation, 31: e01865.

Patterson, S.A., Denton, D.T.J., Hasler, C.T., Blais, J.M., Hanson, M.L., Hollebon, B.P., Rodriguez-Gil, J.L., Langlois, V.S., Patey, G., Yang, Z., and Orihel, D.M. (2022). Resilience of larval wood frogs (*Rana sylvatica*) to hydrocarbons and other compounds released from naturally weathered diluted bitumen in a boreal lake. Aquatic Toxicology, 425: 106128.

Pease, M.L. Rose, R.K., and Butler, M.J. 2010. Effects of human disturbance on the behaviour of winter ducks

Proulx, G. (2006). Winter habitat use by American Marten, Martes americana, in western Alberta boreal forests. Canadian Field-Naturalist 120: 100-105.

Rail, J.F., Darveau, M., Desrochers, A., and Huot, J. (1997). Territorial responses of Boreal forest birds to habitat gaps. The Condor, 99: 967-980.

Ranta, B.W. (1997). Selected Wildlife and Habitat Features: Inventory Manual-for use in Forest Wildlife Management. Queen's Printer for Ontario. Ontario, Canada.

Rea, R.V. 2003. Modifying roadside vegetation management practices to reduce vehicular collisions with moose Alces alces. Wildlife Biology 9: 81-91.

Read, J.L. 1999. A strategy for minimizing waterfowl deaths on toxic waterbodies. *Journal of Applied Ecology.* 36(3): 345-350.

Reid, D. G. (1984). Ecological interactions of river otters and beavers in a boreal ecosystem. M.Sc. thesis, University of Calgary, Calgary, Alta.

Rich, A.C., Dobkin, D.S., and Niles, L.J. (1994). Defining forest fragmentation by corridor width: the influence of narrow forest-dividing corridors on forest-nesting birds in Southern New Jersey. Conservation Biology, 8(4): 1109-1121.

Rimmer, C.C., and McFarland, K.P. (2020). Tennessee Warbler *Leiothlypis peregrina*, version 1.0. *In* Birds of the World (A.F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.tenwar.01

Rød-Eriksen L, Skrutvold J, Herfindal I, Jensen H, Eide NE. (2020). Highways associated with expansion of boreal scavengers into the alpine tundra of Fennoscandia. Journal of Applied Ecology., 57: 1861-1870.

Rodríguez, A., García, A.M., Cervera, F. And Palacios, V. (2006). Landscape and anti-predation determinants of nest-site selection, nest distribution and productivity in a Mediterranean population of Long-eared Owls Asio otus. Ibis, 148: 133-145.

Rose, M., & Hermanutz, L. (2004). Are boreal ecosystems susceptible to alien plant invasion? Evidence from protected areas. Oecologia, 139(3): 467–477.

Russel, A.L., Butchkoski, C.M., Saidak, L., McCracken, G.F. (2009). Road-killed bats, highway design, and the commuting ecology of bats. Endangered Species Research, 8: 49-60.

Ryeland, J., Weston, M.A., and Symonds, M.R.E. (2020). The importance of wetland margin microhabitat mosaics; the case of shorebirds and thermoregulation. Journal of Applied Ecology, 58(2): 382-391.

Santos, S.M., Mira, A., Salgueiro, P.A., Costa, P., Medinas, D., and Beja, P. (2016). Avian trait-mediated vulnerability to road traffic collisions. Biological Conservation, 200: 122-130.

Sanzo, D. (2004). Water chemistry: its effects on amphibians in northwestern Ontario, Canada. M.Sc. Thesis. Lakehead University, Thunder Bay, Ontario.

Saracco, J.F., Pyle, P., Kaschube, D.R., Kohler, M., Godwin, C.M., and Foster, K.R. (2022). Demographic declines over time and variable responses of breeding bird populations to human footprint in the Athabasca Oil Sands Region, Alberta, Canada. Ornithological Applications, 125: duac037.

Schmidt, B.R., and Zumbach, S. (2008). Amphibian road mortality and how to prevent it: A review. *In* Urban Herpetology. Society for the Study of Amphibians and Reptiles. J.C. Mitchell, R.E. Jung Brown, and B. Bartolomew, editors. Pages 157-167.

Schou, C.P.E., Levengood, A.L., Potvin, D.A. (2021). Limited effects of traffic noise on behavioural responses to conspecific mating calls in the eastern sedge frog *Litoria fallax*. Acta Ethologica, doi: 10.1007/S10211-021-00378-7.

Scrafford, M.A., Nobert, B.R., Boyce, M.S. (2020). Beaver (Castor canadensis) use of borrow pits in an industrial landscape in northwestern Alberta. Journal of Environmental Management. 269. 110800.

Seitz, T.J., Spellman, K.V. and Mulder, C.P.H. (2024) Wildfire and invasive plants in Alaska's boreal forest-state of the science report. University of Alaska Fairbanks International Arctic Research Center and Institute of Arctic Biology. Alaska: Fairbanks, Pp. 30.

Shanley, C.S., and Pyare, S. (2011). Evaluating the road-effect zone on wildlife distribution in a rural landscape. Ecosphere 2(2):art16.

Shine, R., Lemaster, M., Wall, M., Langkilde, T., and Mason, R. (2004). Why did the snake cross the road? Effects of roads on movement and location of mates by garter snakes (*Thamnophis sirtalis parietalis*). Ecology and Society 9(1): 9.

Silva, M., Johnson, K.M., Opps, S.B. (2009). Habitat use and home range size of red foxes in Prince Edward Island (Canada) based on snow-tracking and radio-telemetry data. Central European Journal of Biology, 4(2): 229-240.

Siemers, B.M., and Schaub, A. (2010). Hunting at the highway: traffic noise reduces foraging efficiency in acoustic predators. Proceedings of the Royal Society B, 278: 1646-1652.

Singer, H.V., Slattery, S.M, Armstrong, L., and Witherly, S. 2020. Assessing breeding duck population trends relative to anthropogenic disturbances across the boreal plains of Canada, 1960-2007. *Avian Conservation and Ecology.* 15(1).

Smerdon, B.D., Devito, K.J., and Mendoza, C.A. (2005). Interaction of ground water and shallow lakes on outwash sediments in the subhumid Boreal Plains of Canada. Journal of Hydrology, 314: 246–262.

St-Amour, V., Wong, W.M., Garner, T.W.J, Lesbarreres, D. (2008). Anthropogenic influence on prevalence of 2 amphibian pathogens. Emerging Infectious Diseases. 14(7): 1175-1176.

Stone, E.L., Jones, G., & Harris, S. (2009). Street Lighting Disturbs Commuting Bats. Current Biology, 19(13): 1123–1127.

Stone, E.L., Jones, G., & Harris, S. (2012). Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats. Global Change Biology, 18(8): 2458–2465.

Stralberg, D., and Bayne, E.M. (2013). Modeling avifaunal responses to climate change across Alberta's natural regions. Progress report prepared for the Biodiversity Management and Climate Change Adaptation Project. 31 May 2013. 98 pp.

Strasser, E.H. and Heath, J.A. (2013). Reproductive failure of a human-tolerant species, the American kestrel, is associated with stress and human disturbance. J Appl Ecol, 50: 912-919.

Street, G.M., Rodgers, A.R., & Fryxell, J.M. (2015). Mid-day temperature variation influences seasonal habitat selection by moose. *The Journal of Wildlife Management*, *79*(3), 505-512.

Strickland, D. and H.R. Ouellet (2020). Canada Jay (*Perisoreus canadensis*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.gryjay.01

Suffice, P., Asselin, H., Imbeau, L., Cheveau, M., & Drapeau, P. (2017). More fishers and fewer martens due to cumulative effects of forest management and climate change as evidenced from local knowledge. *Journal of Ethnobiology and Ethnomedicine*, *13*, 1-14.

Taylor, J.D., Yarrow, G.K., and Miller, J.E. (2017). Beavers. Wildlife Damage Management Technical Series. USDA, APHIS, WS National Wildlife Research Center. Ft. Collins, Colorado. 21p.

Taylor, P. 2018. Palm Warbler in Artuso, C., A.R. Couturier, K.D. De Smet, R.F. Koes, D. Lepage, J. McCracken, R.D. Mooi, and P. Taylor (eds.). The Atlas of the Breeding Birds of Manitoba, 2010-2014. Bird Studies Canada. Winnipeg, Manitoba

Tennessen, J.B., Parks, S., and Langkilde, T. (2014). Traffic noise causes physiological stress and impairs breeding migration behaviour in frogs. Conservation Physiology, 2(1): cou032–cou032.

Tennessen, J.B., Parks, S.E., Swierk, L., Reinert, L.K., Holden, W.M., Rollins-Smith, L.A., Walsh, K.A., Langkilde, T. (2018). Frogs adapt to physiologically costly anthropogenic noise. Proceedings of The Royal Society B: Biological Sciences, doi: 10.1098/RSPB.2018.2194.

Thompson, S.J., Arnold, T.W., and Vacek, S. 2012. Impact of encroaching woody vegetation on nest success of upland nesting waterfowl. *The Journal of Wildlife Management.* 76(8): 1635-1642.

Thorne, T.J. (2017). Bats of Ontario. First Edition. Hawk Owl Publishing, Newcastle, Ontario.

Towerton, A.L., Kavanagh, R.P., Penman, T.D., Dickmen, C.R. (2016). Ranging behaviour and movements of the red fox in remnant forest habitats. Wildlife Research, 43: 492-506.

Vander Vennen, L.M., Patterson, B.R., Rodgers, A.R., Moffatt, S., Anderson, M.L. and Fryxell, J.M. (2016). Diel movement patterns influence daily variation in wolf kill rates on moose. Funct Ecol, 30: 1568-1573.

Velicer, C. and Lesser, M. (2024). Engineering invasion: Do canopy gaps created by the North American beaver (Castor canadensis) facilitate terrestrial plant invasions? University of Rochester, Journal of Undergraduate Research, 23(1).

Veon, J.T., and McClung, M.R. (2023). Disturbance of wintering waterbirds by simulated road traffic noise in Arkansas wetlands. Journal of Wildlife Management 87:e22387.

Voorhees, L.D., and Cassel, J.F. 1980. Highway right-of-way: mowing versus succession as related to duck nesting. *The Journal of Wildlife Management*, 155-163.

Walker, D.A., and Everett, K.R. 1987. Road dust and its environmental impact on Alaskan taiga and tundra. *Arctic and Alpine Research.* 19(4): 479-489.

Ware, H.E., McClure, C.J.W., Carlisle, J.D., and Barber, J.R. (2015). A phantom road experiment reveals traffic noise is an invisible source of habitat degradation. PNAS 112(39): 12105-12109.

Welsh, D.A. (1987). Palm Warbler. In D. Cadman, P. F. J. Eagles, and F. M. Helleiner (eds.) Atlas of the Breeding Birds of Ontario. University of Waterloo Press, Waterloo.

Woollard, T.F., Harrison, D.J., Erin M. Simons-Legaard, and Kirstin E. Fagan. (2024). Functional Responses in American Marten Habitat Selection Indicate Cumulative Effects of Progressive Habitat Change. Ecosphere 15(1): e4715.

Wright, M.D., Goodman, P., and Cameron, T. C. (2010). Exploring behavioural responses of shorebirds to impulsive noise. Wildfowl, 60: 150-167.

Yagi, A.R., Planck, R.J., Yagi, K.T., Tattersall, G.J. (2020). A long-term study on Massasaugas (*Sistrurus catenatus*) inhabiting a partially mined peatland: a standardized method to characterize snake overwintering habitat. Journal of Herpetology, 54(2): 235-244. doi: 10.1670/18-143.

Zurcher, A.A., Sparks, D.W., and Bennett, V.J. (2010). Why did the bat not cross the road? Acta Chiropterologica 12(2): 337-340.

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