# Appendix G

## Final Fish and Fish Habitat Technical Support Document

MARTEN FALLS FIRST NATION
**COMMUNITY ACCESS ROAD**

# Fish and Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment

***February 2026***

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This limitations statement is considered an integral part of this report.

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## Revision History

| Report | Date | Revised By: | Revision Description |
|---|---|---|---|
| **Draft** | December 18, 2024 | WSP Canada Inc. | Draft Report for inclusion with Draft EA / IS Report |
| **Final** | February 20, 2026 | WSP Canada Inc. | Final Report for inclusion with Final EA / IS Report |

# Executive Summary

This Report presents the existing conditions and effects assessment for the fish and fish habitat discipline that has been prepared in support of the *Marten Falls First Nation Community Access Road Environmental Assessment / Impact Statement Report*. The Report provides a comprehensive assessment of potential effects of the Marten Falls First Nation Community Access Road Project (the Project) on fish and fish habitat. This assessment includes consideration of both effects from the Project and cumulative effects from the Project and other reasonably foreseeable developments. The fish and fish habitat assessment used widely accepted scientific practices and incorporated Indigenous Knowledge, where available.

Fish and fish habitat Valued Components, including a species at risk, were identified in Section 8.8 of the *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020a). A total of six fish species represented Valued Components in the Environmental Assessment / Impact Assessment. The fish and fish habitat Valued Components and rationale for their selection are:

- Lake Sturgeon (*Acipenser fulvescens*) (cultural importance and species at risk);
- Walleye (*Sander vitreus*) (cultural importance and local recreational value);
- Brook Trout (*Salvelinus fontinalis*) (cultural importance and local recreational value);
- Northern Pike (*Esox lucius*) (cultural importance and local recreational value);
- Lake Whitefish (*Coregonus clupeaformis*) (cultural importance and local recreational value); and
- Burbot (*Lota lota*) (cultural importance and local recreational value).

Cultural importance also considers species that are harvested by community members for sustenance. The assessment of potential effects on fish and fish habitat was informed by the assessments completed for hydrology, surface water quality, groundwater (Oji-Cree translation, *anamakamigwabo*) quality, and air quality. Alterations in abundance and distribution of fish can affect ecological services (e.g., availability of fish) for people that use these resources. As such, the fish and fish habitat assessment provided information that was used to support other Valued Component assessments such as Aboriginal and Treaty Rights and Interests; social; land and resource use; and human health and community safety.

# Setting

At a regional scale, the Project would start approximately 57 kilometres (km) north of Nakina, Ontario, and end at the community of Marten Falls, approximately 175 km north of Nakina. The fish and fish habitat assessment used the same spatial boundaries as surface water, which consist of an effects assessment Local Study Area of 75,500 ha and an effects assessment Regional Study Area of 2,546,430 ha.

# Existing Conditions

Existing conditions for fish and fish habitat were characterized based on results from field studies carried out between 2019 and 2022, Indigenous Knowledge, and other available data sources (e.g., literature).

# Potential Residual Effects and Proposed Mitigation and Enhancement Measures

An analysis was completed to evaluate Project components and activities and associated effects pathways that could potentially affect fish and fish habitat. Project activities that would have the potential to affect fish and fish habitat during the Project lifespan include:

- Clearing of the right-of-way;
- Constructing the Community Access Road;
- Constructing bridges and install culverts;
- Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles;
- Operating the Preferred Route; and
- Maintaining the Preferred Route and permanent bridges and culverts.

As part of the pathways analysis, proposed mitigation and enhancement measures were considered to determine whether effects on fish and fish habitat Valued Components could be avoided or reduced to negligible levels. A variety of environmental design features and mitigation and enhancement measures were proposed to minimize the Project's effects on fish and fish habitat, including:

- Follow best management practices and environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Fisheries and Oceans Canada and the Ministry of Natural Resources;
- Areas of sensitive fish habitat and fishing areas that have been identified through the Indigenous Knowledge program in pre-construction design will be avoided;

- Limit the Project footprint to the extent feasible;
- Use existing access roads where possible;
- Complete work as quickly as possible to shorten the duration of disturbance;
- Use existing waterbody crossing structures where possible. Minimize the number of waterbody crossings required for the Project;
- Construct waterbody crossings in a manner that maintains downstream flows and fish passage and follows conditions of permits or authorizations issued for the Project by Fisheries and Oceans Canada and the Ministry of Natural Resources;
- Avoid sensitive habitats (e.g., spawning areas and groundwater upwellings), where feasible;
- Complete instream construction in isolation of flowing water (i.e., use isolation methods for the installation and removal of culverts where surface water exists at the time of construction);
- For isolations / diversions, maintain 100% downstream flow;
- Avoid construction during a fish and fish habitat restricted activity timing window, where feasible;
- Install, monitor, and manage appropriate erosion and sedimentation control measures to minimize or avoid sediment mobilization from the disturbed area to drainages or waterbodies and in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020); and
- Follow Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b) and regularly inspect and maintain culverts and bridges to prevent blockages from forming and causing ponding or backwater effects.

# Residual Effects Assessment

After mitigation and enhancement measures were considered, some of the potential pathways from the Project to the environment were removed or had effects that were predicted to be of a negligible level. However, it was identified that the Project could have greater than negligible effects on fish and fish habitat from the following residual effect pathways:

- Changes to fish habitat quantity and quality through physical alteration of waterbodies;
- Changes to fish habitat quantity and quality through changes to riparian vegetation;
- Injury or mortality of fish from instream construction;

- Changes to habitat quality from the release of sediment at waterbody crossings;
- Changes to fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology;
- Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures, affecting fish access to habitats;
- Changes to fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels;
- Changes to fish survival and reproduction from improved public access to recreational angling areas; and
- Changes to fish survival and reproduction from spill of fuel or other materials.

## Significance Determination

After implementation of the Project, the weight of evidence from the analysis predicts that the Valued Component fish populations would remain self-sustaining and ecologically effective in the effects assessment Regional Study Area. Therefore, the residual effects on fish and fish habitat Valued Components after implementation of the Project are predicted to be **not significant**.

## Prediction Confidence and Uncertainty

Overall, there is a moderate degree of confidence in the predictions related to the changes to fish and fish habitat Valued Components because there were baseline data for the majority of the sites available, the Project-related effects are mostly understood, and the level of uncertainty associated with the effectiveness of proposed mitigations is low to moderate.

## Cumulative Effects

Two residual effects were carried forward to the cumulative effects assessment:

1. Residual effects to fish habitat quantity and quality through physical alteration of waterbodies where work is below the high-water mark; and
2. Residual effects to fish survival and reproduction from improved public access to recreational angling areas.

Overall, the Valued Component fish populations are expected to remain self-sustaining and ecologically effective.

# Monitoring and Follow-Up

Monitoring programs will be implemented for the pre-construction, Construction, and Operation and Maintenance Phases of the Project to verify effects predictions and effectiveness of mitigation and enhancement measures for fish and fish habitat. Adaptive management will be applied, if required, based on monitoring results.

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Attachment D – Undefined Crossings
Attachment E – Waterbody Crossing List

# 1 Introduction

This Report presents the existing conditions and effects assessment for the fish and fish habitat discipline and is being prepared in support of the *Marten Falls First Nation Community Access Road Environmental Assessment / Impact Statement Report*.

Marten Falls First Nation (Oji-Cree translation, *Wegwajihwana*) is a remote First Nation community in northern Ontario, approximately 430 km from Thunder Bay, Ontario, located at the junction of the Albany (Oji-Cree translation, *Keshijih'wano Wih Ziibih*) and Ogoki (Oji-Cree translation, *Zakamosgwanih' Ziibih*) rivers. Marten Falls is proposing a multi-purpose Marten Falls First Nation Community Access Road Project (the Project) that will connect the community to the Ontario provincial highway network.

The Project includes the construction and operation of the Community Access Road with the following key characteristics:

- Approximately 184 km of two-lane gravel all-season road on a new right-of-way (see **Section 6** for further details on the selection of the Preferred Route);
- Approximately 100 m wide right-of-way cleared; and
- Proposed designated speed limit of 80 km per hour.

Marten Falls First Nation is currently accessible year-round by air transportation out of Thunder Bay, Ontario, and Nakina, Ontario, and by a winter access road constructed on a annual basis, if winter conditions permit. Since the 1990s, Marten Falls First Nation has received provincial funding to maintain the 140 km of winter road to the community.

For the purposes of this document, waterbodies are defined as depressions with defined beds or banks where water collects on the surface of the ground, whether or not the water is continuously present. Waterbodies consist of watercourses or water features. A watercourse means an identifiable depression in the ground in which a flow of water regularly or continuously occurs (*Conservation Authorities Act;* Government of Ontario, 2003; Stanfield, 2017). A watercourse may be a natural or constructed channel such as a river, creek, stream, or ditch. In comparison, a water feature means a natural, or wholly or partially constructed, depression that supports standing water (Oji-Cree translation, *wanihbiiya*) regularly or continuously such as a lake (Oji-Cree translation, *zaakaihgan*), pond, or reservoir (Ministry of Natural Resources and Forestry, 2011). A waterbody (i.e., watercourse or water feature) is considered permanent if it contains water for at least nine months of the year and seasonal (i.e., intermittent or ephemeral) if it contains water for less than nine months of the year (Ministry of Natural Resources and Forestry, 2015a). Wetlands that were considered to be fish-bearing are discussed in this Report and all wetlands (i.e., fish-bearing and non-fish bearing) are described in WSP Canada Inc.'s *Vegetation Technical Support Document: Existing Conditions and Effects Assessment* (2026b).

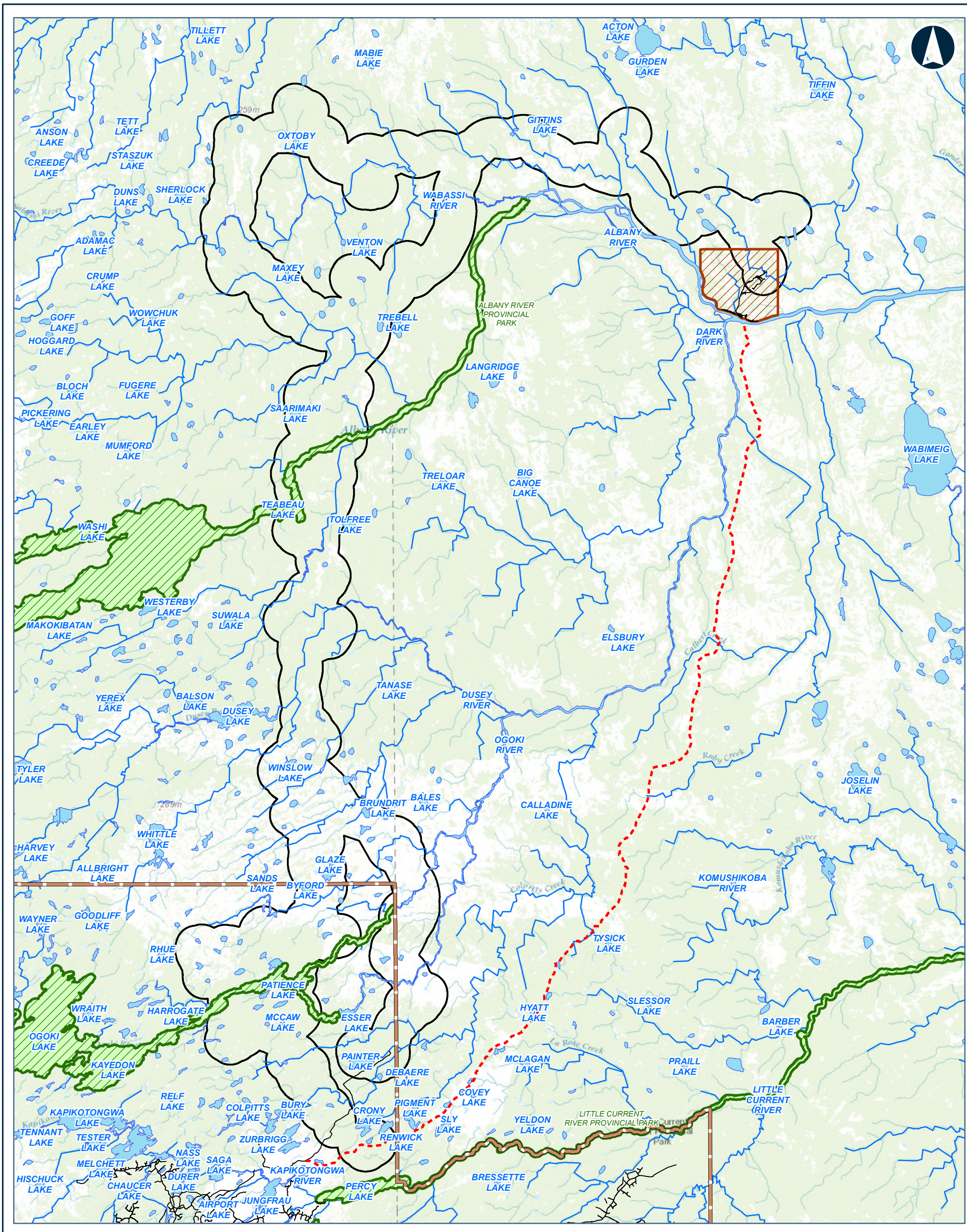
## 1.1 Project Overview

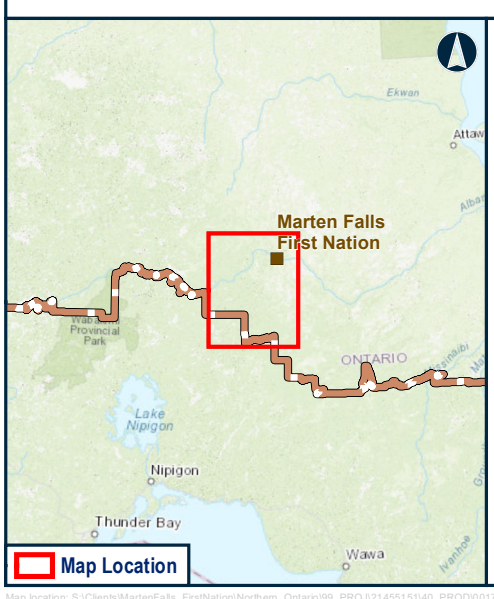
The Project consists of a Community Access Road from Painter Lake Road located approximately 57 km north of Nakina, Ontario to the Community of Marten Falls First Nation (**Figure 1-1**). The Community Access Road will serve community access and industrial supply needs for both the community (e.g., fuel, construction supplies, and water treatment supplies) and industrial proponents (e.g., mining and forestry). Therefore, to minimize the number of infrastructure corridors in the Far North, the Project will be constructed as a multi-purpose road that is built to meet industrial use specifications.

In April 2018, Marten Falls First Nation signed an agreement with the Ministry of the Environment, Conservation and Parks to prepare an Environmental Assessment under the *Ontario Environmental Assessment Act*, 1990, to support the development of the Community Access Road. A study under the *Ontario Environmental Assessment Act* was formally initiated by Marten Falls First Nation in March 2019 when the *Notice of Commencement for a Terms of Reference* for the Project was published.

All-season public roads that require 75 km or more of new right-of-way, as per Schedule 1 (51) of the Physical Activities Regulations under the *Impact Assessment Act*, may be subject to the *Impact Assessment Act* (Government of Canada, 2019). After considering the detailed Project Description, the Impact Assessment Agency of Canada determined that a federal Impact Assessment was required for the Community Access Road and an Impact Statement needed to be submitted to the Impact Assessment Agency of Canada for review and approval. The Impact Assessment Agency of Canada prepared and released the Marten Falls Community Access Road Project: Tailored Impact Statement Guidelines in February 2020 (Impact Assessment Agency of Canada, 2020a) to outline the information and studies necessary to conduct the Impact Assessment.

The federal and provincial governments are cooperating on the assessment of the Community Access Road, in accordance with the Cooperation Plan (Impact Assessment Agency of Canada, 2020b). The Cooperation Plan allows Marten Falls First Nation to prepare one single Environmental Assessment / Impact Statement submission to satisfy both the federal and provincial processes.




## Legend

- ROAD
- WINTER ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- PROJECT STUDY AREA

**Notes:**
None

**Data Source:**
Base Data: Provided by MNRF 2019; Route Infrastructure - Provided by AECOM 2019. Contains Information licensed under the Open Government Licence Ontario.
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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## PROJECT LOCATION

0 5 10 20
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Feb, 2026 | 1:450,000 * when printed 11"x17" |
| Rev:0 | |

**Figure 1-1**

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## 1.2 Report Overview

This Report includes the following:

- A summary of the Project components and activities (**Section 2, Project Description**);
- A compilation of information shared by Indigenous Peoples and other interested persons related to fish and fish habitat (**Section 3, Information Shared by Indigenous Peoples and Other Interested Persons Which Informed This Report**);
- Study methods and assessment scope (**Section 4, Study Methods and Assessment Scope**);
- A description of existing conditions for fish and fish habitat (**Section 5, Existing Conditions**);
- A summary of the selection of the Preferred Route as it relates to fish and fish habitat (**Section 6, Selection of the Preferred Route**);
- The residual effects assessment (**Section 7, Residual Effects Assessment**);
- The cumulative effects assessment (**Section 8, Cumulative Effects Assessment**);
- A summary of monitoring programs and future commitments related to fish and fish habitat (**Section 9, Monitoring Programs and Future Commitments**); and
- An overall summary and recommendations (**Section 10, Summary and Recommendations**).

As described in the *Environmental Assessment / Impact Statement Report* and in **Section 6** of this report, the characterization of existing conditions for the Project was completed on two alternative routes (Alternative 1 and 4). The data collected through the characterization of existing conditions were used to inform the selection of the Preferred Route (**Section 6**). The residual (**Section 7**) and cumulative (**Section 8**) effects assessments were completed on the selected Preferred Route.

## 1.3 Qualifications of Individuals

A list of names and qualifications of the authors and technical reviewers of this report is presented in **Table 1-1**.

**Table 1-1: Qualifications of Individuals**

| Name | Title / Role | Years of Experience | Qualifications |
|---|---|---|---|
| **Christina Campbell** | Experienced Aquatic Biologist | 6 | M.Res. |
| **Barbra Fortin** | Lead Aquatic Biologist | 17 | M.Sc. |
| **Ashley Morton** | Principal Aquatic Ecologist | 23 | B.Sc. |
| **Kristine Mason** | Senior Principal Aquatic Biologist | 29 | M.Sc. |

M.Res. = Master of Research; B.Sc. = Bachelor of Science; M.Sc. = Master of Science.

# 2 Project Description

## 2.1 Project Components

### 2.1.1 Community Access Road

The Project consists of an approximately 184 km all-season road within a 100 m wide right-of-way, 60 m of which will be cleared of vegetation. The Community Access Road will be approximately 11 m wide to accommodate a two-lane gravel road with culverts and two-lane bridges at water crossing locations. Traffic levels for the Project have been estimated at 700 vehicles a day for the north–south section and 100 vehicles a day for the east–west section of the Marten Falls First Nation Community Access Road. These volumes are reflective of the anticipated peak traffic in 2046.

Road embankment design mitigations are being further considered in high-suitability habitat for caribou where feasible. Operational mitigations such as lower speed limits, signage about wildlife risks, roadside vegetation management, and snow berm height management will be further planned and implemented to facilitate safe wildlife crossing of the Community Access Road.

The predominant building materials used to construct the Community Access Road will be blasted rockfill and composite excavation material capped with granular surface material. The majority of blasted rockfill will be obtained from rock outcrops within and / or adjacent to the right-of-way. Building materials will be primarily obtained through the pits and quarries (**Section 2.1.3**) developed specifically to support construction of the Project.

Early investigations on permafrost have shown the Project is located within the isolated patches permafrost zone (Heginbottom, Dabreuil, & Harker, 1995), with some possible locations identified in test holes and helicopter reconnaissance by KGS Group (KGS Group, 2019a; KGS Group, 2019b). Excavation within identified permafrost areas will be avoided, whenever possible, as cutting into surface vegetation can disturb the permafrost regime resulting in thaw and unstable ground. As a precaution, the design will primarily use fill to minimize any permafrost degradation and will follow the recommendations outlined in a Permafrost Management Plan.

The proposed approach to road construction through peatlands endeavours to keep peat in place while promoting natural water flow. A permeable embankment made of quarried rock or selected granular material will be placed over the peat, supported by heavy geogrid to prevent clogging and allow settlement. To preserve peatland hydrogeology, 900-mm equalization culverts will be installed at appropriate intervals, informed by additional field programs and studies (i.e., peatlands hydrogeological monitoring, water budget study, and a field program to develop a detailed map of peat thickness), to be carried out during subsequent design phases of the Project. For further information on the proposed

construction approach, please refer to *Appendix W* under the *Final Environmental Assessment / Impact Statement Report*.

For specific details on the Preferred Route, please refer to **Section 6**.

### 2.1.2 Bridges and Culverts

Permanent bridges and culverts will be required for the various waterbodies to be crossed by the Community Access Road. Based on initial design and planning, the proposed waterbody crossing structure for the *Environmental Assessment / Impact Statement Report* was initially determined based on bankfull width for each waterbody identified in the crossing list as follows:

- For waterbody crossings with bankfull widths less than 5 m, it was assumed that culverts would be used (requiring in-water work);
- For waterbody crossings with bankfull widths greater than 5 m and less than 30 m, it was assumed that clear span bridges would be used (no in-water work);
- For waterbody crossings greater than 30 m, it was assumed that bridges with piers and abutments would be used (requiring in-water work); and
- For waterbody crossings in flooded / impounded wetlands where wetted widths were greater than bankfull width at the time of the assessment, it was assumed that in-water work would be required.

The type of crossing structure for individual waterbodies may change during detailed design based on site-specific conditions.

The bridges will range in size from clear span to multi-span bridges and will accommodate two lanes of traffic with appropriate shoulder widths. The foundation supports for the bridge abutments are expected to consist of driven steel piles, drilled concrete piles, or concrete spread footings. Bridges will be designed to meet fish passage requirements and navigation requirements, as required, based on federal and provincial regulations. Where feasible, bridges will be installed above the high-water mark; however, abutments and / or reinforcement material may be installed below the high-water mark. Permanent bridges along the Community Access Road will be designed to accommodate increased flooding and rainfall under expected and anticipated climate change conditions.

For certain waterbody crossings, culverts will be constructed using either corrugated steel pipe culverts or box culverts with minimum culvert diameters (or spans) of 900 mm. The culverts will either be closed- or open-bottom depending on fisheries sensitivities and soil conditions. The culverts will be designed to accommodate fish passage, where appropriate. Permanent culverts along the Community Access Road will be designed to withstand expected and anticipated climate change conditions, such as increased rainfall, higher temperatures, frequent freeze-thaw cycles, and heightened flooding risks.

Equalization culverts will also be installed where spring-melt or storm runoff needs to pass from one side of the Community Access Road to the other to prevent flooding and / or erosion and to maintain the existing surface water drainage patterns. These culverts will be installed on low-lying areas that do not provide fish habitat and were not considered in this Report.

Additional design measures and wildlife crossing mitigation options will be incorporated on select bridges and culverts located in high-suitability habitat for Species at Risk and road mortality vulnerable species (i.e., amphibians and reptiles). These measures will be further considered during detailed design and implemented during construction at prioritized locations to facilitate safe wildlife passage above or below the Community Access Road and reduce the risk of barriers to movement across the Project area during operations.

The type of crossing structure for individual waterbodies may change during detailed design based on site-specific conditions.

### 2.1.3 Pits and Quarries

Pits and quarries will be developed to provide crushed rock and granular materials for the construction of the Project and temporary access roads. Most of the rock required for construction is expected to come from quarry sites adjacent to the Project. Temporary access roads will be established to connect the various Project components, as required, and will be limited in length to the extent feasible. The pits and quarries may require dewatering, with an associated discharge to land or nearby watercourses (if water quality is suitable).

All materials will be subject to a geotechnical verification process to confirm they possess the desired physical properties for use in construction. The development and operation of all pits and quarries will be subject to the aggregate permitting process under the *Aggregate Resources Act* (Aggregate Resources of Ontario: Site Plan (2020) Standards and Technical Reports and Information (2023)). Permitted pits and quarries will follow the progressive and final rehabilitation requirements outlined in the approved site plans under the *Aggregate Resources Act*.

Only material that has been cleared through a geochemical verification process will be used for the permanent and temporary roads to avoid acid rock drainage or metal leaching. Monitoring of runoff will be conducted; further details about this specific type of monitoring will be available in the Surface Water Management Plan of which the Owner/Operator will be responsible to follow all applicable Ontario permitting guidelines.

### 2.1.4 Temporary Infrastructure for Construction

The temporary infrastructure for the Project includes temporary access roads, staging areas, camps, and debris and / or timber stockpiles. Temporary access roads will be required to access the right-of-way during construction. The purpose of the temporary access roads is to facilitate emergency, equipment and personnel access, and to provide access to and from pits and quarries, staging areas, camps, and debris and / or timber stockpiles. The temporary access roads will be cleared, but not grubbed, to approximately 10 m wide to accommodate equipment movement. The temporary access roads will be limited in length to the extent feasible. Temporary bridges and culverts will be required to cross the various waterbodies along the temporary access roads. Existing access roads will be used where possible; however, access is limited in the area.

Bridges and culverts will be required to cross the various waterbodies along the access roads. Based on initial design and planning, the proposed waterbody crossing structures for the *Environmental Assessment / Impact Statement Report* were initially determined based on bankfull width for each waterbody identified in the crossing list as follows:

- For waterbody crossings with bankfull widths less than 5 m, it was assumed that culverts would be used (requiring in-water work);
- For waterbody crossings with bankfull widths greater than 5 m and less than 30 m, it was assumed that clear span bridges would be used (no in-water work);
- For waterbody crossings greater than 30 m, it was assumed that bridges with piers and abutments would be used (requiring in-water work); and
- For waterbody crossings in flooded / impounded wetlands where wetted widths were greater than bankfull width at the time of the assessment, it was assumed that in-water work would be required.

Temporary construction camps, staging areas, and stockpile areas are anticipated to be established at various locations along the right-of-way and / or near other Project components. These components are proposed to support crews and to store equipment, vehicles, materials, and supplies.

Temporary access roads leading to temporary quarry areas will also be rehabilitated and surrendered in accordance with the *Aggregate Resources Act*. Temporary quarries not required for maintenance activities will be vegetated in accordance with the Rehabilitation Plan. Access roads to quarries maintained for operations will be blocked to discourage public use.

## 2.2 Project Activities

The Project is planned to occur in two phases: Construction and Operation and Maintenance. The following Project activities will occur in each phase, including:

- Construction Phase Project activities
  - Clearing of the right-of-way for the Community Access Road and access roads (e.g., remove and dispose of trees, shrubs, fallen timber, and surface litter; strip organic materials; grub);
  - Blasting rock (e.g., remove rock at quarries and, as required, at specific locations in association with road and bridge construction);
  - Constructing the Community Access Road (e.g., overburden excavation and removal, excavation of granular material at pits, removal of unsuitable soil, placing and compacting of rock and granular material, trimming and shaping the Community Access Road, stockpiling of mineral soil and leaf litter [organic material], and soil handling and replacement from stockpiles at decommissioning);
  - Constructing bridges and installing culverts (e.g., surface water management and erosion control, dewatering of the watercourses to create ice bridges, alteration of natural drainage systems, and watercourse bank grading to improve approaches if required);
  - Constructing and operating temporary infrastructure (e.g., construction camps, access roads, laydown areas, and staging areas);
  - Decommissioning temporary infrastructure (e.g., removal of temporary culverts and bridges and channel remediation); and
  - Mobilizing equipment, supplies, and personnel (e.g., haulage of materials, soil and liquid waste management, fuel storage, hazardous materials handling, sewage and effluent treatment, and water storage and effluent monitoring for temporary construction camps).
- Operation and Maintenance Phase Project activities
  - Operating the Preferred Route.
  - Maintaining the Preferred Route, including:
    - Excavation at pits, and excavations and / or blasting at quarry sites.
- Dewatering within pits and quarry sites;
- Grading road surfaces (e.g., washout repair and correct grade);
- Conducting erosion control (e.g., apply native seed mix);
- Conducting dust suppression (e.g., apply environmentally friendly dust products);

- Clearing vegetation on road shoulders (e.g., mowing grass and removing brush and small trees);
- Removing snow (e.g., plowing);
- Conducting bridge and culvert maintenance (e.g., conducting seasonal inspections, debris removal);
- Conducting ditch maintenance (e.g., maintaining drainage to design standard by excavating, filling, trimming, and shaping ditches); and
- Conducting road maintenance (e.g., repairing settlement, road surface cracks, and slope failures).

# 3 Information Shared by Indigenous Peoples and Other Interested Persons Which Informed This Report

In the course of completing the description of existing conditions and effects assessment for this Report, information provided by Indigenous Knowledge holders, Indigenous community members, regulators and public stakeholders was used to develop the approach and assessment conducted for this study. This information and how it informed the development of this Report were described in this section. However, this section does not detail all the information, comments, or questions received related to the Project and is limited to the information that informed this Report. For a full description of all consultation and engagement related to the Community Access Road, refer to the *Record of Consultation and Engagement for the Environmental Assessment / Impact Statement Report*. Information related to the Indigenous Knowledge Program can be found in the *Marten Falls First Nation Community Access Road: Aboriginal and / or Treaty Rights and Interests Report* (Dillon, 2024a).

## 3.1 Indigenous Knowledge

Indigenous Knowledge refers to Indigenous systems of knowledge as well as cultural practices related to the production of knowledge based on traditional belief systems, relationships to the environment, and community practices. It is the accumulated and living knowledge built upon the historical experiences of Indigenous Peoples living on the land and adapting to social, economic, environmental, spiritual, and political change (Chiefs of Ontario, n.d.). It includes knowledge about the natural environment (e.g., locations of caribou seasonal use and calving areas), the relationships between environmental changes and species or ecosystems, and how potential effects on the environment can be avoided or reduced.

Indigenous land and resource use refers to specific areas and resources used for traditional purposes when Indigenous Peoples learn and practice their Indigenous Knowledge (Garvin & Northern Forestry Centre (Canada), 2001); this includes the areas and sites used for hunting, trapping, fishing, and gathering and the resources harvested, as well as cultural sites, features, and practices—sometimes referred to as Traditional Land Use.

In 2019, the Marten Falls First Nation Community Access Road Project Team launched a program to collect Indigenous Knowledge. The Indigenous Knowledge Program is a critical component of the information base upon which the assessments will rely. The information generated through the Indigenous Knowledge Program has been woven with scientific approaches, and both knowledge systems will be given equal consideration in forming the foundation for existing conditions, predicting potential Project effects, and determining appropriate mitigation and monitoring methods.

The Indigenous Knowledge Program occurs in two concurrent phases:

1. Collecting existing Indigenous Knowledge and information on Indigenous land and resource use to help inform the early stages of the assessments; and

2. Completing Project-specific Indigenous Knowledge and Land and Resource Use studies.

The protection and confidentiality of Indigenous Knowledge and information on Indigenous land and resource use is of the utmost importance to the Project Team. To honour and respect this important information, Indigenous Knowledge Sharing Agreements were established with interested communities prior to the use of community information. The Sharing Agreement outlines how confidential and sensitive information will be woven into the Project's environmental / impact and design processes.

All Indigenous communities and groups identified by the Ministry of the Environment, Conservation and Parks and the Impact Assessment Agency of Canada through the Indigenous Engagement and Partnership Plan have had the opportunity to participate in the Indigenous Knowledge Program. The Indigenous Knowledge Program provides interested Indigenous communities an opportunity to share existing Indigenous Knowledge and information on Indigenous land and resource use and cultural values that may be relevant to the Project and / or complete Project-specific studies to collect and share Indigenous Knowledge and information on Indigenous land and resource use and cultural values. The Indigenous Knowledge Program included opportunities for Indigenous communities and groups to meet with the Proponent to discuss the program, ask questions, and share concerns and interests.

The Proponent strove to respectfully collaborate with Indigenous communities on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values were considered in reporting, and how potential effects on Aboriginal and Treaty Rights and Interests were assessed. Measures to support this included, but were not limited to:

- Engaging Indigenous communities to solicit information on Indigenous Knowledge and Indigenous land and resource use and cultural values to inform existing conditions;

- Providing Indigenous communities with draft sections of the *Environmental Assessment / Impact Statement Report*; and
- Illustrating how Indigenous Knowledge and information on Indigenous land and resource use and cultural values has been integrated and confirming it has been presented appropriately.

The Proponent aims to complete collaborative working sessions with Indigenous communities for the effects assessment on Aboriginal and Treaty Rights and Interests. Further information on how potential effects on Indigenous Rights were assessed is provided in the *Aboriginal and Treaty Rights and Interests Study Plan* (Dillon, 2021).

Information provided by Indigenous Knowledge holders, recognized as such by their Indigenous community, has been obtained through literature review and shared directly by Indigenous nations in support of this Project through face-to-face meetings or receipt of Indigenous Knowledge reports. The information, some of which is confidential, that has been used to inform this reporting is described in **Table 3-1**.

## Table 3-1: Indigenous Knowledge

| Topic | Indigenous Community | Details | Section Reference |
|---|---|---|---|
| ■ **Culturally Important Species** | ■ Aroland First Nation (Dillon, 2024b; Shared Value Solutions, 2024)<br>■ Fort Albany First Nation (FAFN, 2024)<br>■ Marten Falls First Nation (Dillon, 2024a; Marten Falls First Nation 2021a; Marten Falls First Nation, 2023)<br>■ Nibinamik First Nation (Dillon, 2024c)<br>■ Weenusk First Nation (MNP LPP, 2024) | ■ Aroland First Nation identified a number of fish species as culturally important and / or harvested by community members including Brook Trout (Speckled Trout) (*Salvelinus fontinalis*; Oji-Cree translation, *masamekos*), Lake Trout (*Salvelinus namaycush*, Oji-Cree translation, *namegos*), Lake Sturgeon (*Acipenser fulvescens*; Oji-Cree translation, *nameh*), Northern Pike (*Esox lucius;* Oji-Cree translation, *najwabe*), Sucker sp. (*Catostomidae;* Oji-Cree translation, *namebin*), Walleye (Pickerel; *Sander vitreus;* Oji-Cree translation, *okaas*), Sauger (*Sander canadensis*), Lake Whitefish (*Coregonus clupeaformis;* Oji-Cree translation, *atikameg*), and Rainbow Trout[(a)].<br>■ Fort Albany First Nation identified a number of fish species as culturally important and / or harvested by community members including Brook Trout, Northern Pike, Lake Sturgeon, Sucker sp., Trout sp., Walleye (Pickerel), Lake Whitefish, and Salmon[(a)].<br>■ Marten Falls First Nation identified a number of fish species as culturally important and / or harvested by community members including Lake Sturgeon, Ling (Burbot*;* Oji-Cree translation, *mihzhash*), Northern Pike, Brook Trout (speckled trout), Sucker sp., Walleye, and Lake Whitefish.<br>■ Nibinamik First Nation noted that fish are harvested by the community and is a traditional food source.<br>■ Weenusk First Nation and noted an overall cultural importance of fish to the community. | ■ **Section 5.4.1** |
| ■ **Oji-Cree names for waterbodies** | ■ Marten Falls First Nation (2019) | ■ Oji-Cree and local names were used to first describe waterbodies, followed by the English name, where available. | ■ *Fish and Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment*<br>■ **Attachment B – Fish and Fish Habitat Baseline Report.** |
| ■ **Concerns and impacts related to damming and diversions** | ■ Aroland First Nation (Shared Value Solutions, 2024)<br>■ Fort Albany First Nation (Firelight Research Inc., 2024)<br>■ Marten Falls First Nation (2023)<br>■ Weenusk first Nation (MNP LPP, 2024) | ■ Marten Falls First Nation noted human-induced environmental issues including the damming and diversions of waterways within Marten Falls First Nation traditional territory have impacted animal species that rely on these water resources for life and sustenance.<br>■ Marten Falls First Nation noted that water crossings have been identified as a concern, particularly as they relate to spawning areas for fish and the potential for watercourse crossings negatively impacting Lake Sturgeon and Brook Trout spawning areas. A reference to similar / previous historical impacts was made relating to damming at Lake St. Joseph that produced these circumstances.<br>■ Fort Albany First Nation provided observations related to how surface water and fish habitat have been impacted by damming and water control structures, noting changes to water quality and quantity and concerns relating to how Lake Sturgeon and other bottom-feeding fish that require cool waters may be impacted. The community discussed how the dams at Lake St. Joseph and Big Trout Lake control the water level on the Albany River, resulting in downstream effects in the Fort Albany area. Community members also noted that the water control structures have impacted the natural cycle and timing of river break-ups in the spring due to dam releases causing the ice to break. One community noted the following regarding water levels:<br>○ "*It's really dry now, just when I went to Albany recently … in the summertime. That river used to be full of water. Now it's just rocks and boulders. People drive around their trucks now or four-wheelers [in exposed section of the river] Because of lack of water."*<br>■ Aroland First Nation noted impacts on fish spawning due to damming / diversions along the Ogoki River, which is attributed to the presence of the Waboose Dam, with one community member noting the following:<br>○ "*You know that dam they got in Ogoki? The Ogoki? That big dam they got, Waboose dam, they call it? That caused a lot of problems for them back then. All the sturgeon and all the river beaver, muskrat. Caused a lot of problems for them. Every time they opened that dam, all those spawning fish would get washed away. Same thing with the little beaver and the little muskrat. Washed them away. Caused a lot of problems back then. And still to this day, that's what's the problem now with that dam. When they release it, everything's gone. And they were saying that, my parents were saying that when the little beavers and the little muskrat, when they were getting born or whatever, they would wash away. Because when they let that dam go, everything that's along the river washes away."*<br>■ Weenusk First Nation also noted observations relating to changes in fish quantities as a result of changes to water levels in nearby systems, noting: | ■ **Section 5.2**<br>■ **Attachment B** |

| Topic | Indigenous Community | Details | Section Reference |
|---|---|---|---|
| | | "*The number [of fish] has changed, and I think it's because the river system has changed as well (…) The river system has become shallower every year and it's hard for fish to be (…) in the waters where it's shallow.*" | |
| ■ Observations of fish and fish habitat | ■ Marten Falls First Nation (Dillon, 2024; Marten Falls First Nation, 2023; Marten Falls First Nation, 2021a)<br>■ Fort Albany First Nation (Firelight Research Inc., 2024)<br>■ Kashechewan First Nation (MNP LPP, 2024a). | ■ Marten Falls First Nation noted the presence of a number of observations regarding fish species at different locations throughout their traditional territory, including<br>■ Northern Pike, Walleye, Brook Trout, Lake Sturgeon, and Sucker near Snake Rapids (Oji-Cree translation, *Ginabic Pawitik*);<br>■ Brook Trout, Lake Sturgeon, and Northern Pike south of the confluence of the Wabassi River;<br>■ Brook Trout and Walleye south of Long Neck Island (Oji-Cree translation, *kiniigo yahway minis*); and<br>■ Brook Trout and Walleye at Gourlie Creek (Oji-Cree translation, *Onagwa'ihgan Ziibih*), southwest of Trebell Lake.<br>■ Marten Falls First Nation also noted the following:<br>○ Brook Trout, Lake Sturgeon, Ling (Burbot), Northern Pike, sucker, Walleye, and Lake Whitefish at Teabeau Lake and the Albany River (downstream of Washi Lake [Oji-Cree translation, *Obaashiwizaagaykaniing*]). Lake Whitefish and Northern Pike were also noted at Tolfree Lake to the east;<br>○ Lake Sturgeon within the Ogoki River and Patience Lake (Oji-Cree translation, *Bakihda'hawgan*). There are many fish in this area as the water levels tend to be shallow; and<br>○ Fish habitat (and harvesting activities) within the Albany River, Ogoki River, and Ruby Creek. The presence and harvest of species including Brook Trout, Lake Sturgeon, Northern Pike, Brook Trout, suckers, Walleye, and Lake Whitefish were noted.<br>■ Fort Albany First Nation identified the presence of productive fish habitat at several locations including the rapids along the Albany River near Ogoki, at the mouth of the Henley River, the fork area where the Albany River splits, and at Pledger Lake. The community noted species such as Walleye, Northern Pike, Lake Sturgeon, and Lake Whitefish reside in these areas.<br>■ Kashechewan First Nation noted the importance of the pristine fish habitat provided by the Kistachowan Sipi (Albany River) watershed, which flows through Kashechewan First Nation's traditional lands. The community noted that it provides a variety of fish species for harvesting including Northern Pike, Walleye, Lake Sturgeon, Lake Whitefish, and various trout species through angling, gillnetting, and ice fishing. One community member identified, the presence of whitefish in Albany River around August and September each year. | ■ **Section 5.2**<br>■ **Section 5.4.1**<br>■ **Attachment B** |
| ■ **Observations of fish spawning areas** | ■ Aroland First Nation (Shared Value Solutions, 2024)<br>■ Marten Falls First Nation (Dillon, 2024a; Marten Falls First Nation, 2019; Marten Falls First Nation, 2021a; Marten Falls First Nation, 2023) | ■ Aroland First Nation noted the following regarding fish habitat and spawning areas:<br>○ The presence of a number of fish spawning areas in the upper and lower channels of the Ogoki River, as well as locations within the main channel where species at risk, such as Lake Sturgeon are known to reside;<br>○ Significance of Patience Lake due to Lake Sturgeon spawning area, noting a desire that the area east of Patience – where a crossing is proposed, remains protected;<br>○ The presence of fish spawning areas at Ogoki Lake, Melchett Lake, Tennant Lake, Kapikotongwa Lake, Briarcliffe Lake, Nass Lake, and Durer Lake; and<br>○ The presence of fish spawning areas near water crossings at the Kawashkagama River, Kapikotongwa River, as well as the creek connecting Terrier Lake and Hauenstein Lake, and other unnamed creeks.<br>■ Spawning or harvesting locations for Valued Component fish species were identified in relation to the nearest connected waterbody crossing and incorporated into the baseline report (**Attachment B**) and existing conditions section (**Section 5**) in the characterization of the fish communities. This included information related to the locations of spawning beds (fish species not identified), Lake Sturgeon net set locations, Northern Pike harvest locations, and Brook Trout locations. Additionally, Marten Falls First Nation noted the presence of a number of observations regarding fish spawning at different locations throughout their traditional territory including:<br>○ A general, negative impact of dams on fish habitat and spawning grounds and the impact on Brook Trout populations specifically;<br>○ Lake Sturgeon feeding and spawning areas along the Ogoki River;<br>○ The Old Man River contains spawning habitat for Brook Trout, notably within the vicinity of sand bars;<br>○ Brook Trout are considered to spawn and inhabit the Dusey River. One community member noted fewer fish in comparison to the past in this area after a forest fire approximately 20 years ago; and | ■ Informed **Section 5**<br>■ **Section 5.2**<br>■ **Section 5.4.1.1**<br>■ **Attachment B** |

| Topic | Indigenous Community | Details | Section Reference |
|---|---|---|---|
| | | ○ Kagiami Falls is a fish spawning area and that Brook Trout, Lake Sturgeon, Northern Pike, and Walleye are present in this area. | |
| ■ Decline in fish population | ■ Aroland First Nations (Shared Value Solutions, 2024)<br>■ Weenusk First Nation MNP LPP, 2024b) | ■ Aroland First Nation noted changes to fish health and populations at Kawashkagama Lake were noted by Aroland First Nation, although a specific species was not identified.<br>■ Aroland First Nation have noted observations of population decline of Brook Trout over the last five years, with one participant noting that they are not able to catch the same volume of fish as they used to in the past.<br>■ Another community member from Aroland First Nation noted that they had previously fished Brook Trout in this river all their life and now were not able to catch any, stating the following:<br>○ *"Well, my concern is here [at the Albany River]. This is the concern I have because of the trout population. Because there's something happening with the brook trout on the Albany River. They're not there anymore. There should be three, four, five-pound brook trout in there. This is what we're trying to figure out. What's going on? Because I've seen a decline in* the *population. And some of, like, you know, my nephews, they're starting to see that too because I'm bringing that up to them. Where are these trout? We've been fishing that place all our lives and we know where they are, where they're supposed to be but they're not there."* (Shared Value Solutions, 2024).<br>■ Weenusk First Nation noted observations related to a decline in fish populations noting, with two community members providing the following feedback:<br>○ "*Walleye used to be plentiful. We used to fish every creek and we'd get something. I usually go fishing with a buddy. It's* more *fun, and I don't know how many we get, maybe 50 (…) you have to go early though, right after breakup, but you can (…) still get em' in there with gill nets*."<br>"*The number [of fish] has changed, and I think it's because the river system has changed as well (…) The river system has become shallower every year and it's hard for fish to be (…) in the waters where it's shallow*." | ■ **Section 5.4.1.2**<br>■ Informed **Section 5.5**<br>■ **Section 5.5.3** |
| ■ Concerns related to:<br>▪ Contamination / Pollution<br>▪ Dust / vibrations<br>▪ Impacts on fish spawning areas<br>▪ Impacts on Lake Sturgeon<br>▪ Increased access to region<br>▪ Linear disturbances and barriers to waterflow<br>▪ Logging<br>▪ Long-term effects<br>▪ Traffic-related impacts<br>■ Mitigation Measures | ■ Aroland First Nation (Dillon, 2024b; Shared Value Solutions, 2024)<br>■ Fort Albany First Nation (Firelight Research Inc., 2024)<br>■ Marten Falls First Nation (2023) | ■ Aroland First Nation and Marten Falls First Nation both noted concerns related to the contamination of fish, particularly Lake Sturgeon (Oji-Cree translation, *nameh*).<br>■ Aroland First Nation noted generalized concerns relating to how increased traffic will result in overall impacts on the natural and atmospheric environment.<br>■ Aroland First Nation noted overall generalized concerns about the impact of dust and vibrations at watercourse crossings where fishing activities take place, as many overnight camp / cabin sites are located in close proximity to the Painter and Anaconda Lake Road waterbody crossings. The community also noted overall concerns related to how waterbody crossings may impact fish spawning areas. Some specific areas of concern that were highlighted included areas of crossings over the Ogoki River, Dusey River, and Albany River.<br>■ Aroland First Nation noted concerns related to how increased access to the region may make it easier for people to access harvesting areas, putting additional pressure on wildlife populations, with one community member noting, *"The first thing I thought about was the wilderness, the animals would be* disturbed. *If the road goes through there, they're travelling routes would be disrupted. And also, their feeding might be disrupted. As for the fish, I think if they build bridges and all that, it's easier access for humans to go harvest. To me, that would be very destructive for the wildlife and fishery."*.<br>■ Aroland First Nation highlighted the presence of Lake Sturgeon habitat within the Ogoki River and Ogoki Lake. The community also noted concerns associated with how the species might be impacted by new watercourse crossings, as well as increased public access resulting in additional pressures due to more people fishing in the area, noting that the species is sensitive to habitat disturbances.<br>■ One community member from Aroland First Nation noted the following regarding Lake Sturgeon:<br>○ *"Interviewee: Quite a number of years we've been going up and down there. As far as I remember, that was the route* my dad used to make. All our lives we've been going up and down that [Ogoki] river. So that was their livelihood back then, sturgeon. They would go there and hunt sturgeon and they would sell them right there on the spot.<br>○ Interviewer: To who?<br>○ Interviewee: To planes that come in and they'd buy the sturgeon right there. They would have live sturgeon tied up. And as soon as the plane lands, that's when they'd clean the sturgeon. Because you can't keep sturgeon that long. Like *it spoils real fast, that sturgeon. So, you've got to clean it whenever you have ice. And it's pretty hard to get ice up there. Yes, and they used to have ice houses. They used to have ice houses where they'd keep their* | ■ Informed **Section 7.3.1**<br>■ **Section 7.3.1.5.1**<br>■ **Section 7.3.1.6.1**<br>■ **Section 7.3.1.8.1**<br>■ **Section 7.3.1.9.1**<br>■ **Section 7.3.1.10.1**<br>■ **Section 7.3.1.11.1**<br>■ **Section 7.3.1.12**<br>■ **Table 7-5**<br>■ Informed **Section 7**<br>■ Informed **Section 8** |

| Topic | Indigenous Community | Details | Section Reference |
|---|---|---|---|
| | | *fish, meat, whatever. Mostly the tourists would keep their fish there. Like before they'd come home, they'd pick it up and take it. And that's the only refrigeration they had was those ice houses."*<br>■ Another community member from Aroland First Nation noted the following regarding the importance of Ogoki Lake and the associated river system in supporting fish populations – highlighting its importance for Lake Sturgeon.<br>○ *"They shouldn't bother [Ogoki Lake] and the river system then. To me, anyways. There's a lot of nature there, and* fishing *and spawning. Especially sturgeon: that's their spawning route to Amy Falls and up."*<br>■ Aroland First Nation provided the following suggestions relating to Project mitigation measures which may apply to fish and fish habitat:<br>○ Follow provincial guidelines regarding barriers and containment systems at all bridge construction sites to prevent materials from entering the water.<br>○ Follow Fisheries and Oceans Canada's and Ontario's Species at Risk Stewardship Program guidelines regarding activity timing windows, sediment and erosion control, and stormwater management at all water crossings and where bridges are being constructed or upgraded. This is particularly important where spawning beds and Lake Sturgeon are known to reside (e.g., the Ogoki River crossings).<br>■ Marten Falls First Nation noted concerns related to fish habitat and spawning areas including increased pollution in the waterways, an influx of overfishing, and the impacts of logging.<br>■ Marten Falls First Nation also noted suggestions for mitigation measures to offset these concerns including erecting physical barriers, building the road farther away from habitat and spawning sites, adequate signage for no fishing areas, increasing Ministry of Natural Resources presence, dust suppression, prohibiting logging near spawning areas, and additional monitoring of waterways and fish habitat.<br>■ Fort Albany First Nation noted generalized concerns including:<br>○ How the Project may result in impacts on fish habitat, fish contamination, and the community's trust in the safety of consuming fish and practicing subsistence fishing activities.<br>○ How linear disturbances / building road crossings may impact fish habitat due to the introduction of barriers to natural watershed flow impeding fish movement.<br>○ The prediction of potential long-term / slowly evolving effects on aquatic habitats.<br>○ How the Project might result in impacts on water flow, in particular, relating to how the Project could act as an additional barrier to natural water flow. Fort Albany First Nation also highlights specific concerns related to how the Attawapiskat River, Albany River, Moose River, and Winisk River might be impacted as a result.<br>■ Weenusk First Nation noted concerns specific to:<br>○ Mercury levels in certain harvested fish within their traditional territory.<br>○ Changes to fish quantity as a result of Project-related impacts on spawning / reproductive sites, habitat quality and availability, and changes to water quality.<br>○ Contamination and spills impacting water quality, and as a result, fish habitat and spawning / reproductive areas.<br>○ The potential for upriver impacts to cause downstream effects, including on fish movement and migration.<br>○ The potential for impacts related to air quality as a result of fugitive dust from movement and operations of construction equipment and vehicles.<br>○ Impacts on harvestable species within the community's traditional territory as a result of increased access. | |

Notes:
Sp. = species.
(a) Rainbow Trout and Salmon sp. have not been historically documented in the literature or sampling for the Project.

## 3.2 Indigenous Engagement

The content presented in **Section 3.2** reflects information that was available at the time the *Draft Environmental Assessment / Impact Statement Report* was prepared. No updates have been made to this section for the *Final Environmental Assessment / Impact Statement Report*. For the most up-to-date and comprehensive documentation of engagement, please refer to *Appendix X - Record of Consultation and Engagement* under the *Final Environmental Assessment / Impact Statement Report*, which serves as the source for all comments received during later phases of the Project.

In addition to the Indigenous Knowledge provided by Indigenous Knowledge holders, information was collected from all Indigenous community members with interests in this Project. The information that has been used to inform this Report is described in **Table 3-2**.

**Table 3-2: Indigenous Engagement**

| Topic | Indigenous Community | Details | Section Reference |
|---|---|---|---|
| ■ Observations of fish and fish habitat | Marten Falls First Nation (2021a) | The Wabassi River (Oji-Cree translation, *Wabihzii Wih Ziibih*) was identified as habitat for Jackfish (Northern Pike), Trout, and Walleye. | **Section 5.2.2** |
| ■ Input and insights on field programs and sampling locations | Marten Falls First Nation (2021b) | On August 24, 2021, the Project team met with Marten Falls First Nation Community Member Advisors via teleconference to discuss upcoming field studies. The Project team provided comments and insights on the Surface Water, Fish and Fish Habitat, Vegetation, Physiography, and Peatlands (Oji-Cree translation, *maashkiigwabo*) field programs. Comments were shared regarding species of fish located in the areas of sampling locations. | This comment helped guide the planning of fish and fish habitat field programs (**Section 4.5**). |
| ■ Consideration of fish species habitat / spawning locations | Marten Falls First Nation (2021b) | Fish species spawning or locations for Valued Component fish species were identified at waterbody crossings and incorporated into the baseline report (**Attachment B**) and existing conditions section (**Section 5**) to characterize the fish communities at the waterbody crossing. | **Section 5, Attachment B** |
| ■ Cultural significance<br>■ Concerns related to:<br>○ Fish migration | Kasabonika Lake First Nation | A former Chief of the community highlighted the importance of country foods (including fish and caribou), and noted concerns related to potential impacts on fish migration at river crossings. Fish communities at waterbody crossings are characterized within the existing conditions section (**Section 5**). | **Section 5** |

## 3.3 Regulator and Public Stakeholder Input

In March 2025, the *Draft Environmental Assessment / Impact Statement Report* was submitted to Regulators, government experts and Indigenous communities for review as part of the Environmental Assessment / Impact Assessment process. All comments received during the review period were carefully evaluated by the Marten Falls First Nation Community Access Road Project Team, and the Report was updated where appropriate.

The content presented in **Section 3.3** reflects information that was available at the time the *Draft Environmental Assessment / Impact Statement Report* was prepared. No updates have been made to this section for the submission of the *Final Environmental Assessment / Impact Statement Report*. For the most up-to-date and comprehensive documentation of regulator and public stakeholder input, please refer to *Appendix X - Record of Consultation and Engagement* under the *Final Environmental Assessment / Impact Statement Report*, which serves as the source for all comments received during later phases of the Project.

The Proponent engaged with Regulators and Public Stakeholders with technical knowledge related to the Valued Components to inform aspects of this Report. The information and how it informed the development of this Report are described in **Table 3-3.**

## Table 3-3: Public, Agency, and Other Input

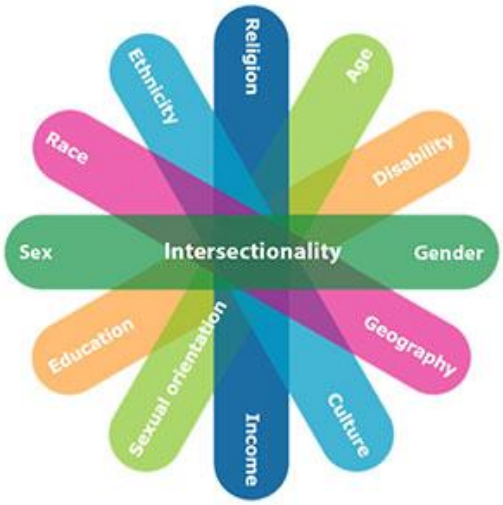
| Topic | Provided By | Details | Section Reference |
|---|---|---|---|
| ■ Edits to study plans | ■ Ministry of the Environment, Conservation and Parks (2022)<br>■ Ministry of Northern Development, Mines, Natural Resources and Forestry (2021) | ■ A number of regulators requested that any edits or deviations to the Fish and Fish Habitat Workplan methodology be presented in the Environmental Assessment. This has been captured as part of the assessment on fish and fish habitat. | **Section 4.1** |
| ■ Observations related to Lake Sturgeon spawning areas<br>■ Sensitive fish habitat<br>■ Cultural significance<br>■ Observations of fish and fish habitat | ■ Marten Falls First Nation (2022, 2023) | ■ A community member asked where the Albany River bridge is in relation to Lake Sturgeon spawning areas and noted concern for the species.<br>■ A community member noted that protecting fish populations and avoiding sensitive fish areas is very important and that in the future larger crossings should be shown better on the maps.<br>■ Community members noted the importance of Lake Sturgeon for members of Fort Hope First Nation and provided details on Lake Sturgeon for areas including the Old Man River, Albany River, and Patience Lake. Detail on the presence of Brook Trout at Gourie Creek and Old Man River was also provided. | Existing environmental conditions for Lake Sturgeon are presented in **Section 5.5.1**<br>This comment will be considered and addressed as part of the effects assessment (**Section 7**). |
| ■ Observations related to fish spawning locations | ■ Public Feedback / Inquiry | ■ Received an inquiry on June 24, 2021, regarding what will be done about issues of crossing the Dusey River in Brook Trout spawning habitat near Dusey Lake (Oji-Cree translation, *Atikameko Zakaihkan*). | This comment will be considered and addressed as part of the effects assessment (**Section 7**). |
| ■ Consideration of Study Area | ■ Public Feedback / Inquiry | ■ The Project will be located in relatively intact watershed and contain relatively unperturbed fish populations. Fish are an important cultural and economic resource for the affected First Nations. As such, the secondary watershed is the largest relevant scale for considering Project effects on fish. | This comment will be considered and addressed as part of the effects assessment (**Sections 4.3.2.3 and 7**). |

## 3.4 Gender-Based Analysis Plus

The *Impact Assessment Act* of Canada (Government of Canada, 2019) requires Gender-Based Analysis Plus to be applied to Impact Assessments in Canada. Gender-Based Analysis Plus is not a specific set of methods for Impact Assessments, but rather an approach that is adapted to the Project and the communities potentially affected and / or being engaged.

Gender-Based Analysis Plus is an approach to assess the inequalities and effect of policies, programs, and projects on diverse groups and identities. These identities could include (but are not limited to) gender, sexual orientation, age, race, ethnicity, class, religion, and mental or physical disability (Women and Gender Equality Canada, 2022). These identities can also intersect or overlap; for example, where an individual identifies as being both Indigenous and an Elder or youth. A schematic depiction of Gender-Based Analysis Plus intersecting identity factors are provided in **Figure 3-1**.

**Figure 3-1: Gender-Based Analysis Plus Intersecting Identity Factors**




Source: (Canadian Institutes of Health Research, 2022)

The Gender-Based Analysis Plus approach involves understanding how certain vulnerable groups such as Indigenous Peoples; women; Elders; youth; and two-spirit, lesbian, gay, bisexual, transgender, queer, questioning, intersex, and asexual persons experience and could be disproportionately affected by a project. Understanding how these groups could be affected by projects allow for more targeted, sensitive, and appropriate enhancement measures, mitigations, monitoring, and follow-up (Impact Assessment Agency of Canada, 2021).

# 4 Study Methods and Assessment Scope

This section provides a summary of the study methods and assessment scope for the existing conditions and effects assessment for fish and fish habitat.

## 4.1 Study and Work Plan Purpose, Objectives, and Deviations

As required by the *Impact Assessment Act* (Government of Canada, 2019) and referenced in the *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020a), study plans and work plans were developed for disciplines as required. The purpose of the study plan was to explain:

- The existing conditions study methodology that will result in a comprehensive description of the existing environment potentially affected by the Project;
- The process for ensuring efficient and transparent data management and analysis was completed;
- Development of the discipline-specific effects assessment methodology; and
- Work plans contain details on how to action the study plan and include information such as the location of sampling sites, scheduling, and sequencing.

The *Draft All Season Community Access Road: Fish and Fish Habitat Study Plan* (Fish and Fish Habitat Study Plan; AECOM, 2021) and *All Season Community Access Road: Fish and Fish Habitat Field Logistics Workplan* (Fish and Fish Habitat Workplan; Golder, 2021), including comments from regulators, can be found in **Attachment A – Draft Study Plan, Workplan and Regulator Comments**.

In some instances, through the execution of this study, the approach deviated from what was described in the original Draft Study Plan; these deviations are outlined in **Table 4-1**. Deviations were required as the Project evolved due to challenges encountered in the field, alternative methodologies being developed, comments from regulators, and updated guidance becoming available. General changes, such as changes to section headings, the organization of sections and subsections and the phrasing and tense have been made throughout and have not been documented in **Table 4-1**.

## Table 4-1: Deviations from Draft Study Plan

| Section Reference | Description of Change | Rationale |
|---|---|---|
| **4.2.2 Valued Components and Indicators** | The Draft Study Plan previously did not include a "Measure of Change" column in the Valued Components and Indicators Table (now **Table 4-2**). | The measure of change column provides a more detailed expression of the indicator. |
| **4.2.3 Spatial Boundaries** | The Draft Study Plan previously used the term "Local Study Area" to define the 5 km corridor studied in the Existing Conditions section and within which the footprint of the Project would be further refined. This area has been retitled as the "Project Study Area." | This change eliminates confusion between the Project Study Area and the discipline-specific Local Study Area. |
| **4.7 Data Management and Analysis** | In **Section 3.4.1** of the Draft Study Plan, it was previously identified that data would be backed up on a "daily basis." This wording has been revised to state that data would be backed up on a "regular basis." | This change brings alignment with the Proponent's various data backup policies. |
| **4.7 Data Management and Analysis** | In **Section 3.4.2** of the Draft Study Plan, wording was updated to note that datasets from all survey sites will be provided upon report finalization. No timeline had been previously identified. | The revision provides added clarity around when the data would be provided. |
| **4.2.2 Valued Components and Indicators** | Valued Components and Indicators are introduced in **Section 4.2.2.** | The revision provides added clarity in this report. |
| **4.2.3 Spatial Boundaries** | The aquatics study areas (Construction Disturbance Area, Local Study Area, and Regional Study Area) have been revised and their descriptions updated. | This change provides separate study areas for the alternative routes and Preferred Route. |
| **4.4.2.5.1.2 Magnitude** | For magnitude, environmental discipline-specific definitions were developed as part of the Study Plan; however, the rationale for "negligible" and "low" magnitude was changed. | During Construction, there is potential for the death of fish during normal activities (e.g., during a fish salvage) or harvest; however, this will not result in a change in the population dynamics and therefore a low rating is suitable. |

| Section Reference | Description of Change | Rationale |
|---|---|---|
| **5 Existing Conditions** | ■ The methods on how the Existing Environmental Conditions were characterized have been updated to include details on waterbody crossing list development, revisions to route alignment, and all field investigations (2019 to 2022).<br>■ Field investigations at waterbody crossings were revised based on consultation with the Impact Assessment Agency of Canada, Fisheries and Oceans Canada, and the Ministry of Natural Resources. It was determined that site-specific fish and fish habitat data from a subset of waterbody crossings would provide sufficient baseline information for which to characterize the fish and fish habitat existing environment.<br>■ The field investigations were described as rapid or detailed assessments.<br>■ Fish and benthic invertebrate sampling are no longer grouped under a Biological Sampling header.<br>■ Proposed fish community sampling methods table was updated to only include sampling methods used: backpack electrofishing and minnow trapping.<br>■ Desktop information was not compiled in a data layer per route. | This change provides clarity on the work completed and incorporates regulator feedback. |
| **7.3.1 Potential Effects, Mitigation and Enhancement Measures, and Predicted Residual Effects** | ■ Updated the indirect effect and discipline interaction definition. | This change provides clarity on the direct and indirect effects and discipline interactions in consideration of the indirect effects in residual effects assessment. |
| **7.3.2 Characterization of Predicted Residual Effects** | For magnitude, environmental discipline-specific definitions were developed as part of the Draft Study Plan (**Table 4-13**); however, one rationale for “low” magnitude was changed. During Construction, there is potential for the death of fish during normal activities; however, this will not result in a change in the population dynamics and therefore a low rating is suitable. | N/A |

Notes: N/A = not applicable; km = kilometre.

# 4.2 Study Scoping

## 4.2.1 Temporal Boundaries

Project phases, which are temporal boundaries, were developed to establish the timeframes within which potential effects of the Project were considered. As indicated in **Section 2.1.4**, the Project is planned to occur in two phases:

- **Construction Phase**—The time from start of construction, including site preparation activities, to the start of operation and maintenance of the Community Access Road. Decommissioning of construction works is included in the Construction Phase. The Construction Phase is anticipated to take approximately three to ten years to complete; and
- **Operation and Maintenance Phase**—The Operation and Maintenance Phase starts once construction activities are complete and lasts for the life of the Project. The Operation and Maintenance Phase of the Project is considered to be permanent based on the expected timeline for when major refurbishment of road components (e.g., bridges) is anticipated.

There are currently no plans to decommission the Community Access Road as there is no expected / known end date for its need. Therefore, future suspension, decommissioning, and eventual abandonment was not considered in this Report. It will be considered if and when a decommissioning or abandonment application is made for the Community Access Road.

In determining the temporal boundaries, in particular, the long duration of the Operation and Maintenance Phase, consideration was given to the long-term effects on the well-being of present and future generations.

## 4.2.2 Valued Components and Indicators

The Impact Assessment Agency of Canada describes **Valued Components** as the environmental, health, social, economic, or additional elements or conditions of the natural and human environment that may be affected by a proposed project and area of concern or value to the public, Indigenous Peoples, federal authorities, and interested parties (Impact Assessment Agency of Canada, 2020). The selection of fish and fish habitat Valued Components was based on the roles and linkages of each species in the ecosystem and food web, the traditional and cultural importance of these species to local communities, importance to aquatic biodiversity, and the species' presence within nearby waterbodies.

The Valued Components for the fish and fish habitat discipline (**Table 4-2**) were determined through consideration of the following factors:

- Valued Component presence in the study area;
- The extent to which the Valued Component is linked to the interests or exercise of Aboriginal and Treaty Rights of Indigenous Peoples and whether an Indigenous Group has requested the Valued Component;
- The extent to which the effects (real or perceived) of the Project and related activities have the potential to interact with the Valued Component;
- The extent to which the Valued Component may be under cumulative stress from other past, existing, or future undertakings in combination with other human activities and natural processes;
- The extent to which the Valued Component is linked to federal, provincial, territorial, or municipal government priorities (e.g., legislation, programs, policies);
- The possibility that adverse or positive effects on the Valued Component would be of particular concern to Indigenous Groups, the public, or federal, provincial, territorial, municipal, or Indigenous governments; and
- Whether the potential effects of the Project on the Valued Component can be measured and / or monitored or would be better ascertained through the analysis of a proxy Valued Component (e.g., another species with a similar role in the food web).

**Indicators** represent the resource, feature, or attribute related to the Valued Component that, if changed, may demonstrate an effect on the environment. The indicators and rationale for selection and measurement of potential effects, which were also used to assess and evaluate the alternative routes, are provided in **Table 4-2**. Indicators may be characterized quantitatively or qualitatively. For example, effects from changes in the survival and reproduction of fish and fish habitat Valued Components are often expressed through qualitative assessment of alterations in habitat availability. For the *Environmental Assessment / Impact Statement Report*, the indicators for fish and fish habitat were as follows:

- **Habitat quality and quantity**—Habitat quality is the type and condition of habitat available (i.e., quality of spawning, rearing, or overwintering habitat) for various life history stages of fish. Habitat quality also considers food availability and water quality conditions. Habitat availability for Valued Component fish species was assessed using field-collected data supplemented by historical information on their general distribution with considerations made to their specific habitat requirements. Habitat quality was assessed qualitatively by determining changes that may occur to habitat types and conditions because of Project activities. Habitat quantity is the amount of habitat available for various life history stages of fish;

- **Distribution and connectivity**—Distribution considers the geographic range of fish presence in waterbodies and connectivity is the spatial configuration and linkage of habitats and movement of fish. Distribution and connectivity was determined using a qualitative assessment of changes that may occur to habitat availability, including habitat fragmentation, that would affect fish movement and habitat use; and
- **Survival and reproduction**—Survival and reproduction considers the ability of fish to survive and produce viable offspring. A qualitative assessment of changes to fish survival and reproduction is based on direct (i.e., mortality of individuals resulting from physical activities or Project infrastructure) or indirect (i.e., changes to habitat availability [quantity and quality] and distribution [connectivity] changes to the population such that survival and reproduction are affected). This qualitative assessment considered changes to habitat quality, habitat quantity, and distribution and connectivity that may have the potential to result in a measurable change in survival and reproduction, including those that have the potential to affect aquatic biodiversity. Changes to survival and reproduction were assessed qualitatively. The assessment considered whether changes to habitat availability or distribution occurred related to the Project such that survival or reproduction of a fish population(s) could be affected in a measurable way, and with consideration of where changes to fish populations could affect biodiversity.

The indicators for the fish and fish habitat Valued Components were initially outlined in the *Terms of Reference* (AECOM Canada Ltd., 2020) and then refined in the *Draft Fish and Fish Habitat Study Plan* (AECOM Canada Ltd., 2021). A summary of the Valued Component and indicators selected for the assessment of Project effects on fish, and the rationale for their selection are provided in **Table 4-2.**

## Table 4-2: Valued Components and Indicators

| Valued Component | Indicators | Rationale for Selection | Measures of Change |
|---|---|---|---|
| **Nameh**[(a)]<br>**Lake Sturgeon (*Acipenser fulvescens*)** | ■ Habitat quantity and quality<br>■ Distribution and connectivity<br>■ Survival and reproduction | ■ Species of conservation concern (designated as Special Concern under *Species at Risk Act* [Government of Canada, 2023] and *Endangered Species Act* [Government of Ontario, 2007])<br>■ Cultural importance and sustenance<br>■ Importance for the maintenance of biodiversity | ■ Changes to habitat suitability (e.g., temperature, substrate, depth, flows)<br>■ Changes in habitat use or access to important habitats (e.g., spawning, refugia, nursery areas) |
| **Okaas**[(a)]<br>**Pickerel**[(b)]<br>**Walleye (*Sander vitreus*)** | ■ Habitat quantity and quality<br>■ Distribution and connectivity<br>■ Survival and reproduction | ■ Cultural importance and local recreational / economic value and sustenance / biodiversity | |
| **Masamekos**[(a)]<br>**Speckled Trout**[(b)] **/ Brook Trout (*Salvelinus fontinalis*)** | | | |
| **Najwabe**[(a)]<br>**Northern Pike (*Esox lucius*)** | | | |
| **Atikameg**[(a)]<br>**Lake Whitefish (*Coregonus clupeaformis*)** | | | |
| **Mihzhash**[(a)]<br>**Ling**[(b)]<br>**Burbot (*Lota lota*)** | | | |

Notes:
(a) Oji-Cree name.
(b) Local English language name.

### 4.2.3 Spatial Boundaries

This section includes a summary of the general Project study areas that were defined for the Project and also describes the discipline-specific study areas that were designed to capture the geographic extents to allow for the characterization of existing conditions of fish and fish habitat Valued Components and their habitat for both alternatives and for the assessment of direct and indirect effects from the Preferred Route on fish and fish habitat Valued Components.

#### 4.2.3.1 Project Study Areas

General Project study areas were initially established for the scoping of field programs and to delineate study areas for discipline-specific surveys. These general Project study areas are described in **Table 4-3**.

**Table 4-3: Project Study Areas Definition and Description**

| Study Area | Definition | Description |
|---|---|---|
| **Construction Disturbance Area** | Area of expected direct disturbance | 100 m wide Community Access Road right-of-way, temporary work areas, worker camps, pits, quarries, and temporary and permanent access roads |
| **Project Study Area** | Area where most of the direct effects of the Project are likely to occur | Area within 2.5 km (total of 5 km) of the centreline of the route alternatives |

Notes: m = metre; km = kilometre.

#### 4.2.3.2 Aquatic Study Areas

Discipline-specific study areas identify the geographic extents within which potential effects of the Project are likely to occur and were considered in the *Environmental Assessment / Impact Statement Report*. Discipline-specific Local and Regional Study Areas were subsequently defined for the Project. In defining these areas, the following were considered:

- Location and other characteristics of the discipline relative to the Project;
- The anticipated extent of the potential Project effects;
- Federal, provincial, regional, and local government administrative boundaries;
- Input from Indigenous Groups;
- Community knowledge and Indigenous Knowledge;
- Current or Indigenous land and resource use by Indigenous communities;

- Exercise of Aboriginal and Treaty Rights of Indigenous Peoples, including cultural and spiritual practices; and
- Physical, ecological, technical, social, health, economic, and cultural considerations.

The spatial boundaries for fish and fish habitat overlap with the corresponding Local Study Area and Regional Study Area boundaries for surface water (WSP, 2026a). As such, the fish and fish habitat and surface water study areas have been combined and described as the “aquatics” study areas.

As described in the *Environmental Assessment / Impact Statement Report* and in **Section 6** of this Report, the characterization of existing conditions for the Project was completed on two alternative routes (Alternative 1 and 4). The data collected through the characterization of existing conditions were used to inform the selection of the Preferred Route. The existing conditions Local and Regional Study Areas considered the two alternative routes (Alternative 1 and 4). As the residual and cumulative effects assessment was completed on just the selected Preferred Route, the Local and Regional Study Areas for the effects assessment differed from the existing conditions study areas and only considered the one route.

#### 4.2.3.2.1 Existing Conditions Study Areas

The existing conditions spatial boundaries for aquatics are defined by a Local Study Area and a Regional Study Area. These spatial boundaries were applied to each alternative, considering the Project components within the Construction Disturbance Area. The existing conditions study areas cover the extent to which readily available information suggests the Project may have noticeable effects on the environment.

The Construction Disturbance Area includes the Project footprint, which encompasses a 100 m wide right-of-way for each Route Alternative (i.e., Alternative 1 and Alternative 4). The right-of-way is only expected to be cleared to a width of 60 m for permanent use with the remaining 40 m to be temporarily cleared to accommodate activities such as the excavation of quarries, construction of temporary laydown areas, and the implementation of debris and / or timber stockpiles. Alternative 1 includes approximately 226 km of new all-weather road, while Alternative 4 comprises approximately 194 km in length of new all-weather road. The Construction Disturbance Area was designed to capture the potential direct effects of the Project at the immediate local scale (i.e., the area of direct disturbance where fish and fish habitat are most likely to be directly affected by Project infrastructure and activities).

### Local Study Area

The aquatics existing conditions Local Study Area includes the Construction Disturbance Area and extends 2.5 km from the centreline of the right-of-way for the Route Alternatives (total 5 km width). Where Project components (e.g., pits and quarries) fall outside the 2.5 km extension from centreline, a 500 m buffer was applied (**Figure 4-1**). The aquatics existing conditions Local Study Area was designed to capture the local effects of the Project on surface water and fish and fish habitat environments that may extend beyond the Construction Disturbance Area with the understanding that the spatial extent of this Local Study Area is intended to account for the local area where effects of the Project are likely to be measurable. The Local Study Area was selected in consideration of the guidance in the federal *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020).

### Regional Study Area

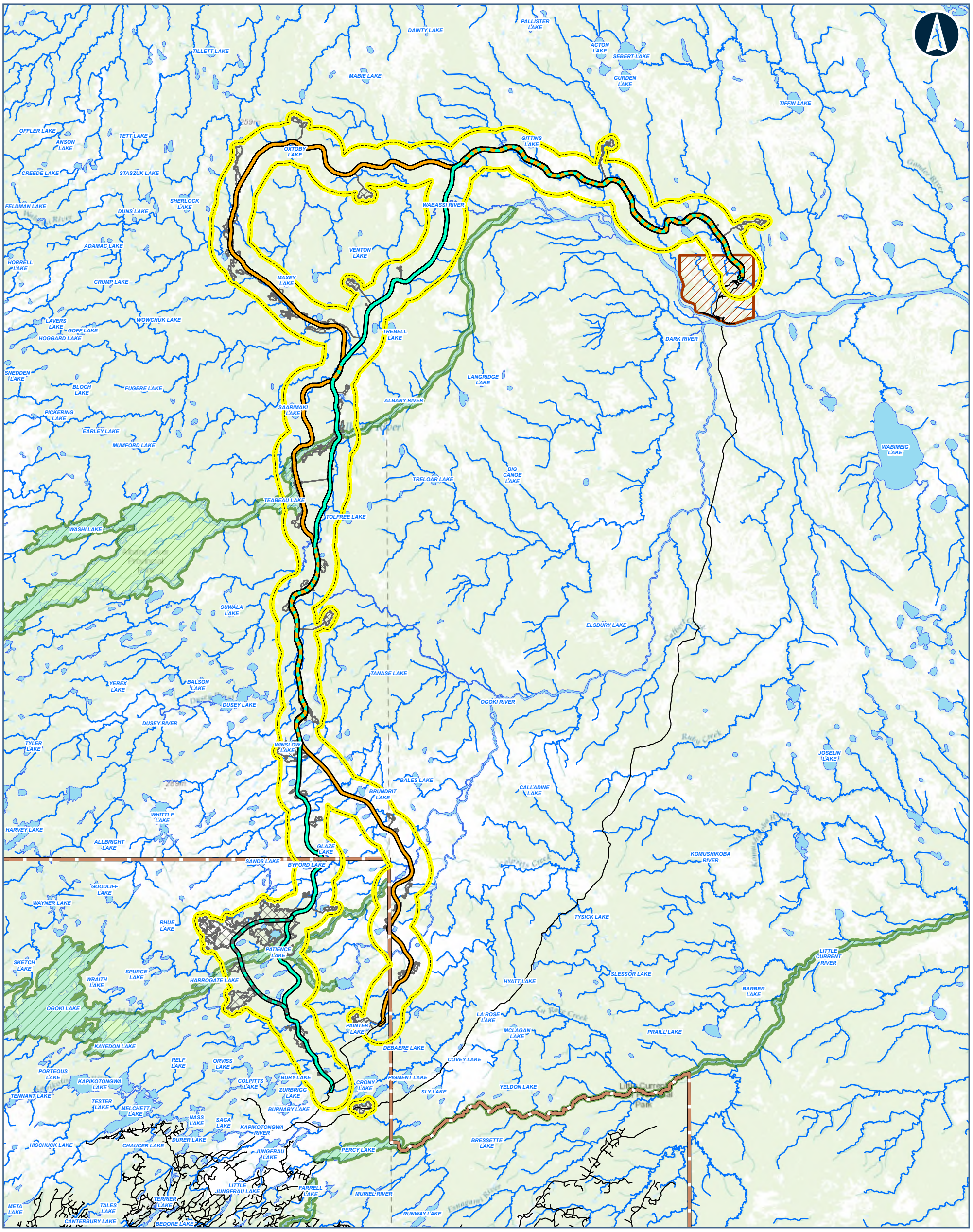
The aquatics existing conditions Regional Study Area includes the catchment areas (as defined on a tertiary watershed scale) of each waterbody that is crossed by the Project footprint. These include the tertiary watersheds of the Upper Albany – Makokibatan, Lower Ogoki, and Upper Albany – Muswabik. The Regional Study Area was designed to provide a large enough area to assess the cumulative and regional effects on surface water and fish and fish habitat environments. The Regional Study Area was selected in consideration of the guidance in the federal *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020).

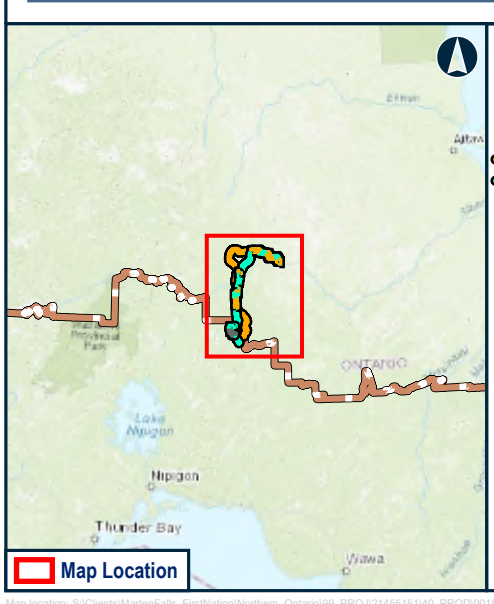
The existing conditions Construction Disturbance Area and the aquatics existing conditions Local Study Area and Regional Study Area are further described in **Table 4-4** and illustrated in **Figure 4-1** and **Figure 4-2**.

## Table 4-4: Aquatics Existing Conditions Study Areas

| Study Area | Area Size (ha) | Geographic Extent | Rationale |
|---|---|---|---|
| **Construction Disturbance Area** | 12,665 | ■ Area encompassing the Project footprint including the 100 m wide Community Access Road right-of-way, temporary construction access roads, work areas, worker camps, long-term pits and quarries, and temporary access roads. | ■ Area of direct disturbance that includes the area where fish and fish habitat is most likely to be directly affected by Project infrastructure and activities.<br>■ A buffer is applied to the Project footprint to allow for uncertainty in the Project footprint including road alignment shifts to avoid sensitive features. |
| **Local Study Area** | 170,545 | ■ Includes the Project footprint and extends approximately 2.5 km from the centreline of Alternative 1 and Alternative 4 (total 5 km width). A 500 m buffer has been applied to areas where the Construction Disturbance Area falls outside of the 2.5 km from the centreline of Alternative 1 and Alternative 4. | ■ The area outside of the Construction Disturbance Area with no direct interaction with Project infrastructure, but that has the potential to be subjected to direct (e.g., temporary culverts) or indirect effects (e.g., sedimentation and spills). |
| **Regional Study Area** | 2,568,527 | ■ Includes the three tertiary watersheds (4GD Upper Albany – Makokibatan, 4GE Lower Ogoki, and 4GF Upper Albany – Muswabik) that are intersected by the centreline of Alternative 1 and Alternative 4. The Regional Study Area was extended to include areas where the Local Study Area falls outside of these tertiary watersheds.<br>■ Tertiary watersheds are based on the federal “Drainage Area” reporting framework and represent third level subdivisions of Canada into suitably sized areas based on drainage for administrative purposes (Ministry of Natural Resources and Forestry, 2015b). | ■ The area where direct effects outside of the Construction Disturbance Area and Local Study Area are not likely; however, there is potential for broader-scale indirect effects and where cumulative effects may occur. |

Notes: ha = hectare; m = metre; km = kilometre




**Legend**

- ROAD
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**

- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION

- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATICS LOCAL STUDY AREA (2.5 KM)

**Notes:**
None

**Data Source:**
Base Data: Provided by MNRF 2019; Route Infrastructure - Provided by AECOM 2019. Contains Information licensed under the Open Government Licence Ontario.
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Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, AAFC, NRCan
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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## EXISTING CONDITIONS AQUATIC LOCAL STUDY AREA

0 2.75 5.5 11 16.5 22
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Feb, 2026 | 1:480,000 * when printed 11"x17" |
| Rev:0 | |

**Figure 4-1**

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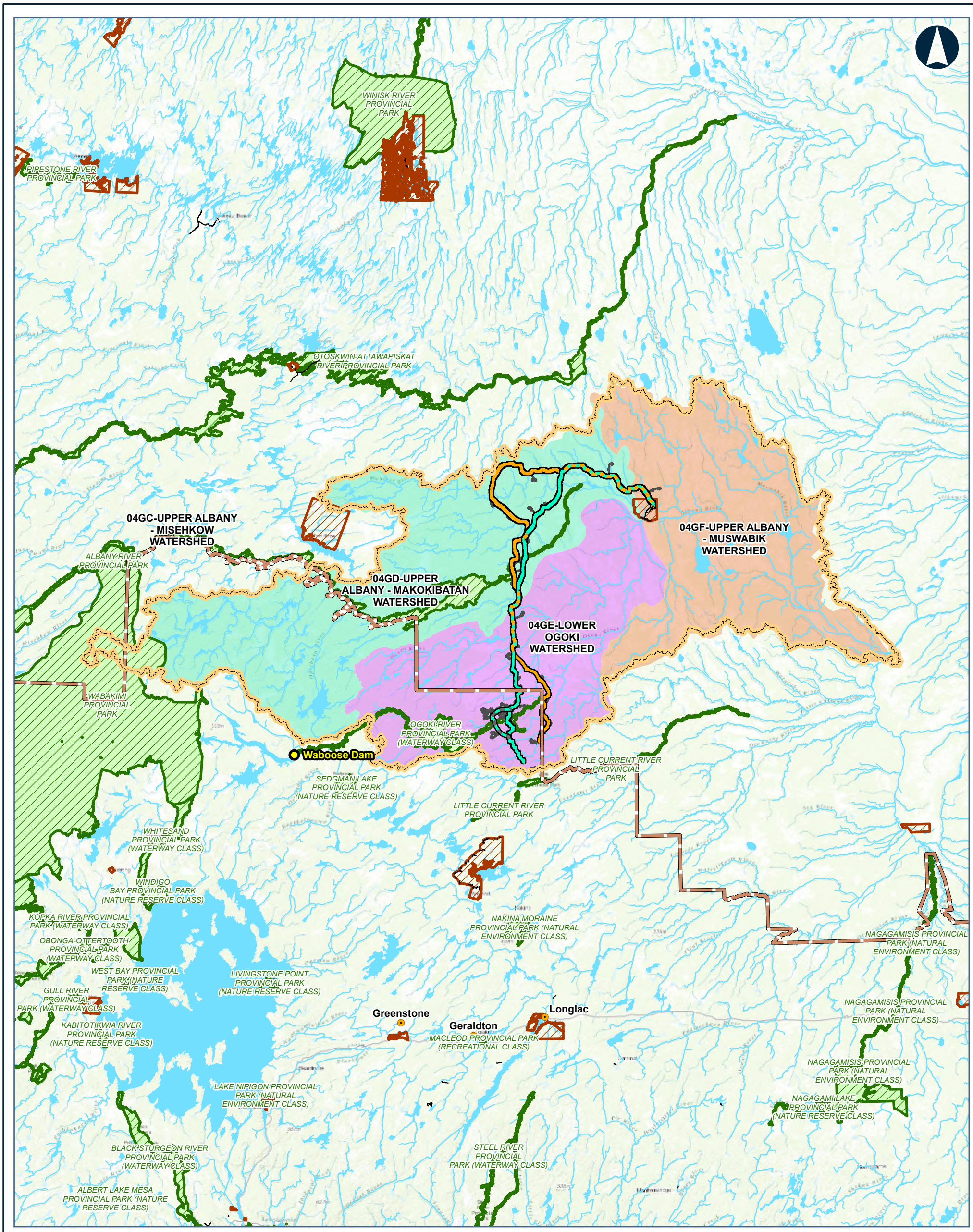
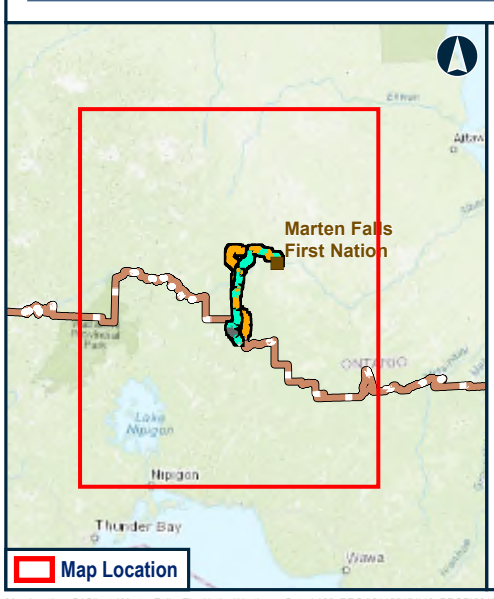
Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0018_SurfaceWater_Baseline\21455151-0018-CS-0000\21455151-0018-CS-0000.aprx
Date Saved: 2/10/2026 2:37 PM User Name: INRR172702




**Legend**

- DAM
- TOWN/COMMUNITY
- ROAD
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**

- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION
- FAR NORTH BOUNDARY
- LOWER OGOKI WATERSHED
- UPPER ALBANY - MAKOKIBATAN WATERSHED
- UPPER ALBANY - MUSWABIK WATERSHED
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA - 100M
- SURFACE WATER REGIONAL STUDY AREA

**Notes:**
None

**Data Source:**
Base Data: Provided by MNRF 2019; Route Infrastructure - Provided by AECOM 2019. Contains Information licensed under the Open Government Licence Ontario.
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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## EXISTING CONDITIONS AQUATIC REGIONAL STUDY AREA

0 5 10 20 30 40
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Feb, 2026 | 1:1,500,000 * when printed 11"x17" |
| Rev:0 | |

**Figure 4-2**

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Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0018_SurfaceWater_Baseline\21455151-0018-CS-0000\21455151-0018-CS-0000.aprx
Date Saved: 2/10/2026 2:37 PM User Name: INRR172702

#### 4.2.3.2.2 Effects Assessment Study Areas

The selection of a Preferred Route resulted in refined study areas that represent the same geographic extents of the existing condition study areas; however, they only apply to the Preferred Route. The Construction Disturbance Area for the Preferred Route and the effects assessment Local Study Area and Regional Study Area are described in **Table 4-5**. The size, nature, and location of past, present, and reasonably foreseeable projects will be taken into consideration in the development of the cumulative effects assessment study area(s) and are further discussed in **Section 4.4.3**.

**Table 4-5: Discipline-Specific Study Areas Description and Rationale**

| Study Area | Area Size (ha) | Geographic Extent | Rationale |
|---|---|---|---|
| Construction Disturbance Area | 4,700 | Includes the Project footprint including the 100 m wide right-of-way of the Preferred Route, pits and quarries, and the temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles. | ■ Area of direct disturbance that includes the area where fish and fish habitat is most likely to be directly affected by Project infrastructure and activities.<br>■ A buffer is applied to the Project footprint to allow for uncertainty in the Project footprint including road alignment shifts to avoid sensitive features. |
| Local Study Area | 97,971 | Includes the Project footprint and extends approximately 2.5 km from the centreline of Preferred Route (total 5 km width). A 500 m buffer has been applied to areas where the Construction Disturbance Area falls outside of the 2.5 km. | ■ The area outside of the Construction Disturbance Area with no direct interaction with Project infrastructure, but that has the potential to be subjected to direct (e.g., temporary culverts) or indirect effects (e.g., sedimentation and spills). |
| Regional Study Area | 2,568,527 | Includes the three tertiary watersheds (4GD Upper Albany – Makokibatan, 4GE Lower Ogoki, and 4GF Upper Albany – Muswabik) that are intersected by centreline of the Preferred Route. The Regional Study Area was extended to include areas where the Local Study Area falls outside of these tertiary watersheds. Tertiary watersheds are based on the federal “Drainage Area” reporting framework and represent third level subdivisions of Canada into suitably sized areas based on drainage for administrative purposes (Ministry of Natural Resources and Forestry, 2015a). | ■ The area where direct effects outside of the Construction Disturbance Area and Local Study Area are not likely; however, there is a potential for broader-scale indirect effects and cumulative effects. |

Notes: ha = hectare; m = metre; km = kilometre.

## 4.3 Existing Conditions Study Design and Methods

Characterization of the fish and fish habitat existing environment was completed by undertaking a desktop review supplemented by field investigations completed specifically for the Project. The characterization of the fish and fish habitat existing environment was completed to meet the requirements outlined in Section 8.8 Fish and Fish Habitat and Section 8.11 Species at Risk of the federal *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020).

The desktop review included a review of available existing information, including aerial imagery and light detection and ranging (where available) to develop the waterbody crossing list. Field investigations consisted of aerial reconnaissance and rapid and detailed fish and fish habitat surveys at a subset of waterbody crossings from 2019 to 2022. The methods used to characterize the fish and fish habitat existing environment are described in the following sections and in **Attachment B**. Baseline data were compiled for sites on the waterbody crossing list where potential direct effects of the Project at the immediate local scale (i.e., the area of direct disturbance where fish and fish habitat are most likely to be directly affected by Project infrastructure and activities) could affect the waterbody (i.e., new waterbody crossing structures to be installed for the Project).

## Table 4-6: *Tailored Impact Statement Guidelines* Sections 8.8 and 8.11 Requirements Relevant to Fish and Fish Habitat

| *Tailored Impact Statement Guidelines* Sections 8.8 and 8.11 Requirements | Section Addressed In |
|---|---|
| Provide a characterization of fish (as defined in subsection 2(1) of the *Fisheries Act*) and other aquatic species on the basis of resident and migratory species, food webs and trophic levels, structural and functional linkages, life history, and population dynamics, such as dispersion, fertility, recruitment, mortality rates, recolonization, age structure, sex ratios, population regulation, stability, distribution (communities, stocks, subpopulations, metapopulations), movements, migratory patterns, routes and preferred corridor, seasonal and annual trends in abundance, sensitive habitats and periods in relation to the study area, behavioural habitat selection, mating strategies, social interactions, and predator–prey interactions at multiple spatial and temporal scales, which are critical to identifying effects to population persistence and ecological processes. | ■ **Section 5**<br>■ **Attachment B** |
| Provide a description of the biodiversity within the freshwater environment, including trophic state, periphyton, phytoplankton, zooplankton, fish, and the interactions and relative significance of each species with the identified food chains. | ■ **Section 5**<br>■ **Attachment B** |
| Identify the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline biodiversity for fish and marine animals, including the rationale for their selection. | ■ **Section 5**<br>■ **Attachment B** |
| Provide information on the surveys carried out and the source of data available (e.g., location of sampling stations, catch methods, date of catches, species, catch-per-unit effort). | ■ **Section 5**<br>■ **Attachment B** |
| Describe primary and secondary productivity in affected water bodies with a characterization of biotic interaction processes (e.g., food web and trophic levels, nutrient cycling), season variability, ranges, and sensitive periods. | ■ **Section 5**<br>■ **Attachment B** |
| List any aquatic species at risk, including critical habitat, that are known to be present within the study area. | ■ **Section 5**<br>■ **Attachment B** |
| Provide a description and location of critical habitats for aquatic species at risk that are known to be present within the study area. | ■ **Section 5**<br>■ **Attachment B** |
| Provide a characterization of fish habitat features that may demonstrate the presence of fish species in terms of appropriate habitats—water quality and quantity characteristics, sediment type characteristics, benthic features, prey, shelter, refuge, feeding, spawning habitats, nursery habitats, rearing habitats, overwintering, migration routes, and the sensitive times for these activities. | ■ **Section 5**<br>■ **Attachment B** |
| Describe the use of fish and / or aquatic species (including Walleye, Northern Pike, Lake Whitefish, Brook Trout, Chain Pickerel (***Esox niger***), Yellow Perch (***Perca flavescens***), Cisco (***Coregonus artedi***), Burbot, Longnose Sucker (***Catostomus catostomus***), White Sucker (***Catostomus commersoni***), Lake Sturgeon, and Lake Chub (***Couesius plumbeus***) for consumption or where use has Indigenous cultural importance. | ■ **Section 5**<br>■ **Attachment B** |

| ***Tailored Impact Statement Guidelines* Sections 8.8 and 8.11 Requirements** | **Section Addressed In** |
|---|---|
| Describe any existing effects associated with previous or current activities (e.g., angling pressures, commercial fisheries). | ■ **Section 5**<br>■ **Attachment B** |
| Identify sensitive habitat areas (e.g., Ecologically and Biologically Sensitive Areas) within the study area. | ■ **Section 5**<br>■ **Attachment B** |
| Provide a list of all provincially listed protected species at risk and species assessed by the COSEWIC (Committee on the Status of Endangered Wildlife in Canada) that have the status of extirpated, endangered, threatened, or of special concern and that may be directly or indirectly affected by the Project. Use existing data and literature as well as surveys to provide current field data that reflects the natural inter-annual and seasonal variability. | ■ **Section 5**<br>■ **Attachment B** |
| Provide a list of all species at risk listed under Schedule 1 of the federal *Species at Risk Act* that may be directly or indirectly affected by the Project. Use existing data and literature as well as surveys to provide current field data that reflects the natural inter-annual and seasonal variability of each species. Species at risk that may inhabit the Project area include Lake Sturgeon. | ■ **Section 5**<br>■ **Attachment B** |
| Collect species at risk data to represent temporal sources of variation. | ■ **Section 5**<br>■ **Attachment B** |
| Ensure that, at minimum, the combined information from existing data and field surveys must be able to describe the distribution and abundance of species at risk in relation to the study areas. | ■ **Section 5**<br>■ **Attachment B** |

### 4.3.1 Desktop Assessment

The desktop assessment consisted of the development of a waterbody crossing list and a review of available existing information. A preliminary list of applicable information sources including federal and provincial guidance was reviewed in development of this approach.

#### 4.3.1.1 Waterbody Crossing List Development

A waterbody crossing list was developed for the Construction Disturbance Area by using geographic information systems to overlay the Project footprint with the Ontario Hydro Network (Ministry of Natural Resources and Forestry, 2011) data layer to identify potential mapped and unmapped waterbodies crossed by the Project. The initial waterbody crossing list was developed based on the Rev01 alignment for Alternatives 1 and 4, which was provided in May 2019. Additional potential waterbodies not mapped in the Ontario Hydro Network were identified through manual review of the routes overlaid on aerial imagery. These “unmapped”, potential waterbody crossings were then added to the waterbody crossing list. Waterbody crossings were then assigned a site identification code that consisted of a Route Alternative identifier (RA-1 = Alternative 1, RA-4 = Alternative 4, or RA1-4 = overlapped section of both Alternative 1 and Alternative 4), followed by “-WC” (waterbody crossing) and then a two-digit number in sequential order from south to north. The two-digit number is unique for each waterbody crossing (i.e., there is no repetition of numbers). As per **Section 2.1**, the equalization culverts were not considered in the crossing list.

Once light detection and ranging imagery was available, the crossing list was refined by re-examining the unmapped crossings to determine if the digital elevation model from light detection and ranging showed evidence of a defined channel. Unmapped water features without defined beds or banks (a criterion for the definition of a waterbody in Ontario [*Conservation Authorities Act*; Government of Ontario, 2003; Stanfield, 2017]) were not considered waterbodies, and thus, not included in the crossing list.

The crossing list was refined further by incorporating data gathered from the field investigations (i.e., aerial reconnaissance and ground-based surveys) to verify the presence of a waterbody and to characterize the channel morphology and fish habitat.

#### 4.3.1.2 Review of Available Information

A desktop review of existing information sources and previous studies was completed to inform and augment the baseline information gathered from the field investigations to characterize the aquatic environment. Fish and fish habitat existing conditions were compiled at the local scale for each waterbody potentially affected by the Project (i.e., within the Construction Disturbance Area).

Available existing information was reviewed to characterize the context of the fish and fish habitat and describe the baseline aquatic environment at waterbodies within the study areas of the Project. Some of the information included (but was not limited to) waterbody type, thermal regimes, fish species, significant fish habitat features (e.g., spawning habitat, nursery habitat, migration barriers), aquatic Species at Risk, Species of Conservation Concern,[1] Species at Risk habitat, and restricted activity timing windows. In addition to the review of existing information, information gathering relied on public consultation and Indigenous Knowledge. Community and Indigenous Knowledge was collected through the Indigenous Knowledge Program. Through consultation with the public and Indigenous community members, the Project Team collected specific information regarding fisheries and traditional uses of waterbodies in the study areas, such as traditional and current fishing grounds, spawning habitat, and migration corridors.

Information sources for the desktop review included:

- Physical, ecological, technical, social, health, economic, and cultural considerations draft *Aquatic Ecology Technical Supporting Document for the Integrated Transportation System for the Cliffs Chromite Project* (Golder, 2013);
- Other Environmental Assessments / Impact Assessments and reports in northwestern Ontario (Government of Ontario, 2019; Golder, 2018a,b);
- Electronic data obtained from the Ministry of Natural Resources through the Land Information Ontario database and the Natural Heritage Information Centre (Government of Ontario, 2015a; Ministry of Natural Resources and Forestry, 2020);
- Ministry of Natural Resources fisheries reports, including *Inland Ontario Lakes Designated for Lake Trout Management* (Ministry of Natural Resources and Forestry, 2015b), *Atlas of Brook Trout Streams and Rivers in Ontario* (Ministry of Natural Resources and Forestry, 2003), and *Atlas of Walleye Streams and Rivers in Ontario* (Ministry of Natural Resources and Forestry, 2004);
- Ichthyology collection mapping from the Royal Ontario Museum (2016);
- Aerial imagery and light detection and ranging imagery provided by Marten Falls (acquired June 2020);
- Lists of species of conservation importance that have been developed by authorities and expert committees;
- At a federal level – Committee on the Status of Endangered Wildlife in Canada and *Species at Risk Act* (Government of Canada, 2023);

1. Species of Conservation Concern includes species with Provincial (Ontario) S-rank assigned by Natural Heritage Information Centre as S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable); species listed as Special Concern under the *Endangered Species Act*; and species identified as nationally Endangered or Threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected under the *Endangered Species Act*.

- At a provincial level – *Endangered Species Act* (2007), *Species at Risk in Ontario list* (Government of Ontario, 2023), Natural Heritage Information Centre species of conservation concern (Ministry of Natural Resources and Forestry, 2020);
- Applicable reports and documentation from other publicly available sources (Eakins, 2023; Golder, 2013; Marshall and Jones, 2011; Holm et al., 2010; Scott and Crossman, 1998);
- Fish ON-Line data from the Ministry of Natural Resources and Forestry database (Ministry of Natural Resources and Forestry, 2023);
- Restricted activity timing windows (Fisheries and Oceans Canada, 2013); and
- Information on fish species and fish habitat for cultural, traditional, or sustenance use from Indigenous communities, groups, and traditional land-based rights holders (Marten Falls First Nation, 2021b).

### 4.3.2 Field Investigations

In addition to the collection and review of existing information relevant to the Project, field studies were conducted to substantiate existing data and previous field work in the Project area (e.g., the Cliffs Chromite Project) to characterize the existing conditions of the Valued Components and as a baseline for assessing potential effects. The field investigations collected more detailed information and filled gaps in the desktop assessment.

Fish and fish habitat field surveys were conducted between 2019 and 2022. Aerial reconnaissance, detailed fish and fish habitat assessments, rapid aerial fish habitat assessments, fish sampling, and benthic invertebrate sampling were conducted at selected waterbody crossings.

Through consultation with the Impact Assessment Agency of Canada, Fisheries and Oceans Canada, and the Ministry of Natural Resources, it was determined that site-specific fish and fish habitat data from a subset of waterbody crossings would provide sufficient baseline information for which to characterize the fish and fish habitat existing environment. The following distribution of subset sites was agreed upon and targeted for the field investigations:

- A habitat assessment at a 50% subset of locations where the Construction Disturbance Area intersects with waterbodies with potential fish habitat;
- Fish community sampling at a 50% subset of locations where the Construction Disturbance Area intersects with waterbodies with potential fish habitat (typically where habitat assessment has been completed); and
- Benthic invertebrate sampling at a 25% subset of sites selected for habitat assessment.

The field investigations to support the *Environmental Assessment / Impact Statement Report* were targeted at a subset of waterbody crossings as described in the previous bullet points. However, it is understood that, for Fisheries and Oceans Canada and the Ministry of Natural Resources permitting purposes, site-specific ground-based surveys will be required at all waterbody crossings where work is anticipated to occur below the high-water mark during Construction. The approach to the field data collection program for fish and fish habitat has been tailored to meet the objectives of the *Environmental Assessment / Impact Statement Report* and permitting stages of the Project.

#### 4.3.2.1 Site Selection

A site selection process was implemented to determine the waterbody crossing locations for detailed assessment. Selection was based on several factors, including:

- Representative sites per tertiary watershed;
- Logistics (i.e., potential helicopter landing within 500 m);
- Health and safety (i.e., were sites safe for field crew access by helicopter or by foot?). Some sites were not accessible within 500 m of helicopter and were not able to have detailed surveys completed;
- Cultural importance (which to date has been provided by only Marten Falls First Nation); and
- Available background information and previous studies (i.e., *Draft Aquatic Ecology Technical Supporting Document for the Integrated Transportation System for the Cliffs Chromite Project* (Golder, 2013); where sections of the Preferred Route overlap with the alignment of the Cliffs Chromite Project route.

The waterbody crossing locations selected for field assessment were evenly distributed along the length of Alternative 1 and Alternative 4 and among the relevant tertiary watersheds to the extent feasible.

Wherever the route re-alignment resulted in a change of waterbody crossing location, the updated locations were used for the 2022 field programs. All waterbody crossing locations were reviewed against the Rev03 alignment to help to ensure site-specific field data had been collected at the most up-to-date crossing location. In some cases, a field survey was completed at both the original Rev01 location and then surveyed again at the updated Rev02 or Rev03 location. The site selection process also considered any revisions to the waterbody crossing list.

#### 4.3.2.2 Aerial Reconnaissance

A total of 164 proposed waterbody crossings were identified by desktop review on Alternatives 1 and 4 based on the Rev01 alignment to establish the initial waterbody crossing list. These crossings were surveyed by aerial reconnaissance on September 5 and 6, 2019. The objective of the aerial reconnaissance was to provide high-level information on waterbody crossings to refine the waterbody crossing list, evaluate crossings for flow regime, gather information for site access for future field programs, and support the aerial imagery review in the desktop baseline characterization. Flow regime (as identified on the Ontario Hydro Network [Ministry of Natural Resources and Forestry, 2011], reviewed from the past investigation results for the Cliffs Chromite Project [Golder, 2013], or visually assessed in the field – refer to Surface Water Hydrology Existing Conditions) was determined as follows:

- **Ephemeral**—flows only during and after large precipitation events for a period of a few days to a few weeks;
- **Intermittent**—flows during wet seasons and in the summer after a major rain event; and
- **Permanent**—flows for most of the year but can run dry during drought conditions, noting that, to be conservative, waterbodies with unknown flow regimes were considered to be permanent when evaluating fish presence.

Habitat variables were documented where possible at each of the identified waterbody crossing locations, including waterbody type (e.g., watercourse, lake / pond, bog or fen terrain, drainage feature); habitat and bed substrate types; presence of fish passage barrier and type (if applicable); and fish habitat potential (i.e., potential for the waterbody to support fish). Detailed methods are described in **Attachment B**.

#### 4.3.2.3 Detailed Fish Habitat Assessments

Detailed fish habitat assessments were completed to obtain site-specific field data at a subset of waterbody crossings to verify or augment the results and assumptions from the aerial reconnaissance and imagery review.

Fish habitat and channel characteristics were assessed in the vicinity of the proposed crossing location (i.e., instream habitat types, channel width and depth, bed material, instream cover, bank condition, and in situ water quality). Potential habitat was evaluated for sport fish (i.e., large-bodied fish targeted for sport angling), non-sport fish (i.e., coarse, large-bodied fish not targeted for sport angling), and forage fish (i.e., small-bodied fish where adult body size remains small).

Detailed fish habitat assessments were completed at 55 waterbody crossings. Some sites were visited more than once, either in a different season (e.g., spring and fall) and / or in a different year (e.g., 2019 and 2022). The purpose of the multiple visits was to capture the seasonal and / or annual variations of the fish communities and fish habitat in the waterbodies. Detailed methods are described in **Attachment B**.

#### 4.3.2.4 Rapid Aerial Fish Habitat Assessments

Rapid aerial fish habitat assessments were completed to describe fish habitat and channel characteristics in the vicinity of the proposed waterbody crossing locations from a low-level helicopter fly-over when sites selected for detailed assessment were inaccessible for detailed habitat assessments. Site-specific field data were gathered at these sites to verify or augment the results and assumptions from the aerial reconnaissance and imagery review. The channel was characterized from the air based on the presence of bed and banks (i.e., defined, undefined, and poorly defined). Where possible, estimates and observations on dominant habitat type, dominant substrate, cover for fish, direction of flow, bankfull and wetted width and depth, and presence of fish barriers were noted. Rapid aerial fish habitat assessments were completed at 40 waterbody crossings.

#### 4.3.2.5 Benthic Invertebrate Sampling

Benthic invertebrates are a food source for many fish species and therefore support fish communities. The benthic invertebrate community was sampled at a subset of 25% of the total number of assessment sites. All benthic invertebrate assessments were completed in accordance with Ontario Benthic Biomonitoring Network guidelines.

Sampling sites were selected to target representative waterbody types and habitat to provide a baseline of diversity and abundance. Site selection considered factors such as flow and thermal regime, watershed representation and waterbody type, and health and safety and logistical constraints. Ideally, benthic invertebrate samples were collected from within 10 m of the Community Access Road centreline.

Benthic invertebrate community samples were collected using one of two pieces of equipment:

- In lotic / erosional environments (i.e., watercourses with predominantly coarse substrates), samples were collected using a Surber sampler (sample area = 0.093 square metres [$m^2$]) where there were suitable coarse substrates (i.e., cobble or boulder); and
- In lentic / depositional environments (i.e., waterbodies with sediments that are predominantly silt / sand), samples were collected using a grab sampler (i.e., Ekman or petite Ponar) (sample area = 0.023 $m^2$).

Three replicate samples were collected at each location and combined to prepare one composite sample. Replicate sampling locations were selected according to the presence of similar aquatic habitat (i.e., flowing water, similar substrate, water depth, and presence of aquatic vegetation) in the lentic or lotic environment within each waterbody. The selection of similar habitat was maintained to the extent possible between sub-sampling locations at each site to reduce habitat-related variability in the benthic invertebrate community data.

Composite samples were sieved through a 500 µm mesh Nitex screen. Material retained in the mesh was placed in a 1-litre (L) plastic bottle and preserved in 10% buffered formalin. Samples were couriered to a qualified taxonomist for taxonomic identification and enumeration at the end of the program. The resulting sample was set in preservative for identification and enumeration per assessment site through laboratory analysis. Detailed methods are described in **Attachment C – Benthic Invertebrate Baseline Report.**

#### 4.3.2.6 Fish Sampling

Fish sampling was completed in 2019, 2020, and 2022 at 46 waterbody crossing locations using a high output backpack electrofisher and / or baited minnow traps. Detailed methods are described in **Attachment B**.

Fish communities were characterized by exerting fishing effort where conditions are suitable to support fish and were logistically and safely feasible to execute. Fish sampling was completed in compliance with applicable *Licence to Collect Fish for Scientific Purposes* issued by the Ministry of Natural Resources for the Project. The methods employed at each assessment site was site-specific and was dictated by site conditions and waterbody category identified in the desktop assessment. Characteristics such as geomorphic conditions, season / temperature, access and safety considerations, existing fish community, Valued Components and trophic levels, and water depth were taken into consideration when determining appropriate sampling techniques to employ to avoid or minimize species capture biases. Where necessary to minimize species collection biases and to target varying trophic levels (where the potential for such variety is present), a combination of fish collection methods was used. **Table 4-7** provides an overview of the fish sampling methods that were performed, where appropriate, per assessment site in the Construction Disturbance Area. Wherever possible, backpack electrofishing was the preferred method of collection.

**Table 4-7: Fish Community Sampling Methods Employed**

| Method | Targeted Species | Suitable Habitats | Description |
|---|---|---|---|
| **Backpack Electrofishing** | All | Wadable with water depths typically no greater than 70 cm; effectiveness is subject to various water quality parameters. Streams and small rivers, shorelines of lentic waterbodies. | The application of an electrical current to water that results in an uncontrolled muscular convulsion in fish that causes them to swim toward the anode of an electrofishing unit mounted on the back of a crew member. |
| **Minnow Trapping** | Small-bodied fishes or juvenile large-bodied fish | Water deeper than 30 cm. Streams, rivers, lakes, ponds. | A baited, wire mesh trap that passively captures small-bodied fish. |

Notes: cm = centimetre.

General survey data (i.e., date and time, weather, specific transect boundaries, and / or trap location) and sampling effort were documented. Each individual fish was identified in the field and enumerated, and age class (e.g., young-of-year, juvenile, adult) and observations of evident disease (e.g., tumours, lesions, parasites) were noted. The length and weight of Valued Component fish species was documented. Lethal sampling was not the intention for the Project, and every attempt was made to release fish alive.

## 4.4 Effects Assessment

The following is a broad overview of the approach for the identification, assessment, and evaluation of potential effects:

- Review Construction and Operation and Maintenance activities to identify potential interaction(s) that could result in environmental effects;
- Characterize the existing environment for both route alternatives, which considers approved projects, both past and present;
- Identify potential environmental effects of the Preferred Route and recommend avoidance and mitigation measures to avoid or minimize identified effects as well as identify opportunities to enhance benefits to the environment;
- Predict and assess potential environmental effects of the Preferred Route remaining after taking into consideration the recommended mitigation measures (i.e., residual effects) using direction, magnitude, geographic extent, duration, frequency, reversibility, and likelihood;
- Predict cumulative effects that may result from a combination of the residual effects of the Preferred Route with the effects of other past, present, and reasonably foreseeable projects; and

- Identify a follow-up program for the Preferred Route that includes monitoring to verify the prediction of the effects assessment and effectiveness of the mitigation measures and a requirement for monitoring of the commitments made in the *Terms of Reference* and *Environmental Assessment / Impact Statement Report*.

The following sections provide specific fish and fish habitat considerations pertaining to the methodology for effects assessment. For detailed descriptions of the methodology used to inform this study refer to the *Environmental Assessment / Impact Statement Report*. Refer to **Section 6** for details related to the Preferred Route and **Section 4.2.3.2** for a description of the revised study areas that have been used in the effects assessment.

The effects assessment for the fish and fish habitat existing environment was completed to meet the requirements outlined in Section 15.1 of the federal *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) and the *Terms of Reference* (AECOM 2020) (**Table 4-8**).

## Table 4-8: *Tailored Impact Statement Guidelines* Section 15.1 and *Terms of Reference* Requirements

| *Tailored Impact Statement Guidelines* Section 15.1 | Section Addressed In |
|---|---|
| Describe any direct, incidental or cumulative predicted positive and / or adverse effects to fish (all developmental stages) and fish habitat as defined in subsection 2(1) of the *Fisheries Act*, including the calculations of any potential habitat loss (temporary or permanent) including spawning grounds, nursery, rearing, food supply, and migration areas, or death of fish. The assessment must include a consideration of:<br>■ The geomorphological changes and their effects to hydrodynamic conditions and fish habitats (e.g., modification of substrates, dynamic imbalance, silting of spawning beds);<br>■ The modifications of hydrological, and hydrometric conditions on fish habitat, critical habitat for aquatic species at risk, and on the fish species' life cycle activities (e.g., reproduction, fry-rearing, migration);<br>■ Potential effects to riparian areas that could affect aquatic biological resources and productivity taking into account any anticipated modifications to fish habitat (e.g., structure, cover);<br>■ Describe effects to fish biodiversity considering identified biodiversity metrics;<br>■ Effects to the primary and secondary productivity of water bodies and how Project-related effects may affect fish food sources;<br>■ Any potential imbalances in the food web and trophic levels in relation to baseline conditions;<br>■ Potential for direct effects of contamination downstream of the Project on fish and bioaccumulation of contaminants (e.g., selenium, mercury, chromium, arsenic) in fish that may be consumed by Indigenous groups;<br>■ Potential direct and incidental effects on fish behaviour, distribution, abundance, migration patterns; and<br>■ Potential losses of individuals and relationship to population density and the resiliency of a population. | ■ **Section 7**<br>■ **Section 8** |
| Describe the effects of changes to the aquatic environment on fish and fish habitat, including:<br>■ The anticipated changes in the composition and characteristics of the populations of various fish species, especially those of cultural significance to Indigenous communities with traditional land use practices in the area and provincially or federally listed aquatic species at risk;<br>■ Describe any modifications in migration, local movements (e.g., upstream and downstream migration, and lateral movements) or stranding of fish, following the construction, operation or closure of works (e.g., physical, chemical and hydraulic barriers to fish passage);<br>■ Identify any reduction in fish populations as a result of potential overfishing due to increased access to the Project area;<br>■ Contaminant levels in harvested species and their prey; and<br>■ Describe any modifications and use of habitats, including the ability to access the habitat. | ■ **Section 7** |
| Include a discussion of how Project construction timing correlates to key fisheries timing windows for freshwater and anadromous / catadromous species, and any potential effects resulting from overlapping periods. | ■ **Section 7** |

| ***Tailored Impact Statement Guidelines* Section 15.1** | **Section Addressed In** |
|---|---|
| A discussion of how vibration caused by Project activities (e.g., blasting) may affect fish habitat and behaviour, such as spawning or migrations. | ■ **Section 7** |
| Describe potential effects from impingement and entrainment of fish and other aquatic biota through water withdrawal. | ■ **Section 7** |
| Describe any need for an *Fisheries Act* authorization and / or a *Species at Risk Act* permit and describe any consideration of Department of Fisheries and Oceans guidance documents. | ■ **Section 7** |
| Include a risk assessment of the potential introduction and intrusion of aquatic invasive species. | ■ **Section 7** |
| Describe effects from changes in light level. | ■ **Section 7** |
| Describe any positive changes, such as habitat creation. | ■ **Section 7** |
| Describe the anticipated changes in the composition and characteristics of the populations of fish, following modifications to the aquatic environment, including but not limited to:<br>■ Disruption of life stages or habitat with regard to their productivity, life cycles, migration, or local movements, including a consideration of spawning, rearing, feeding, and overwintering;<br>■ Disruption of feeding activities of fish;<br>■ Distribution and abundance of fish;<br>■ Contaminant levels in harvested species and their prey;<br>■ A consideration of a change in: behavior, displacement, access to habitat, habitat structure, species composition, ecosystem structure and function and habitat quality; and<br>■ Freshwater animal health and condition. | ■ **Section 7** |
| Describe any effects to other aquatic organisms. | ■ **Section 7** |
| Describe any changes to aquatic plants, including all benthic and detached algae and phytoplankton. | ■ **Section 7** |
| ***Terms of Reference* Requirement Section 7.2.9** | **Section Addressed In** |
| The EA will assess potential effects of the Project on fish and fish habitat, which will consider fish species that have the potential to be located within the study area. Project-related effects on surface water quality and quantity may result in indirect effects on fish and fish habitat, including Species at Risk. Deposition of sediment in a waterbody can result in the loss of or alteration to habitat, alteration to baseflows or water temperatures, disruption of fish life processes, and fish and egg mortality. | ■ **Section 7.3.1.4**<br>■ **Section 7.3.1.7**<br>■ **Section 7.3.1.9** |
| The construction of temporary (e.g., bridges, cofferdams, fords, corduroy, swamp mats, culverts, ice and snow crossings) and permanent (e.g., bridges, culverts) watercourse crossings, and blasting as required, have the potential to result in adverse effects to fish and fish habitat. The potential effects associated with placement of structures in | ■ **Section 7.3.1.1**<br>■ **Section 7.3.1.3**<br>■ **Section 7.3.1.5** |

| ***Tailored Impact Statement Guidelines* Section 15.1** | **Section Addressed In** |
|---|---|
| water includes disruption of life processes such as migration and spawning due to fish passage issues, fish mortality due to equipment and machinery, dewatering, water-taking or water discharging activities, changes in water quality (e.g., accidental release of contaminates), and the degradation, alteration or loss of fish habitat and function. | ■ **Section 7.3.1.6**<br>■ **Section 7.3.1.8**<br>■ **Section 7.3.1.11** |
| Blasting near waterbodies may cause the release of blast residues, particles at high velocity, instant and significant pressure changes and exposed soils. This may result in fish and egg mortality and degradation, alteration or loss of habitat. | ■ **Section 7.3.1.8** |
| The CAR will provide year-round access to the Far North, which is likely to increase access to waterbodies for recreational use. This has the potential to result in an increase in angling pressure to fish populations, higher risk of the introduction of invasive aquatic species, parasites and disease, and the accidental release of contaminants to waterbodies. | ■ **Section 7.3.1.10** |

### 4.4.1 Project–Environment Interactions

Considering the Project components and activities presented in **Section 2**, interactions are identified between the Project components and activities to the existing conditions of fish and fish habitat Valued Components. These interactions support the identification of potential effects, both direct and indirect, that may result in changes to fish and fish habitat. The likely Project–environment interactions were identified based on professional judgment, activities planned to occur, and as described in the *Marten Falls Community Access Road Project Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020). **Table 4-9** provides the preliminary analysis of Project–environment interactions for fish and fish habitat. The analysis of Project–environment interactions for fish and fish habitat that are likely to have a potential effect is provided in **Section 7.1**.

**Table 4-9: Project–Environment Interactions**

| Project Phases | Project Activities | Fish and Fish Habitat |
|---|---|---|
| **Construction** | Clearing of the right-of-way (e.g., remove and dispose of trees, shrubs, fallen timber, and surface litter; strip organic materials; grub) | **X** |
| | Blasting rock (e.g., remove rock at quarries and, as required, at specific locations in association with road and bridge construction) | **X** |
| | Constructing the Community Access Road (e.g., remove unsuitable soil, place and compact rock and granular material, trim and shape the Community Access Road) | **X** |
| | Constructing bridges and install culverts | **X** |
| | Constructing, operating, and decommissioning temporary infrastructure (e.g., remove temporary culverts and bridges and remediate channels) | **X** |
| **Operation and Maintenance** | Operate the Preferred Route | **X** |
| | Maintain the Preferred Route[(a)] and permanent bridges and culverts | **X** |

Notes:
(a) Includes general maintenance activities (e.g., grading, erosion control, excavation at pits / quarries and processing aggregate, dust suppression), seasonal maintenance activities (e.g., clear vegetation on road shoulders, snow clearing and bridge and culvert maintenance, ditch maintenance), and special maintenance activities (e.g., slope failures and road settlement / break-up).
X = yes

## 4.4.2 Assessing Residual Effects

### 4.4.2.1 Potential Effects

Following the identification of the Project–environment interactions, the existing conditions for the Preferred Route were reviewed to determine the potential effects of the Project. The potential effects on fish and fish habitat were described as either direct or indirect, and the potential effects on other disciplines were described as discipline interactions. The potential direct and indirect effects resulting from the Project–environment interactions considered input received through the Indigenous Knowledge Program and Consultation and Engagement Program, regulatory agency guidance, and professional judgement.

A **direct effect** is an immediate change to an environmental component caused by a project activity at the same time and place as the activity. An **indirect effect** occurs when a change resulting from a Project activity leads to subsequent changes in other environmental components, which may occur later in time or at a different location but is reasonably foreseeable.

**Residual effects** are the effects that remain after the application of mitigation measures.

**Discipline interactions** occur when a change to one Valued Component resulting from a Project activity causes a change to another Valued Component in another discipline (e.g., changes in fish abundance or distribution could indirectly affect recreational tourism).

Fish and fish habitat may be indirectly affected by changes to other environmental disciplines. For example, the atmospheric environment can affect fish and fish habitat by aerial deposition of pollutants from Project activities directly to surface waterbodies or to the terrestrial environment where pollutants can be transported to waterbodies with runoff and thereby affect fish and fish habitat. Changes to physiography, geology, terrain and soils, surface water, and vegetation can alter flow patterns and the interaction of water with soils and vegetation potentially resulting in changes to fish and fish habitat quality and quantity. Land and resource use that may be affected by the Project, such as expansion of industry (i.e., recreation and tourism), can affect fish populations and fish habitat due to increased activity and recreational angling.

**Table 4-10** provides a preliminary identification of how changes in other disciplines may result in changes to fish and fish habitat. The degree of risk for discipline interactions to fish and fish habitat as a result to changes to another discipline varies depending on activity.

### Table 4-10: Potential Fish and Fish Habitat Indirect Interactions with Other Disciplines

| Indirect Interactions with Fish and Fish Habitat | Discipline and Associated Valued Components | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aboriginal and Treaty Rights and Interests | Atmospheric Environment | Climate Change | Acoustic and Vibration Environment | Physiography, Geology, Terrain, and Soils | Surface Water | Groundwater And Geochemistry | Vegetation | Peatlands | Wildlife | Fish and Fish Habitat | Social | Economy | Land and Resource Use | Human Health and Community Safety | Visual Aesthetics | Archaeological and Cultural Heritage |
| **Indirect effects on fish and fish habitat as a result of changes in other disciplines** | - | X | X | X | X | X | X | X | X | - | | - | - | X | - | - | - |

Notes
X = Potential for discipline interaction as a result of the Project.
- = No potential for discipline interaction is anticipated as a result of the Project.

### 4.4.2.2 Mitigation and Enhancement Measures

Following the identification of potential effects, the effects assessment has explored technically and economically feasible mitigation measures to avoid or minimize the identified negative effects. In addition, enhancement measures to increase positive effects beyond those that are already inherent to the design have been considered where appropriate. These measures consisted of industry-standard practices, federal and provincial standard specifications, regulator-mandated measures, best management practices, Indigenous and community recommendations, and recommendations from environmental professionals based on expertise, scientific publications, experience, and judgement.

It is important that mitigation and enhancement measures are achievable, measurable, verifiable, and monitored for compliance and effectiveness during all temporal phases as part of the Project follow-up monitoring plan. Recommended environmental monitoring will verify the predicted environmental effects, evaluate the effectiveness of mitigation and enhancement measures, and identify the process the Proponent will follow if mitigation and enhancement measures are not effective.

The *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) Section 20 requirements and *Terms of Reference* (AECOM, 2020) requirements for fish and fish habitat related to mitigation and enhancement measures are provided in **Table 4-11**. The applicability of these requirements has been evaluated and will be adapted to the needs of the site, environment, and Project activities.

**Table 4-11: *Tailored Impact Statement Guidelines* Section 20 Requirements and *Terms of Reference* Requirements**

| *Tailored Impact Statement Guidelines* Section 20 Requirement | Section Addressed In |
|---|---|
| Identify measures to prevent and mitigate the risk of engaging in activities that cause harmful alteration, disruption, or destruction in key sensitive periods and locations (e.g., spawning) for fish. | ■ **Section 7.3.1** |
| Identify measures to avoid the deposit of substances harmful to fish or migratory birds in water or areas frequented by fish and / or migratory birds. | ■ **Section 7.3.1** |
| Identify measures to prevent waterbody crossings (e.g., culverts) from negatively affecting freshwater fish movement (e.g., due to flow, debris, or “perching”). | ■ **Section 7.3.1** |
| Describe mitigation measures that area specific to each environmental, health, social or economic effect identified. Mitigation measures are to be written as specific commitments that clearly describe when and how the proponent intends to implement them, what decision-making criteria will be used, and the outcome these mitigation measures are designed to address. | ■ **Section 7** |

| *Terms of Reference* Requirement | Section Addressed In |
|---|---|
| To mitigate potential adverse effects on fish and fish habitat, waterbody crossings and culvert installations will be designed and installed in accordance with applicable provincial and federal guidelines and standards to avoid harmful alteration, disruption or destruction of fish habitat. | ■ **Section 7.3.1.1**<br>■ **Section 7.3.1.3**<br>■ **Section 7.3.1.5**<br>■ **Section 7.3.1.6**<br>■ **Section 7.3.1.8**<br>■ **Section 7.3.1.11** |

### 4.4.2.3 Predicting Residual Effects

Following the identification of direct and indirect effects as described in **Section 4.4.2.1** and identification of mitigation and enhancement measures, residual effects were predicted. Once predicted, residual effects were characterized by residual effects characteristics, which are described in **Section 4.4.2.4**. Any predicted residual effects are also carried forward into the cumulative effects assessment, which is described in **Section 4.4.3**.

### 4.4.2.4 Characterization of Predicted Residual Effects

Predicted residual effects, if identified, were described in terms of the effects assessment characteristics presented in **Table 4-12.** These effect characteristics were described in detail in the *Environmental Assessment / Impact Statement Report*. The section that follows outlines how these characteristics were applied as well as any discipline-specific characteristics, if applicable.

**Table 4-12: Residual Effects Characteristics**

| Effects Characteristic | Definition | Description |
|---|---|---|
| **Context** | ■ Ecological context<br>■ Socio-economic context | ■ Qualitative discussion<br>■ See description in **Discipline-Specific Characteristics** |
| **Direction** | ■ Direction of change on fish and fish habitat from existing conditions | ■ Positive: net gain or positive effect<br>■ Neutral: no change to existing conditions[(a)]<br>■ Negative: net loss or adverse effect |
| **Magnitude** | ■ Magnitude is the expected change on fish and fish habitat from existing conditions | ■ Negligible, low, medium, high<br>■ See description in **Discipline-Specific Characteristics** |

| Effects Characteristic | Definition | Description |
|---|---|---|
| **Geographic Extent** | ■ The spatial area that the effect on fish and fish habitat is expected to occur | ■ Construction Disturbance Area: effect is confined within the direct physical disturbance of the Project<br>■ Local: effect extends into the Local Study Area<br>■ Regional: effect extends into the Regional Study Area<br>■ Beyond Regional: effect extends beyond the Regional Study Area |
| **Duration** | ■ The period of time over which the effect on fish and fish habitat is expected to occur | ■ Short term: effect ends before the end of Construction<br>■ Medium term: effect occurs during Construction and ends soon after Operation and Maintenance begins, after the activity causing the effect ends<br>■ Long term: effect occurs during Construction Phase and persists into Operation and Maintenance Phase and / or the effect is considered permanent or the likelihood of reversibility is low or uncertain |
| **Frequency** | ■ How often the effect on fish and fish habitat is expected to occur | ■ Infrequent: effect is expected to occur rarely<br>■ Frequent: effect is expected to occur intermittently<br>■ Continuous: effect is expected to occur continuously |
| **Reversibility** | ■ The ability of the effect on fish and fish habitat to return to existing conditions | ■ Reversible: effect is not permanent<br>■ Irreversible: effect is permanent |
| **Likelihood** | ■ Probability that the effect on fish and fish habitat will occur | ■ Unlikely: effect is not likely to occur<br>■ Possible: effect may occur but is not likely<br>■ Probable: effect is likely to occur<br>■ Certain: effect will occur |
| **Uncertainty** | ■ The potential for observed results to deviate from predictions made for fish and fish habitat | ■ See description in **Discipline-Specific Characteristics** |
| **Direct / Indirect** | ■ Nature of the pathway through which the effect occurs. | ■ Direct effects are typically immediate and spatially aligned with the activity. Indirect effects may be delayed or spatially removed but are causally linked and predictable. |

Notes:

(a) When direction is determined to be neutral, the other residual effects criteria are not characterized (e.g., magnitude, geographic extent, duration), as there is no change from existing conditions to characterize.

### 4.4.2.5 Discipline-Specific Characteristics

In addition to the residual effects characteristics described in **Table 4-12**, the following discipline-specific characteristics were also used to characterize the residual effects of the Project and determine the significance of those effects on fish and fish habitat.

#### 4.4.2.5.1 Ecological and Social Context

The context within which the Project's potential effects may occur was taken into account when considering the effects criteria. Effects criteria considered the physical characteristics of an effect (e.g., magnitude, geographical extent, timing, and duration) as well as the context-specific value characteristics (e.g., environmental, health, social, and economic conditions). Context is considered one of the most critical factors when evaluating effects, and the effects assessment has considered potential or existing effects or pressures on social, economic, and health conditions affecting the sensitivity or resilience of a Valued Component.

Context for fish and fish habitat Valued Components considers species sensitivity, resilience, adaptive capacity, current status and trends, applicable legislation, and best management practices. The current and future sensitivity and resilience of fish and fish habitat Valued Components to change caused by the Project are considered and include Indigenous Knowledge where it was available. The ecological context of the effect includes a discussion of the environmental consequences of the predicted effect. Consideration of ecological context includes timing when it is important in the evaluation of the effect, such as when the effect could occur during a species life cycle window. Context also considered whether the residual effect would alter the ability of the Valued Component fish populations to be self-sustaining and ecologically effective.

#### 4.4.2.5.2 Magnitude

Magnitude refers to the amount of change in a parameter relative to the existing conditions of a Valued Component with and without the Project in place or to other standards or guidelines. When evaluating the magnitude of effects, this study considered both the proportion of the Valued Component affected within identified spatial boundaries and the relative effect.

For magnitude, environmental discipline-specific definitions were developed as part of the study plan (**Table 4-13**); however, the rationale for "low" magnitude was changed. During Construction, there is potential for the death of fish during normal activities or harvest (e.g., during a fish salvage); however, this will not result in a change in the population dynamics; therefore, a low rating is suitable.

## Table 4-13: Fish and Fish Habitat Magnitude Definition

| Magnitude Level | Definition | Rationale |
|---|---|---|
| **Negligible** | None or negligible change to baseline habitat conditions or fish behaviour | ■ No change in function or productivity of Valued Component habitat<br>■ No change in behaviour or survival of Valued Component<br>■ Minor change in Valued Component habitat to a degree that does not reduce productivity or function<br>■ Minor disturbance to Valued Component behaviour that does not impede Valued Components from carrying out their life processes; for example, temporary impediments to fish movement or access to habitat during dewatering outside of important timing windows such as spawning.<br>■ Potential incidental death of individual fish to a degree that is not likely to disrupt overall population dynamics or affect local productivity |
| **Low** | Minor change to baseline habitat and conditions without loss of local productivity | ■ Habitat of Valued Components remain suitable and functional but decrease in productivity<br>■ Minor or temporary disturbance to fish that may interrupt a life process but not decrease productivity or prevent fish from carrying out the activity; for example, alteration or infill of a minor portion of productive littoral area used by Valued Component for feeding<br>■ Potential incidental death of fish to a degree that is not likely to disrupt overall population dynamics or affect local productivity |
| **Medium** | Change to baseline habitat and conditions that results in decrease in function and productivity and / or potential harm to fish | ■ Habitat quality and function is reduced but not eliminated<br>■ Decrease in productivity<br>■ Impediment to fish from carrying out life processes<br>■ Potential incidental death of fish to a degree that is not likely to disrupt overall population dynamics but may affect local productivity |
| **High** | Change to baseline habitat and conditions that renders them unusable to fish and / or increases the likelihood of harm to fish | ■ Destruction, complete displacement, or alteration of habitat, rendering it no longer suitable for the function at existing conditions<br>■ Loss of productivity as a result of loss of habitat function<br>■ Restricting fish from carrying out life processes, such as complete barrier to fish migration to spawning habitat<br>■ The death of fish to a degree that results in changes to population dynamics |

### 4.4.2.6 Determination of Significance

A conclusion on significance was made using the characteristics described in **Section 4.4.2.4** as well as taking into consideration professional judgement.

The assessment of significance of residual effects of the Project was informed by the interaction between the residual effects characteristics, with magnitude, duration, and geographic extent being the most important factors, along with consideration of context. Consideration was also given to the concerns of Indigenous communities, interested agencies, groups, and individuals raised during engagement.

Using the overall residual effects characteristics, provided **Table 4-12**, each of the potential residual effects was assigned a significance level as a means of ranking the potential effects on fish and fish habitat. Significance was generally as follows (with consideration of context):

- **Significant**—Residual effects were generally considered to be significant if the residual effects were classified as high in magnitude, a geographic extent greater than the Construction Disturbance Area, and a longer term in duration, or they represent a substantial management concern; and
- **Not Significant**—Residual effects were generally considered not significant if they demonstrated any other combination.

Taking into account the significance for each residual effect along with the context, an overall significance determination was completed for fish and fish habitat Valued Components.

### 4.4.2.7 Prediction Confidence and Uncertainty

Prediction confidence refers to the degrees of certainty in the predicted residual effects and associated determination of significance. All Impact Assessments involve some level of uncertainty, often over many geographic, biophysical, and social dimensions, and observed results may deviate, to some degree, from predictions made in the assessment. Therefore, the residual effects predictions vary in their level of certainty, which could be related to a number of factors, such as Project design and components, existing conditions, spatial and temporal scope, Valued Component response, effectiveness of mitigation and enhancement measures, overall scope of factors considered, and natural and human-induced influences on the biophysical and human environment.

Transparency in describing sources of uncertainty is critical to understanding the confidence that can be attributed to the analysis of effects and is important to decision-making. Efforts to address uncertainties has been focused on those uncertainties that are most meaningful to decision-making, such as how the biophysical and human environment will respond to changes and the efficacy of mitigation and enhancement measures.

Each of the potential residual effects was assigned a confidence level as a means of ranking the potential effects on fish and fish habitat. The confidence levels are defined as:

- **Low**—Uncertainty was considered to be low if there were baseline data for all sites available, the Project-related effects are clearly understood, and / or the level of certainty associated with the effectiveness of proposed mitigations is high.
- **Moderate**—Uncertainty was considered to be moderate if there were baseline data for the majority of the sites available, the Project-related effects are mostly understood, and / or the level of certainty associated with the effectiveness of proposed mitigations is moderate to high; and
- **High**—Uncertainty was considered to be high if there were no baseline data available, the Project-related effects are poorly understood, and / or the level of certainty associated with the effectiveness of proposed mitigations is low or unknown.

Discussion is provided on how uncertainty was addressed to increase the level of confidence so that residual effects will not be worse than predicted.

### 4.4.3 Assessing Cumulative Effects

#### 4.4.3.1 Definitions

The Impact Assessment Agency of Canada defines **Cumulative Effects** as “changes to the environment, health, social and economic conditions, as a result of the Project’s residual environmental, health, social and economic effects combined with the existence of other past, present and reasonably foreseeable physical activities, as well as within activities of the Project itself from multiple emissions and discharges (e.g., simultaneous operations) to understand synergistic or additive effects” (Impact Assessment Agency of Canada, 2020). Cumulative effects may result if:

- The implementation of the Project has the potential to cause direct residual adverse effects on the Valued Components, taking into account the application of technically and economically feasible mitigation and enhancement measures; and
- The same Valued Component may be affected by other past, present, and future physical activities.

A cumulative effect on an environmental, health, social, or economic component may be important even if the Project’s effects on this component by themselves are minor. The method for assessment of cumulative effects is consistent with the *Tailored Impact Statement Guidelines*, *Operational Policy Statement: Assessing Cumulative Environmental Effects* under the *Canadian Environmental Assessment Act*, 2012 (Canadian Environmental Assessment Agency, 2013), and the *Technical Guidance for Assessing Cumulative Environmental Effects* under the *Canada Environmental Assessment Act*, 2012 (Canadian Environmental Assessment Agency, 2018).

The identification and assessment of cumulative effects will be undertaken as follows:

- Identify and assess the residual effects of the Project;
- Define the spatial and temporal boundaries for cumulative effects based on the residual effects predicted;
- Identify other past, present, and reasonably foreseeable activities with effects likely to overlap in type of effect (i.e., Valued Component), temporally, and spatially with the predicted residual effects of the Project; and
- Predict potential cumulative effects and identify additional mitigation.

### 4.4.3.2 Cumulative Effects Scoping

#### 4.4.3.2.1 Valued Components with Residual Effects

The cumulative effects assessment builds on the results of the residual effects assessment described in **Section 4.4.2** and considers the incremental changes that were predicted to have a likely residual adverse effect on a Valued Component. The Valued Components that did not have a residual effect predicted or for which the residual adverse effect is of negligible magnitude, the likelihood is unlikely or possible to occur, or positive in direction, were not carried forward into the cumulative effects assessment. All residual effects on Valued Components identified were brought into the cumulative effects assessment. The rationale for the exclusion of Valued Components from the cumulative effects assessment was provided.

#### 4.4.3.2.2 Temporal and Spatial Boundaries

**Temporal boundaries**, as described in **Section 4.2.1,** correspond to the duration that the likely residual adverse effects of the Project are predicted to occur. The *Marten Falls Community Access Road Project Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) indicate the cumulative effects assessment should look at potential effects throughout the life cycle of the Project, including decommissioning and abandonment; however, there are currently no plans to decommission the Project. Therefore, this assessment is limited to identifying and assessing cumulative effects during the Project Construction and Operation and Maintenance Phases.

**Spatial boundaries**, which are the study area(s) within which the geographic extent of cumulative effects will be studied, may vary by the residual effects of each Valued Component selected. For example, the geographic extent of residual effects on the migration patterns of wildlife Valued Components may differ from the geographic extent of habitat loss to the same Valued Components as a result of the Project. The spatial boundaries used to assess cumulative effects are described in **Section 8.1.2**.

#### 4.4.3.2.3 Identification of Past, Present, and Reasonably Foreseeable Developments

Activities that were considered in the cumulative effects assessment included other past and existing anthropogenic (i.e., human-made) developments and future activities that are reasonably foreseeable. For an activity to be considered foreseeable and included in the cumulative effects assessment, sufficient information about the activity must have been available to make a reasonable assessment of its potential effects (i.e., in the planning / approvals / design stage). This included induced development that is certain or reasonably foreseeable and activities with additive effects, where appropriate (Canadian Environmental Assessment Agency, 2018). Reasonably foreseeable activities that were not considered are those for which formal plans have not been publicly disclosed and information is not available. For a potential future project to be considered in the cumulative effects assessment, preliminary information such as activity description, activity size, footprint, project components, and anticipated timelines are needed to evaluate if the Project and the potential future project will overlap. The full list of past, present, and reasonably foreseeable developments considered in the cumulative effects assessment is presented in the *Environmental Assessment / Impact Statement Report*.

To determine which past, present, and reasonably foreseeable developments and their activities should be considered in the fish and fish habitat cumulative effects assessment, the following questions were answered. If effects of the activities of the projects are expected to overlap in type, time, and space with the residual effects of fish and fish habitat Valued Components, it was assumed that those activities would act cumulatively and be assessed for cumulative effects with the Project.

- Do the Project's activities overlap in the type of effects (e.g., effects on fish habitat quality)?
- Do the Project's activities overlap in the timing of effects (i.e., do they overlap with the cumulative effect temporal boundaries with the identified residual effects)?
- Do the Project's activities overlap in the location of effects (i.e., do they overlap with the cumulative effect spatial boundaries)?

Furthermore, Valued Components that did not have a residual effect predicted, or the residual effect is of negligible magnitude, unlikely or possible to occur, or positive in direction, the effect was not carried forward into the cumulative effects assessment.

### 4.4.3.3 Cumulative Effects Assessment

Following the scoping of the cumulative effects assessment, cumulative effects were assessed for applicable fish and fish habitat Valued Components. Cumulative effects on each Valued Component were identified by reviewing the effects of the Project with and without the other activities with consideration of climate change for longer-term activities.

Effects of past activities (i.e., activities that have been carried out) were used to contextualize the current state of the Valued Component.

Mitigation and enhancement measures that are technically and economically feasible to eliminate or reduce adverse cumulative effects were described. A qualitative assessment of the effectiveness of the measures was provided, taking into consideration all applicable reasonably foreseeable developments to provide a regional context. Cumulative effects were characterized using the same effects characteristics presented in **Table 4-12**.

## 4.5 Identify Monitoring Programs and Future Commitments

Following the residual and cumulative effects assessments, effects monitoring programs were recommended to verify the prediction of the effects assessment and the effectiveness of the mitigation and enhancement measures presented in this Report. Commitments made in this Report are also presented to support compliance monitoring to evaluate whether the Project has been constructed, implemented, and operated in accordance with the commitments made.

## 4.6 Predicting Future Conditions

The prediction of potential future conditions or amount of change from existing conditions for both route alternatives included:

- The number of road crossings and therefore waterbody crossing structures required;
- Considerations of waterbody crossing locations, structure types, and habitat features (for example, where low impact structures including clear span bridges are practical versus structures requiring infill);
- An estimated area of fish habitat within the Construction Disturbance Area using data from the habitat assessments and therefore area of potential disturbance, including temporary disturbance (e.g., in-water work areas and dewatering) during the Construction Phase (i.e., waterbody crossing structure installation) and Operation and Maintenance Phase (i.e., waterbody crossing repairs, replacements);
- Discussion of the existing activities and infrastructure which may currently or previously have had an effect on fish and fish habitat. Existing activities were identified using desktop analysis, consultation with local Indigenous communities, and field observations;
- An estimated area of fish habitat with the potential for permanent alteration or destruction during both the Construction and Operation and Maintenance Phases, within the Construction Disturbance Area; and

- The area of habitat important for fish life functions within the Construction Disturbance Area such as a Valued Component's important habitat features (e.g., spawning, nursery, and overwintering habitat) and therefore the potential to be changed or disturbed. Habitat suitability for these functions was identified and quantified in the Construction Disturbance Area for fish and fish habitat Valued Components, and in turn, the area of direct effect and / or disturbance from Project components (e.g., waterbody crossing structures) to such features were quantified.

Qualitative review of the potential future conditions and potential changes to sensitive features within the Construction Disturbance Area was described in **Section 7**. The predictions of changes as a result of the Project and future conditions were used to inform the effects assessment and identify mitigation and enhancement measures.

## 4.7 Data Management and Analysis

Data management including quality assurance / quality control has been employed to minimize potential for data entry and analysis errors, prepare datasets for analysis, and limit sensitive data distribution in accordance with established agreements.

### 4.7.1 Desktop Analysis

Fish and fish habitat conditions (e.g., habitat type and documented fish presence) collated from the desktop review were compiled at the local scale for each waterbody potentially affected by the Project (i.e., within the aquatic Local and Regional Study Areas) to inform and supplement the field investigations for the Construction Disturbance Area.

### 4.7.2 Field Surveys

A quality assurance / quality control program was used for the Project to minimize the possibility of error during data collection, data entry, and data interpretation. Trained and experienced field personnel were used. Specific work instructions were written to provide field crews with detailed methods to collect data.

All data were entered into Excel spreadsheets then incorporated into the waterbody crossing list to document the fish habitat conditions and fish captured during field surveys. Quality assurance / quality control for the waterbody crossing list involved the following tasks:

- Review by more than one person, including a senior fish biologist; and
- Review by a fish biologist and a water resources engineer.

### 4.7.3 Geographic Information Systems

Where existing conditions data are available in Geographic Information Systems format, this information will be provided to the Impact Assessment Agency of Canada as electronic geospatial data file(s) compliant with the International Organization for Standardization 19115 standard. This will support the Government of Canada's commitment to Open Science and Data and will facilitate the sharing of information with the public through the Canadian Impact Assessment Registry Internet Site and the Government's Open Science and Data Platform. The Impact Assessment Agency of Canada intends to make the geospatial data files available to the public under the terms of the *Open Government Licence – Canada,* excluding geospatial data files related to sensitive species at risk and Indigenous Knowledge.

Complete datasets from all survey sites will be provided upon finalization of this Report. They will be in the form of complete and quality assured relational databases, precisely georeferenced site information, precise observation / visit information, and with observations and measurements in un-summarized form. Databases and Geographic Information Systems files will be accompanied by detailed metadata that meets International Organization for Standardization 19115 standards. Documentation and digital files will be provided for all results of analyses that allow for a clear understanding of the methods and a replication of the results. All geographic data, along with accompanying metadata, pertaining to species at risk will be provided to the Natural Heritage Information Centre and the Ministry of Environment, Conservation and Parks – Species at Risk Branch.

### 4.7.4 Data Analysis

#### 4.7.4.1 Existing Conditions Data Collation

Data were collated to gather all available fish and fish habitat information at each proposed waterbody crossing. Data were collected in the field at each waterbody crossing and supplemented by a review of the sources outlined in **Attachments B** and **C**.

#### 4.7.4.2 Fish Habitat Quantity and Quality

Results of the desktop assessment and field investigations were then used to describe the fish habitat present at waterbody crossings. Fish habitat data were compiled by waterbody crossing to provide an overall summary by Construction Disturbance Area, Local Study Area, and Regional Study Area.

Fish habitat was described by the ranges of habitat conditions or habitat types using the data collected from the desktop assessments and the field investigations.

Metrics used to describe these typical habitat types of the Construction Disturbance Area included but may not be limited to mean geomorphic conditions observed in the Construction Disturbance Area (i.e., bankfull width, bankfull depth, and gradient), presence of habitat features (e.g., aquatic vegetation), bed substrate type, and fish passage barriers.

For understanding the overall habitat quantity and quality, fish habitat potential was rated for each waterbody crossing as having “Fish Habitat” or “No Potential Fish Habitat” for the possible fish species using the available habitat data. This rating was determined using habitat variables described previously. If a waterbody had potential to support fish, including the six Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot), it was rated as having Fish Habitat. If the waterbody was determined to have no defined beds or banks through field surveys or determination with high-resolution light detection and ranging imagery, the waterbody crossing was removed from the crossing list and rated as No Potential Fish Habitat. If there was any uncertainty about the fish habitat potential (i.e., light detection and ranging not available, watercourse obscured by trees during aerial reconnaissance or aerial surveys), a precautionary approach was used, and it was assumed the waterbody had Fish Habitat for small-bodied forage fish species.

To provide an estimate of the overall habitat quantity in square metres of each Valued Component fish species in the Project footprint, the estimated bankfull width at each waterbody crossing with potential for each Valued Component fish species (as outlined in the previous paragraph) was multiplied by a right-of-way width of 100 m. Data from fish habitat assessments conducted within the Construction Disturbance Area were extrapolated to describe the fish habitat in the Local Study Area.

#### 4.7.4.3 Benthic Invertebrates

Benthic invertebrates within samples were identified to family or lower level (species wherever possible) and enumerated by a qualified taxonomist. From the resulting abundance data, the results for each sample were summarized by calculating total density (i.e., number of organisms/$m^2$); richness (total number of taxa at the lowest level of identification); combined densities of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies); Simpson’s diversity index (measures the proportional distribution of organisms in the community, which takes into account the abundance patterns and taxonomic richness of the community); Simpson’s evenness index (measures the distribution of total abundance among the different taxa present in a sample); relative density (quantifies the relative proportion [%] of each major invertebrate group in the community at each station sampled, visually presented as stacked bar graphs); and species presence / absence. This approach allowed the identification of benthic invertebrate community patterns throughout the study areas.

#### 4.7.4.4 Fish Community

Fish community sampling data collected during the field surveys were summarized by waterbody crossing and Route Alternative. Catch-per-unit effort was calculated as a measure of relative abundance for each waterbody crossing location that was sampled (**Attachment B**, Annex A, Aerial Reconnaissance 2019). Fish age classes were documented (i.e., fry, juvenile, and adult) and supplemented observations of suitable spawning and nursery habitat.

### 4.7.5 Residual Effects Assessment

Fish and fish habitat conditions (e.g., habitat type and documented fish presence) for the Preferred Route were collated for the Construction Disturbance Area. A quality assurance / quality control program was used for the Project to minimize the possibility of error during data entry and data interpretation. Quality assurance / quality control for the Preferred Route waterbody crossing list involved the following tasks:

- Review by more than one person, including a senior fish biologist; and
- Review by a fish biologist and a water resources engineer.

Fish species data were used in the context of each waterbody crossing's tertiary watershed (or Local Study Area and Regional Study Area) so that the potential presence of a species in the waterbody crossings is based on the fish known to occur in the watershed. The fish habitat present at each waterbody crossing was evaluated against the habitat preferences of fish species that could potentially inhabit the Local Study Area and Regional Study Area. The potential for a fish species to be present at a waterbody crossing was evaluated based on a comparison to species-specific habitat requirements for spawning, rearing, and feeding were compared to site-specific habitat information gathered during field surveys. If the habitat at the waterbody crossing met the criteria for a fish species' suitable habitat, it was assumed to inhabit the waterbody at the crossing location. Furthermore, if habitat features suitable to a species' spawning behaviour was identified (e.g., coarse bed substrates, presence of aquatic vegetation, riffles), it was determined that there would also be the potential for that fish to spawn at the waterbody crossing location. Indigenous Knowledge of species documentation, traditional fish capture locations, and known spawning locations were also incorporated into the habitat evaluations at each waterbody crossing. Finally, a waterbody crossing's proximity to a historical fish capture location, including those documented near the crossing from the Cliffs Chromite Project (Golder, 2013) was considered in the determination of fish habitat potential.

Quantitative assessments were completed to calculate the fish habitat availability for each of the six Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot).

If there were any uncertainties about the ability of a waterbody to support a species of fish, a conservative approach was used, and it was assumed the species may be present in the waterbody.

# 5 Existing Conditions

The existing conditions for Alternative 1 and Alternative 4 are described based on a combination of information obtained through engagement and consultation, desktop assessment, and field investigations. This section provides a description of existing environmental conditions for fish and fish habitat. For the purpose of this Report, “existing environmental conditions” are defined as those present at the time of assessment within the study areas (i.e., from 2019 to 2022). The characterization of the existing environment serves as the baseline condition for which the environmental effects of the Project will be predicted.

The existing fish and fish habitat conditions are described in the Construction Disturbance Area, Local Study Area, and Regional Study Area for all fish species, including the six fish species selected as Valued Components for the fish and fish habitat assessment. The six fish Valued Component species are further assessed in detail in **Section 5.5**. The existing conditions are presented by Route Alternative with consideration of the indicators for the assessment, including fish habitat quantity and quality, fish community and distribution, and any changes to habitat conditions that could affect fish survival and reproduction.

## 5.1 Aquatic Food Web

Food webs represent the feeding relationships within an ecological community. Phytoplankton and algae typically form the bases of aquatic food webs. They are eaten by primary consumers like zooplankton, benthic invertebrates (**Section 5.3**), and small fish (**Section 5.4**). Primary consumers are in turn eaten by fish. Fish have an important role in the function of the aquatic food web. Consumption of lower trophic level organisms, such as benthic invertebrates, by fish contributes to regulation of trophic structure and, thus, influences the stability, resilience, and food web dynamics of aquatic ecosystems.

Lower trophic organisms are plentiful in the aquatic Local Study Area and are often the primary food source for fish communities. Lower trophic organisms can act as early warning indicators of the health of the aquatic ecosystem due to their abundance and wide distribution. Lower trophic organisms are the primary producers and decomposers of an aquatic ecosystem, transferring nutrients and energy from the sediment–water interface into the food chain (Smith and Smith, 2001).

Phytoplankton communities consist of microscopic plant-like single cellular and multicellular organisms that live suspended in the water column of lakes and grow in colonies (i.e., periphyton) on coarse substrates of watercourse environments (Kalff, 2002). Phytoplankton are often the primary producers in these systems. The phytoplankton community in northern Ontario aquatic ecosystems is often dominated by cyanobacteria (organisms that obtain energy through photosynthesis), although diatoms (i.e., unicellular algae) often play a key role in the phytoplankton community (Kalff, 2002).

Cryptophytes (i.e., a type of algae) are often secondary contributors in terms of abundance and often represent the greatest proportional biomass in oligotrophic (i.e., nutrient poor) lakes (Kalff, 2002). Plankton communities, including phytoplankton and zooplankton, were not sampled per the *Draft All Season Community Access Road: Fish and Fish Habitat Study Plan* (Fish and Fish Habitat Study Plan; AECOM Canada Ltd., 2021) and *All Season Community Access Road: Fish and Fish Habitat Field Logistics Workplan* (Fish and Fish Habitat Workplan; Golder, 2021).

Zooplankton communities consist of microscopic free-floating animals suspended in the water column. They are abundant, diverse, and highly variable in their seasonality and distribution within waterbodies (Wetzel, 2001). Zooplankton act both as filter feeders and carnivores, providing a primary food source to young of the year (i.e., less than one year old) fish and cyprinids (Scott and Crossman, 1998). Zooplankton of oligotrophic systems are often dominated by crustaceans (subclass Copepoda) in both abundance and biomass (Carney, 1990), including water fleas (order Cladocera) and calanoid copepods (order Calanoida) as well as a few rotifers (phylum Rotifera).

Benthic invertebrates are an important link in aquatic food webs. Benthic invertebrates are bottom-dwelling organisms (e.g., clams, worms, crustaceans, insects) living on or within the sediment of waterbodies. Most are herbivores, detritivores, or filter feeders, deriving much of their energy from algae, aquatic plants, and decaying organic material; however, some are predators, typically feeding upon other invertebrates. Many fish species, including early life history stages of piscivorous species, rely upon benthic invertebrates as a food source.

## 5.2 Fish Habitat Quantity and Quality

This section provides an overall summary of fish habitat for the existing conditions Construction Disturbance Area (i.e., the Project footprint, which encompasses a 100 m wide right-of-way for each Route Alternative), the existing conditions Local Study Area, and the existing conditions Regional Study Area, with additional details for Alternative 1 and 4 in **Sections 5.2.1** and **5.2.2,** respectively.

The existing conditions Construction Disturbance Area is located in the Albany River primary watershed and in the Upper Albany – Makokibatan, Lower Ogoki, and Upper Albany – Muswabik tertiary watersheds (**Attachment E – Waterbody Crossing List**).

A total of 91 crossings were described in the existing environment characterization and of these:

- 40 waterbody crossings are on Alternative 1;
- 38 waterbody crossings are on Alternative 4; and
- 13 waterbody crossings overlap both Alternative 1 and 4.

There are three sections of the Alternative 1 and 4 that overlap. Therefore, Alternative1 has 53 total waterbody crossings (40 on Alternative 1 alone, plus the 13 that overlap), and Alternative 4 has 51 total waterbody crossings (38 on Alternative 4 alone, plus the 13 that overlap). Nine waterbody crossings are on named, large permanent rivers, including the Albany, Wabassi, Dusey, and Ogoki rivers.

A total of 73 unmapped water features without defined beds or banks (a criterion for the definition of a waterbody in Ontario [*Conservation Authorities Act*; Government of Ontario, 1990; Stanfield, 2017]) were not considered waterbodies and thus are not included in the crossing list. The list of 73 undefined water features with supporting data (e.g., aerial photographs, light detection and ranging screengrabs) is provided in **Attachment D** – **Undefined Crossings**.

The aquatics existing conditions Local Study Area contains many waterbodies that provide fish habitat and have potential to support many different fish species. The larger waterbodies (i.e., greater than 5 m bankfull width) in the aquatics existing conditions Local Study Area provide fish habitat year-round, including spawning, rearing, feeding, and overwintering habitat. The smaller waterbodies in the aquatics existing conditions Local Study Area may not provide overwintering habitat, as oxygen levels in shallow lakes and wetlands can drop to hypoxic conditions and the watercourses may freeze to bottom. However, these smaller waterbodies can provide suitable habitat for spawning, rearing, and feeding for portions of the year, typically in early spring and after the spring freshet. Spring and fall spawning habitat are available in the aquatics existing conditions Local Study Area for a variety of species. For example, the smaller watercourses with slow moving water and instream vegetation would provide spring spawning habitat for Northern Pike or forage species such as minnows. The watercourses with faster moving water and coarse substrates (i.e., gravel or cobble) would provide fall spawning habitat for Brook Trout or spring spawning habitat for sucker species. Some of the larger watercourses may provide spawning habitat for Lake Sturgeon. The lakes (e.g., Patience Lake) in the aquatics existing conditions Local Study Area may also provide spawning habitat for lake spawning species including Walleye.

There are 19,779 km of mapped watercourses (**Table 5-1**) in the fish and fish habitat existing conditions Regional Study Area. The total length of watercourses is greatest in the Upper Albany – Makokibatan tertiary watershed, with the total length of watercourses being the lowest in the Upper Albany – Muswabik tertiary watershed.

**Table 5-1: Total Length of Watercourses in the Aquatics Regional Study Area by Tertiary Watershed**

| Tertiary Watershed | Total Length of Watercourses in the Regional Study Area (km) |
|---|---|
| Upper Albany – Makokibatan | 9,136 |
| Upper Albany – Muswabik | 4,660 |
| Lower Ogoki | 5,983 |
| **Total** | **19,779** |

Notes: km = kilometre.

A summary of the waterbody crossings by Route Alternative is provided in the following sections. The habitat potential for each waterbody will vary depending on location (e.g., habitat potential may be higher in lower reaches near a major waterbody than in upper reaches in a watershed). The discussion in **Section 5.2** is for the habitat potential at the crossing location in the fish and fish habitat existing conditions Local Study Area.

Indigenous Knowledge obtained from Aroland First Nation, Fort Albany First Nation, and Marten Falls First Nation has also suggested the following relating to potential fish habitat quantity and quality for locations including the Albany River, the Dusey River, the Kawashkagama River, Henley River, the Wabassi River, the Ogoki River, the Old Man River, Ruby Creek, the creek connecting Terrier Lake and Hauenstein Lake, Briarcliffe Lake, Durer Lake, Kapikotongwa Lake, Melchett Lake, Nass Lake, Teabeau Lake, Tennant Lake, Patience Lake, Pledger Lake, Trebell Lake, Tolfree Lake, Long Neck Island, and the Snake Rapids:

- The Albany River, Ogoki River, and Ruby Creek provide habitat and spawning areas for several fish species, including Brook Trout, Lake Sturgeon, Northern Pike, Suckers, Walleye, and Lake Whitefish, including at Snake Rapids (Dillon, 2024a; Firelight Research Inc., 2024; Marten Falls First Nation, 2023; Shared Value Solutions, 2024);
- The presence of Lake Sturgeon feeding and spawning areas (including in the main channel) was noted along the Ogoki River, where one of these areas overlaps with proposed road-river crossings at the southern end of the road (Shared Value Solutions, 2024; Marten Falls First Nation, 2023);
- The presence of fish spawning areas within Ogoki Lake, Melchett Lake, Tennant Lake, Kapikotongwa Lake, Briarcliffe Lake, Nass Lake, and Durer Lake (Shared Value Solutions, 2024);
- Fish spawning areas near water crossings at the Kawashkagama River and Kapikotongwa River, as well as the creek connecting Terrier Lake and Hauenstein Lake, and other unnamed creeks (Shared Value Solutions, 2024);

- Presence of Lake Whitefish and Northern Pike at Tolfree Lake (Marten Falls First Nation, 2023);
- The Dusey River was noted as providing spawning habitat for Brook Trout and Northern Pike (Marten Falls First Nation, 2023);
- The Wabassi River was noted as providing habitat for Northern Pike, Trout, and Walleye south of the confluence of the Wabassi River (Marten Falls First Nation, 2023);
- Presence of Brook Trout, Lake Sturgeon, Ling (Burbot), Northern Pike, Sucker, Walleye, and Lake Whitefish at Teabeau Lake and the Albany River (downstream of Washi Lake (Marten Falls First Nation, 2023);
- Patience Lake was noted a location for setting nets to catch Lake Sturgeon, as well as a location where Lake Sturgeon spawning habitat may be present. Aroland First Nation also noted a desire that the area east of Patience Lake – where a crossing is proposed, remains protected (Marten Falls First Nation, 2023; Shared Value Solutions, 2024);
- Presence of presence of Brook Trout and Walleye south of Long Neck Island (Marten Falls First Nation, 2023a);
- Presence of Brook Trout and Walleye at Gourlie Creek southwest of Trebell Lake (Dillon, 2024a; Marten Falls First Nation 2023); and
- Presence of spawning habitat for Brook Trout within the vicinity of sand bars (Marten Falls First Nation, 2021a) and Lake Sturgeon habitat located on the Old Man River (Marten Falls First Nation, 2023).

Indigenous Knowledge provided by Marten Falls First Nation, Aroland First Nation, and Fort Albany First Nation has also noted that anthropogenic activities including the damming and diversion of waterways within the communities' traditional territory have impacted fish and fish habitat; this includes historical impacts related to damming and diversion activities at Big Trout Lake and Lake St. Joseph at the headwaters of the Albany River, as well as on the Ogoki River due to the Waboose Dam (Firelight Research Inc., 2024; Marten Falls First Nation, 2023a; Shared Value Solutions, 2024). One community member from Aroland First Nation noted the following regarding damming and diversion of waterways:

> *"You know that dam they got in Ogoki? The Ogoki? That big dam they got, Waboose dam, they call it? That caused a lot of problems for them back then. All the sturgeon and all the river beaver, muskrat. Caused a lot of problems for them. Every time they opened that dam, all those spawning fish would get washed away. Same thing with the little beaver and the little muskrat. Washed them away. Caused a lot of problems back then. And still to this day, that's what's the problem now with that dam. When they release it, everything's gone. And they were saying that, my parents were saying that when the little beavers and the little muskrat, when they were getting born or whatever, they would wash away. Because when they let that dam go, everything that's along the river washes away."* (Shared Value Solutions, 2024).

One community member from Fort Albany First Nation noted the following regarding observations of low water levels.

> *"It's really dry now, just when I went to Albany recently … in the summertime. That river used to be full of water. Now it's just rocks and boulders. People drive around their trucks now or four-wheelers [in exposed section of the river] Because of lack of water."* (Firelight Research Inc., 2024).

Weenusk First Nation also noted observations relating to changes in fish quantities as a result of changes to water levels in nearby systems, noting:

> "*The number [of fish] has changed, and I think it's because the river system has changed as well (…) The river system has become shallower every year and it's hard for fish to be (…) in the waters where it's shallow.*" (MNP LPP, 2024)

### 5.2.1 Alternative 1

There are 53 waterbodies crossed by the 100 m Alternative 1 right-of-way (40 by Alternative 1 only and 13 crossed by overlapping sections of Alternatives 1 and 4). Fifty-two of the waterbody crossings are on watercourses and one is on a lake or pond (**Table 5-2**).

The majority (*n* = 46) of the crossings are on permanent (i.e., flows for most of the year but can run dry during drought conditions) waterbodies, and no crossings are on non-permanent waterbodies (i.e., ephemeral draws or intermittent waterbodies). There are seven crossings on waterbodies with unknown flow regimes (i.e., waterbodies that were not in the Land Information Ontario database [Government of Ontario, 2015b], classified as having an unknown flow regime). Thermal regimes (i.e., the Ministry of Natural Resources' classification of waterbodies based on water temperature and fish species present) are unclassified at most (*n* =49) waterbody crossings. However, a cold water regime was identified at three crossings in the Lower Ogoki tertiary watershed (two crossings on the Ogoki River and the Dusey River) and at the Albany River crossing in the Upper Albany – Makokibatan tertiary watershed (**Table 5-2**).The bankfull widths range from less than 1 m to approximately 200 m and the majority (*n* = 30) of channels are considered large (i.e., have bankfull widths greater than 5 m).

As described in the *Surface Water Technical Support Document: Existing Conditions and Effects Assessment* (WSP Canada Inc., 2026a), average total phosphorus concentrations in surface water correspond to mesotrophic type water (i.e., a moderate amount of plant nutrients, such as nitrogen or phosphorus are available) as defined by the Canadian Council of Ministers of the Environment guidelines. Mesotrophic waters are generally moderately productive for lower trophic levels and fish (i.e., primary and secondary productivity).

## Table 5-2: Summary of Fish Habitat Variables of Waterbodies Crossed by Alternative 1

| Tertiary Watershed | Number of Waterbody Crossings | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Waterbody Type | | | Flow Regime | | | Thermal Regime | | | Bankfull Width (m) | | | |
| | Lake or Pond | Watercourse | Total | Permanent | Non-Permanent | Unknown | Cold | Cool | Unknown | <5 | ≥5 | Min | Max |
| Upper Albany – Makokibatan | 1 | 29 | 30 | 24 | 0 | 6 | 1 | 0 | 29 | 13 | 17 | <1 | 200 |
| Lower Ogoki | - | 19 | 19 | 18 | 0 | 1 | 3 | 0 | 16 | 9 | 10 | 2 | 110 |
| Upper Albany – Muswabik | - | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 2 | 2.5 | 25 |
| **Total** | **1** | **52** | **53** | **46** | **0** | **7** | **4** | **0** | **49** | **24** | **29** | **<1** | **200** |

Notes: m = metre; < = less than; ≥ = greater than or equal to; min = minimum; max = maximum.

During the field surveys, a wide variety of aquatic habitat was observed. Habitat types observed included flats, runs, pools, and impoundments. Substrate types included organics, silt, sand, gravel, cobble, boulder, and bedrock. Cover types for fish included depth / turbulence, large woody debris, aquatic vegetation, substrate, and overhanging vegetation (**Table 5-3**). Beaver dams and debris piles were observed at five crossings. One unnamed watercourse (RA1-WC-41) was also identified by Indigenous Knowledge as having spawning habitat for Brook Trout within Alternative 1.

Observations during field surveys identified spawning habitat (e.g., suitable spawning substrate, water depth and velocity, habitat type) for all Valued Component fish species (Lake Sturgeon, Lake Whitefish, Brook Trout, Walleye, Northern Pike, and Burbot) in the Albany and Ogoki rivers and for Brook Trout, Burbot, Northern Pike, and Walleye in the Dusey River. Spawning habitat for Brook Trout was also identified in one unnamed watercourse (RA1-WC-17). Spawning habitat for Burbot was also identified in Gourlie Creek (RA1-WC-40) and one unnamed watercourse (RA1-WC-57). Northern Pike spawning habitat was also identified in the Wabassi River (RA1-WC-51) and in 22 unnamed watercourses. Spawning habitat for Walleye was identified in Gourlie Creek and two unnamed watercourses (RA1-WC-13 and RA1-WC-17). Potential spawning habitat for several forage fish species and other large-bodied fish species (e.g., suckers) was also identified in multiple crossings (**Table 5-3** and **Attachment B**). Spawning habitat for Johnny Darter (Oji-Cree translation, *ashaawe*) (*Etheostoma nigrum*) and Brook Stickleback (Oji-Cree translation, *ginooshench*) (*Culaea inconstans*) was available in all waterbody crossings on Alternative 1.

The Ogoki and Albany rivers have been identified by local Indigenous communities as waterbodies with high traditional value. Detailed field survey results for these rivers at the proposed Alternative 1 crossing locations are in **Attachment B**; however, due to their importance to the local Indigenous communities, the existing conditions at the crossings are also summarized in the following sections.

**Table 5-3: Fish Habitat Characteristics in Waterbodies Crossed by Alternative 1 from Field Survey Results (2019 to 2022)**

| Waterbody Crossing ID | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential |
|---|---|---|---|---|---|---|---|---|
| RA1-4-WC-01 | Unnamed | F | 1.3 | 3 | 0.7 | Or, Si | AV, UC, OV | Habitat suitable for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-02 | Dusey River | F, RF | 34.7 | 44 | 1.3 | Co, Bo, Gr, Sa, Si | Sub, D / T, WD, AV | Variety of habitat units and mixed substrates is suitable for a range of small- and large-bodied fish species. Overwintering habitat present. |
| RA1-4-WC-07 | Unnamed | F | 6 | N/A | 1.5 | Or | D / T, AV | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-09B | Unnamed | F | 3 | 3 | 3 | Or, Si | N/A | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-10 | Unnamed | F | 6 | 6 | 1.5 | Or | D / T, AV, WD | Habitat present for small-bodied fish species adapted to waterbodies with fine substrates. |
| RA1-4-WC-19 | Unnamed | F | 35 | 27 | 1.5 | Or | D / T, AV | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-21 | Unnamed | F | 5.5 | 6 | 1.2 | Or | AV, D / T | Habitat present for fish species adapted to fine substrates and abundant vegetation. |
| RA1-4-WC-27 | Unnamed | F | 4 | 4 | 1 | Or | N/A | Habitat present for fish species adapted to waterbodies with fine substrates. |
| RA1-4-WC-31 | Buffaloskin River | F | 7 | 8 | 0.8 | Or | WD | Suitable habitat present for fish adapted to fine substrates. |
| RA1-4-WC-33 | Unnamed | F | 5.2 / 2.0 | 5.7 | 0.6 / 0.7 | Or | AV, OV | Suitable habitat present for small-bodied fish adapted to fine substrates. |
| RA1-4-WC-35 | Unnamed | F, IP | 2.7 | 3.2 | 0.7 | Or, Sa | UC, WD, D / T, AV, OV | Suitable habitat present for small-bodied fish. Overwintering habitat present. |
| RA1-4-WC-36 | Unnamed | F | 14.5 | 15.5 | >2 | N/A | D / T, AV, WD, OV | Suitable habitat present for fish adapted to fine substrates. Overwintering habitat present. |
| RA1-4-WC-37 | Unnamed | F, SF, IP | 0.45 | 0.5 | 0.25 | Or, Si, Sa | OV, UC | Habitat suitable for species adapted to fine substrates. |
| RA1-WC-01 | Unnamed | IP, F, RF, P, R | 4.8 | 5.5 | 0.5 | Or, Bo, Co, Si, Sa | D / T, AV, WD, Sub, OV | Variety of habitat units and mixed substrates is suitable for a range of small- and large-bodied fish species. Overwintering habitat present. |
| RA1-WC-02 | Unnamed | F, P, RA | 8 | 8 | 1.3 | Bo, Co, Si | D / T, Sub, WD, OV | Habitat suitable for a range of small- and large-bodied fish due to depths and mixed substrates. Overwintering habitat present. |
| RA1-WC-05 | Ogoki River | R, RF | 48 | 73 | >1.5 | Bo, Co, Gr, Sa | Sub, D / T, WD, AV | Large- and small-bodied fish historically documented. Habitat suitable for a range of fish due to depths and mixed substrates. Overwintering habitat present. |
| RA1-WC-09 | Unnamed | IP | 2.1 | 2.4 | 2.6 | Or | UC, WD, OV | Habitat suitable for small-bodied fish species. |
| RA1-WC-11 | Ogoki River | F, R | 100 | 110 | 2 | Co, Si, Or | D / T, Sub, AV | Habitat suitable for a range of fish due to depths and mixed substrates. Large- and small-bodied fish historically documented. Overwintering habitat present. |
| RA1-WC-13 | Unnamed | RF, R | 9 | 9 | N/A | Co, Bo | Sub | Habitat suitable for small-bodied fish and Northern Pike. |
| RA1-WC-14 | Unnamed | F | 3 | 3.5 | 1.2 | Or, Si | D / T, WD, UC | Habitat suitable for small-bodied fish species adapted to fine substrates and low dissolved oxygen. |
| RA1-WC-15 | Unnamed | F | 22 | 4 | N/A | Or | AV | Habitat suitable for small-bodied fish and Northern Pike. |
| RA1-WC-16 | Unnamed | F | 50 / 70 | 6.5 | 1.7 | Or | D / T, AV | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-17 | Unnamed | R | 9 | 10 | 0.9 | Gr, Sa, Si, Co, Bo, Or | D / T, Sub, AV, WD, UC, OV | Habitat present for small- and large-bodied fish. Overwintering habitat present. |
| RA1-WC-19 | Unnamed | F | 20 | 2 | 1 | Or, Si | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. |

| Waterbody Crossing ID | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential |
|---|---|---|---|---|---|---|---|---|
| RA1-WC-19B | Unnamed | R | 1.5 | 2 | - | Or | N/A | Suitable habitat may be present for small-bodied fish. |
| RA1-WC-20 | Unnamed | F, IP | 2 | 2 | <1 | Or | N/A | Habitat suitable for small-bodied fish species adapted to organic substrates. |
| RA1-WC-22 | Unnamed | F, IP | 50 | 17 | 1 | Or, Si | D / T, AV, WD | Habitat suitable for small- and large-bodied fish. Limited overwintering habitat. |
| RA1-WC-23 | Unnamed | R | 90 | 95 | >2 | Si, Or | D / T, AV | Suitable habitat for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-25 | Unnamed | N/A | N/A | N/A | N/A | N/A | N/A | Not a watercourse. No bed or banks present, no signs of bed scour. Unnamed drainage that provides a hydrological connection between two waterbodies. No fish habitat. |
| RA1-WC-26 | Unnamed | F | 1.25 | 2 | 0.2 | Or, Si | WD, OV, UC | Low habitat potential to for small-bodied fish. |
| RA1-WC-27 | Albany River | R, RA | 180 | 200 | >1 | Bo, Co, Be | D / T, Sub | Large- and small-bodied fish historically documented. Habitat suitable for a wide range of fish. Overwintering habitat present. |
| RA1-WC-28 | Unnamed | R, P | 2 | 2.5 | 0.3 | Or, Sa, Bo | WD, OV, UC | Habitat suitable for small-bodied fish. |
| RA1-WC-30 | Unnamed | F | 40 | 3.3 | 0.8 | Sa, Or | D / T, AV, WD, Sub, OV | Habitat suitable for both large- and small-bodied fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-31 | Unnamed | N/A | N/A | N/A | N/A | N/A | N/A | Not a watercourse. No bed or banks present, no signs of bed scour. Unnamed drainage that provides a hydrological connection to a watercourse. No fish habitat. |
| RA1-WC-32 | Unnamed | F | 90 | 6 | 1.2 | Or | D / T, AV, WD, OV | Habitat suitable for both large- and small-bodied fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-33 | Unnamed | N/A | N/A | N/A | N/A | N/A | N/A | Not a watercourse. No bed or banks present, no signs of bed scour. Unnamed drainage that provides a hydrological connection to a watercourse. No fish habitat. |
| RA1-WC-38 | Unnamed | F | 1.5 | 1.5 | <1 | N/A | OV, WD | Habitat may be suitable for small-bodied fish species adapted to fine substrates. Isolated sections of standing water. |
| RA1-WC-39 | Unnamed | F | 2 | 3 | <1 | Or | OV, WD | Habitat may be suitable for small-bodied fish species adapted to fine substrates. Isolated sections of standing water. |
| RA1-WC-40 | Gourlie Creek | F | 14 | 17 | >1 | N/A | N/A | The deep, wide, flat habitat likely provides overwintering and spawning habitat. |
| RA1-WC-41 | Unnamed | F | 4 | 4.3 | 1.1 | Or, Si, Bo | D / T, AV, OV, Sub, UC | Habitat suitable for both large- and small-bodied fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-51 | Wabassi River | F | 60 | 65 | >1.5 | Si, Or | D / T, AV | Habitat suitable for both large- and small-bodied fish. Overwintering habitat present. |
| RA1-WC-52 | Unnamed | F, IP | 1 | 40 | 0.1 | Or | WD, OV, AV | Habitat suitable for fish species adapted to fine / organic substrates and aquatic vegetation. |
| RA1-WC-53 | Unnamed | F | 68 | 68 | 0.8 | Or, Si | N/A | Habitat may be present for small-bodied fish species adapted to fine substrates and Northern Pike. |
| RA1-WC-54 | Unnamed | F | 40 | 40 | <1 | Or | AV | Habitat may be present for small-bodied fish species adapted to fine substrates and Northern Pike. |
| RA1-WC-56 | Unnamed | F | 50 | 0.5 | <0.5 | Or | N/A | Habitat may be present for small-bodied fish species adapted to fine substrates and Northern Pike. |
| RA1-WC-57 | Unnamed | F | 13.6 / 22 | 31.6 | >1.2 / >2 | Si, Sa, Or | D / T, AV, WD, OV, UC | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. |

| Waterbody Crossing ID | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential |
|---|---|---|---|---|---|---|---|---|
| RA1-WC-66 | Unnamed | F | 9 / 105 | 17 | 0.8 | Si, Or | AV, WD, OV | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present for small-bodied fish. |
| RA1-WC-67 | Unnamed | F | 18 | 22 | 1.1 | Si | D / T, AV, WD, OV | Habitat suitable for species adapted to fine substrates. Overwintering habitat present. |

Notes:
Additional information for the waterbody crossings in **Attachment B**.
m = metre; > = greater than; < = less than; N/A = not applicable; "-" = not able to be determined; RF = Riffle; RA = Rapid; R = Run; F = Flat; IP = Impoundment; P=Pool; SF = Subsurface flow; Or = organics; Si = silt; Sa = sand; Gr = gravel; Co = cobble; Bo = boulder; Be = bedrock; Sub = substrate; WD = woody debris; D / T = depth / turbulence; AV = aquatic vegetation; OV = overhanging vegetation; UC = undercut banks.

### Ogoki River at Crossing RA1-WC-05

A fish habitat assessment was completed on September 8, 2019, on the Ogoki River at crossing RA1-WC-05. The surveyed section had a mean wetted width of 48.3 m, a mean bankfull width of 73.3 m, and a mean water depth of greater than 1.5 m. Fish habitat consisted of runs (81%) and riffles (19%). No barriers to fish movement were observed in the surveyed section. Bed substrates consisted of boulders (45%), cobbles (29%), gravel (17%), and sand (9%). Cover for fish was provided primarily by large substrate (boulders) and water depth, with small amounts of woody debris and aquatic vegetation.

The surveyed section had potential to support a variety of small-bodied fish species as well as large-bodied fish. With average water depths greater than 1 m, the surveyed section had high overwintering potential for most fish species. Rearing and spawning habitat potential was high for both small- and large-bodied fish species due to suitable flow, water depths, types of cover, substrate (i.e., mix of coarse and fine), and habitats.

### Ogoki River at Crossing RA1-WC-11

Fish and fish habitat assessments were completed on June 29, 2022, and August 21, 2022, on the Ogoki River at crossing RA1-WC-11. The overall fish habitat results were comparable between seasons. In June 2022, the surveyed section had a mean wetted width of 100 m, a mean bankfull width of 110 m, and a mean water depth of greater than 2 m. Fish habitat consisted of deep flats (60%) and deep runs (40%). No potential barriers to fish movement were observed. Bed substrates consisted of cobble (55%), silt (40%), and organics (5%). Cover for fish was provided primarily by water depths, boulders, and aquatic vegetation.

With mean water depths greater than 2.0 m, suitable substrates (i.e., a mix of available coarse and fine), adequate dissolved oxygen concentrations, and sufficient flow, the surveyed section had moderate to high overwintering, spawning, and rearing potential for small- and large-bodied fish.

### Albany River at Crossing RA1-WC-27

A fish and fish habitat assessment was completed on October 24, 2020, on the Albany River at crossing RA1-WC-27. The surveyed reach had a mean wetted width of approximately 180 m, a mean bankfull width of 200 m, and a mean water depth exceeding 1 m throughout most of the surveyed section. Habitat in the surveyed section consisted of deep runs (92%) and rapids (8%) and bed substrates were boulder (70%), cobble (25%), and bedrock (5%). No barriers to fish movement were observed. Cover for fish was provided by water depth and boulders.

The surveyed section had high overwintering potential for all fish species as the average water depths were greater than 1 m. Spawning and rearing habitat potential was moderate to high for small- and large-bodied fish species, including Lake Sturgeon, which spawn over rocky substrates in fast flowing rapids. A Giant Floater (*Pyganodon grandis*), a native freshwater mussel commonly found in Ontario rivers with a wide distribution across Canada, was found at the crossing.

### 5.2.2 Alternative 4

There are 51 waterbodies crossed by the Alternative 4 100-m-wide right-of-way (**Figure 4-1**) (38 by Alternative 4 only and 13 crossed by overlapping sections of Alternatives 1 and 4). Forty-six of the waterbody crossings are on watercourses and five are on lakes or ponds (**Table 5-4**).

The majority (*n* = 49) of the crossings are on permanent waterbodies, and no crossings are on non-permanent waterbodies. There are two crossings on waterbodies with unknown flow regimes, which were therefore assumed to be permanent. Thermal regimes are unclassified by the Ministry of Natural Resources at most (*n* =47) waterbody crossings. However, there is an identification of a cold-water regime in the Dusey River in the Lower Ogoki tertiary watershed and in the Albany River in the Upper Albany – Makokibatan tertiary watershed. A cool water regime was identified for Ogoki River in the Lower Ogoki tertiary watershed (**Table 5-4**). The bankfull widths range from less than 1 m to approximately 356 m and the majority (*n* = 32) of channels are considered large (i.e., have bankfull widths greater than 5 m).

## Table 5-4: Summary of Fish Habitat Variables of Waterbodies Crossed by Alternative 4

| Tertiary Watershed | Number of Waterbody Crossings | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Waterbody Type | | | Flow Regime | | | Thermal Regime | | | Bankfull Width (m) | | | |
| | Lake or Pond | Watercourse | Total | Permanent | Non-Permanent | Unknown | Cold | Cool | Unknown | <5 | ≥5 | Min | Max |
| Upper Albany – Makokibatan | 1 | 21 | 22 | 22 | 0 | 0 | 1 | 0 | 21 | 7 | 14 | 1.7 | 178 |
| Lower Ogoki | 4 | 21 | 25 | 23 | 0 | 2 | 1 | 2 | 22 | 9 | 16 | <1 | 349 |
| Upper Albany – Muswabik | 0 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 2 | 2.5 | 25 |
| **Total** | **5** | **46** | **51** | **49** | **0** | **2** | **2** | **2** | **47** | **18** | **32** | **<1** | **349** |

Notes: m = metre; < = less than; ≥ = greater than or equal to; min = minimum; max = maximum.

During the field surveys, a wide variety of aquatic habitat was observed (**Table 5-5** and **Attachment B**). Habitat units observed included flats, runs, riffles, pools, and impoundments. Substrate types included organics, silt, sand, gravel, cobble, boulder, and bedrock. Cover types for fish included depth / turbulence, large woody debris, aquatic vegetation, substrate, undercut banks, and overhanging vegetation. Beaver dams were observed at ten waterbody crossings. Indigenous Knowledge provided by Marten Falls First Nation has suggested that dams and additional anthropogenic activities have negatively impacted fish habitat, including spawning grounds in some waterbodies within the community's traditional territory; this includes historical impacts related to damming and diversion activities at Lake St. Joseph at the headwaters of the Albany River (Marten Falls First Nation, 2023).

Observations during field surveys identified spawning habitat (e.g., suitable spawning substrate, water depth and velocity, habitat type) for all Valued Component fish species (i.e., Lake Sturgeon, Lake Whitefish, Brook Trout, Walleye, Northern Pike, and Burbot) in Patience Lake, the Albany River, and the Ogoki River and for Brook Trout and Northern Pike, Burbot, and Walleye in the Dusey River. Spawning habitat for Brook Trout was also identified in the Wabassi River (RA4-WC-55) and five unnamed watercourses. Spawning habitat for Lake Sturgeon was also identified in one unnamed watercourse (RA4-WC-22). Burbot spawning habitat was also identified in the Wabassi River, Gourlie Creek (RA4-WC-41), and one unnamed watercourse (RA4-WC-22). Northern Pike spawning habitat was also identified in the Wabassi River, Gourlie Creek, Colpitts Creek, and 22 unnamed watercourses. Spawning habitat for Walleye was identified in the Wabassi River, Gourlie Creek, and three unnamed watercourses. Potential spawning habitat for several forage fish species and other large-bodied fish species (e.g., suckers) was also identified at multiple crossings (**Table 5-5** and **Attachment B**). Spawning habitat for Johnny Darter and Brook Stickleback was available in all waterbody crossings on Alternative 4.

The Ogoki and Albany rivers and Gourlie Creek have been identified by local Indigenous communities as waterbodies with high traditional value. Detailed field survey results at the proposed Alternative 4 crossing locations are in **Attachment B**; however, due to their importance to the local Indigenous communities, the existing conditions at the crossings are also summarized in the following sections.

**Table 5-5: Fish Habitat Characteristics in Waterbodies Crossed by Alternative 4 from Field Survey Results (2019 to 2022)**

| Waterbody Crossing ID | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential |
|---|---|---|---|---|---|---|---|---|
| RA1-4-WC-01 | Unnamed | F | 1.3 | 3 | 0.7 | Or, Si | AV, UC, OV | Habitat suitable for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-02 | Dusey River | F, RF | 34.7 | 44 | 1.3 | Co, Bo, Gr, Sa, Si | Sub, D / T, WD, AV | Variety of habitat units and mixed substrates is suitable for a range of small- and large-bodied fish species. Overwintering habitat present. |
| RA1-4-WC-07 | Unnamed | F | 6 | N/A | 1.5 | Or | D / T, AV | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-09B | Unnamed | F | 3 | 3 | 3 | Or, Si | N/A | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-10 | Unnamed | F | 6 | 6 | 1.5 | Or | D / T, AV, WD | Habitat present for small-bodied fish species adapted to waterbodies with fine substrates. |
| RA1-4-WC-19 | Unnamed | F | 35 | 27 | 1.5 | Or | D / T, AV | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-21 | Unnamed | F | 5.5 | 6 | 1.2 | Or | AV, D / T | Habitat present for fish species adapted to fine substrates and abundant vegetation. |
| RA1-4-WC-27 | Unnamed | F | 4 | 4 | 1 | Or | N/A | Habitat present for fish species adapted to waterbodies with fine substrates. |
| RA1-4-WC-31 | Buffaloskin River | F | 7 | 8 | 0.8 | Or | WD | Suitable habitat present for fish adapted to fine substrates. |
| RA1-4-WC-33 | Unnamed | F | 5.2 / 2.0 | 5.7 | 0.6 / 0.7 | Or | AV, OV | Suitable habitat present for small-bodied fish adapted to fine substrates. |
| RA1-4-WC-35 | Unnamed | F, IP | 2.7 | 3.2 | 0.7 | Or, Sa | UC, WD, D / T, AV, OV | Suitable habitat present for small-bodied fish. Overwintering habitat present. |
| RA1-4-WC-36 | Unnamed | F | 14.5 | 15.5 | >2 | N/A | D / T, AV, WD, OV | Suitable habitat present for fish adapted to fine substrates. Overwintering habitat present. |
| RA1-4-WC-37 | Unnamed | F, SF, IP | 0.5 | 0.5 | 0.3 | Or, Si, Sa | OV, UC | No fish captured; habitat suitable for species adapted to fine substrates. |
| RA4-WC-00 | Unnamed | R, IP, P | 3.5 | 4 | 0.8 | Or, Si, Sa, Gr | WD, AV, D / T | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. |
| RA4B-WC-01 | Ogoki River | R | 80 | 110 | >2 | Co, Bo, Gr, Sa, Si | D / T, AV | Habitat suitable for a range of fish due to depths and mixed substrates. Large- and small-bodied fish historically documented. Overwintering habitat present. |
| RA4B-WC-02 | Unnamed | F, IP | 2.2 | 2.4 | 0.6 | Or | D / T, AV, WD, OV, UC | Habitat suitable for fish species adapted to organic substrates and aquatic vegetation. |
| RA4B-WC-03 | Unnamed | F | <5 | N/A | N/A | N/A | N/A | Poorly defined channel with sections of ponded water that flows into McCaw Lake. Habitat may be present for small-bodied fish species. |
| RA4B-WC-04 | Unnamed | F | <5 | N/A | N/A | N/A | N/A | Poorly defined channel with sections of ponded water that flows into an unnamed lake. Habitat may be present for small-bodied fish species. |
| RA4-WC-02 | Colpitts Creek | F | 12 | 13 | 1 | Si, Bo | AV, WD, Sub, D / T | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-05 | Unnamed | F | 10 | 11 | 1.3 | Or, Si | D / T, AV, WD, UC | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-06 | Unnamed | N/A | N/A | N/A | N/A | N/A | N/A | Not watercourses. No bed or banks present, no signs of bed scour. Six drainage pathways in a wetland complex with multiple flow paths throughout. No fish habitat. |
| RA4-WC-07 | | | | | | | | |
| RA4-WC-08 | | | | | | | | |
| RA4-WC-09 | | | | | | | | |
| RA4-WC-10 | | | | | | | | |
| RA4-WC-11 | | | | | | | | |

| Waterbody Crossing ID | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential |
|---|---|---|---|---|---|---|---|---|
| RA4-WC-12 | Unnamed | F | 8.4 | 10 | 0.6 | Or | AV, UC, OV, D / T, WD | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. |
| RA4-WC-17 | Unnamed | F, IP | 80 | 8 | >1.5 | Or, Si | D / T, AV, WD | Habitat suitable for fish species adapted to organic / fine substrates and aquatic vegetation. |
| RA4-WC-18 | Rock Beaver Creek | F, R, RF | 18.2 | 18.2 | >2 | Co, Gr, Bo | AV, Sub, D / T, WD, OV, UC | Habitat suitable for a range of small- and large-bodied fish species. Overwintering habitat present. |
| RA4-WC-19 | Unnamed | F, R | 2.8 | 2.8 | 1.1 | Sa, Or, Si | D / T, AV, WD | Habitat present for fish species adapted to fine substrates and aquatic vegetation. |
| RA4-WC-21 | Unnamed | F | 12.5 | 8 | >1.5 | Or, Si | D / T, AV, OV | Habitat suitable for fish species adapted to organic / fine substrates and aquatic vegetation. |
| RA4-WC-22 | Unnamed | R, P, F, CH | 9 | 9.2 | 0.5 | Be, Bo, Co, Gr, Sa | D / T, WD, OV | Habitat suitable for fish that spawn in riffles or rapids with course substrates. |
| RA4-WC-23 | Unnamed | IP | 60 | 3.5 | <0.8 | Or | N/A | Poorly defined channel / flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. |
| RA4-WC-24 | Unnamed | F | 1 | 0.6 | 0.5 | Or | AV, UC | Habitat suitable for fish species adapted to fine / organic substrates. The watercourse connects two unnamed lakes / ponds. |
| RA4-WC-25 | Unnamed | F, RF | 6.8 | 7.5 | >2 | Bo, Sa, Gr, Co, Si | WD, Sub, AV, UC, D / T, OV | Habitat suitable for spawners over coarse substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-26 | Unnamed | IP, P, R | 5.5 / 2.3 | 5.5 / 2.3 | 0.8 / 0.4 | Or, Si, Bo, Sa, Gr, Co | Sub, OV, WD, AV | Habitat suitable for a range of fish due to depths and mixed substrates. |
| RA4-WC-27 | Unnamed | F | 53 | 178 | >1 | Or | D / T, AV, WD | Habitat present for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-29 | Unnamed | R | 8 | 8 | <1 | Or | N/A | Poorly defined channel in a wetland with sections of ponded water. Habitat may be present for small-bodied fish species. |
| RA4-WC-31 | Unnamed | R, F | 2.5 | 3 | 0.4 | Sa, Co, Bo, Gr | WD, OV, Sub | Habitat suitable for fish that are adapted to fine / organic substrates. |
| RA4-WC-32 | Unnamed | F, IP | 50 | 3 | <1 | Or | N/A | Poorly defined channel / flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. |
| RA4-WC-34 | Albany River | R | 50 | 70 | >2 | Bo, Sa, Co, Gr | D / T, Sub | Large- and small-bodied fish historically documented. Habitat suitable for a wide range of fish. Overwintering habitat present. |
| RA4-WC-35 | Unnamed | R | 1.3 | 1.7 | 0.3 | Gr, Si, Sa, Or | WD, UC | Habitat suitable for fish that are adapted to fine / organic substrates. |
| RA4-WC-37 | Unnamed | F | 9 | 6 | >1.5 | Or, Si | D / T, OV, AV | Habitat suitable for fish that are adapted to fine / organic substrates and aquatic vegetation. |
| RA4-WC-41 | Gourlie Creek | R | 31 | 34 | 1.5 | Sa, Si | D / T | The deep, wide, flat habitat likely provides overwintering and spawning habitat. |
| RA4-WC-42 | Unnamed | F | 4 | 6 | 0.9 | Or, Si | AV, WD, OV | Habitat suitable for fish that are adapted to fine / organic substrates, aquatic vegetation, and woody debris. |
| RA4-WC-43 | Unnamed | IP | 25 | - | <0.8 | Or | N/A | Poorly defined channel / flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. |
| RA4-WC-45 | Unnamed | F | 7 | 10 | 1.1 | Si, Or | WD | Habitat suitable for fish that are adapted to fine / organic substrates, flooded vegetation, and woody debris. |
| RA4-WC-55 | Wabassi River | R | 45 | 50 | 1.2 | Sa, Co, Gr, Bo | D / T, AV, Sub, UC | Habitat suitable for all fish due to wide variety of substrates available. Overwintering habitat present. |

| Waterbody Crossing ID | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential |
|---|---|---|---|---|---|---|---|---|
| RA4-WC-57 | Unnamed | F | 2 | 2 | 0.5 | Or, Si, Sa, Bo | WD, AV, OV, UC | Habitat suitable for fish that are adapted to fine / organic substrates and aquatic vegetation. |
| RA4-WC-58 | Unnamed | F | 5 | 15 | 0.8 | Or | AV, WD, OV | Habitat suitable for fish that are adapted to fine / organic substrates and woody debris. |

Notes:
Additional information for the waterbody crossings in **Attachment B**.
m = metre; > = greater than; < = less than; N/A = not applicable; "-" – not able to be determined; RF = Riffle, R = Run; F = Flat; IP = Impoundment; P=Pool; SF =Subsurface flow; CH = chute; Or = organics; Si = silt; Sa = sand; Gr = gravel; Co = cobble; Bo = boulder; Be = bedrock; Sub = substrate; WD = woody debris; D / T = depth / turbulence; AV = aquatic vegetation; OV = overhanging vegetation; UC = undercut banks.

### Ogoki River at Crossing RA4B-WC-01

A fish habitat assessment was completed on October 15, 2020, on the Ogoki River at crossing RA4B-WC-01. The surveyed section had a mean wetted width of 80 m and a mean bankfull width of 110 m. Water depth exceeded 2 m throughout most of the section. Habitat consisted entirely of runs (100%) and bed substrates were cobble (40%), boulder (30%), gravel (10%), sand (10%), and silt (10%). Cover for fish was provided by water depth and aquatic vegetation. No barriers to fish movement were observed.

The surveyed section had high overwintering potential for all species as the average water depths were greater than 1 m. Rearing and spawning habitat potential was high for all species due to the presence of suitable substrates, high dissolved oxygen concentrations, aquatic vegetation, and suitable water depths.

### Albany River at Crossing RA4-WC-34

Fish and fish habitat assessments were completed on September 6, 2019, October 26, 2020, and September 15, 2021, on the Albany River at crossing RA4-WC-34.

During the 2019 assessment, the surveyed section had a mean wetted width of 50 m and a mean bankfull width of 70 m. Water depth was greater than 2 m. Habitat in the surveyed section consisted entirely of runs (100%). Substrates consisted of boulders (46%), sand (26%), cobble (17%), and gravel (11%). Cover for fish was provided by water depth and substrate (i.e., boulders). No barriers to fish movement were observed. The fish habitat conditions in the surveyed section were similar in 2020 and 2021 with a mean wetted width of 70 m and mean bankfull width of 77 m. Other than the differences in widths between 2019 and 2020 / 2021, fish habitat parameters were similar in all three years.

The surveyed section had high overwintering potential for most fish species as average water depths were over one metre and it is expected that the Albany River would have flow and suitable dissolved oxygen levels under ice. Spawning and rearing habitat potential was moderate to high for small- and large-bodied fish species, including Lake Sturgeon, which spawn over rocky substrates in fast flowing rapids. Locations for Pickerel (i.e., Walleye) spawning, Lake Sturgeon fish harvesting, and general fish spawning areas / beds were identified in the Albany River between 130 m and 2 km of the crossing location (Marten Falls First Nation, 2019). Brook trout spawning locations have been identified near sand bars in the vicinity of the crossing.

### Gourlie Creek at Crossing RA4-WC-41

A fish and fish habitat assessment was completed on June 25, 2022, on *Onagwabiihkan'iih' Ziibih* (Oji-Cree name) / Evening Hunting River (local name) / Gourlie Creek at crossing RA4-WC-41.

The surveyed section had a mean wetted width of 31 m, a mean bankfull width of 34 m, and a mean water depth greater than 1.5 m. Within the surveyed section, fish habitat consisted entirely of deep run (100%). No potential barriers to fish passage were observed. Substrates could not be determined throughout as the channel was too deep and wide; however, bank substrates were sand (60%) and silt (40%). Cover for fish was provided by water depth.

The surveyed section had high overwintering potential for all species as average water depths were greater than 1 m; therefore, the watercourse was not likely to freeze to the bottom in winter. Rearing and spawning habitat potential was considered moderate for all fish, assuming heterogeneity in bed substrates and considering the size and depth of the watercourse.

## 5.3 Benthic Invertebrates

### 5.3.1 Alternative 1

Of the 23 sites sampled for benthic invertebrates along Alternative 1 (i.e., sites on Alternative 1 and Alternative 1-4), 21 were located in depositional habitat dominated by fine sediments and organic material, and two were in erosional habitat dominated by coarser substrates such as gravel and cobble.

Communities in depositional habitat were dominated by Chironomidae (midges). Communities in erosional habitats were more diverse, with a lower representation of chironomids and greater variation in dominant taxa. Representation by Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa was greater in erosional habitat than in depositional habitat. Ephemeroptera was often the second most abundant group in erosional habitat but was a minor component of depositional communities. Plecoptera taxa were only present in erosional habitat, consistent with the general habitat preferences of this group.

Average total density was greater in depositional habitats (12,276 organisms/$m^2$) and average richness was lower (15 taxa) compared to the two erosional sites sampled, which had an average density of 9,840 organisms/$m^2$ but a greater average richness of 42 taxa. Simpson's diversity index in depositional habitats indicate a fairly diverse community at all sites on Alternative 1, with a mean value of 0.83. The Simpson's evenness index values in depositional habitats show greater variability, with a range of 0.20 to 0.87. Simpson's diversity and evenness index values in erosional habitat showed less variability, with overall means of 0.87 and 0.20, respectively (**Table 5-6**).

**Table 5-6: Summary of Benthic Invertebrate Sampling Results in Waterbodies Crossed by Alternative 1**

| Waterbody Crossing ID | Type of Habitat | Total Density (organisms/$m^2$) | Richness (taxa / station) | EPT Density (organisms/$m^2$) | EPT Richness | Simpson's Diversity Index | Simpson's Evenness Index |
|---|---|---|---|---|---|---|---|
| RA1-WC-01 | Erosional | 17,625 | 38 | 4,822 | 8 | 0.90 | 0.26 |
| RA1-WC-02 | Depositional | 24,828 | 16 | 2,759 | 3 | 0.89 | 0.56 |
| RA1-WC-09 | Depositional | 5,287 | 9 | 0 | 0 | 0.77 | 0.49 |
| RA1-WC-14 | Depositional | 25,776 | 17 | 920 | 2 | 0.71 | 0.20 |
| RA1-WC-14 | Depositional | 16,580 | 15 | 1,839 | 3 | 0.85 | 0.43 |
| RA1-WC-22 | Depositional | 8,851 | 11 | 1,839 | 2 | 0.85 | 0.59 |
| RA1-WC-23 | Depositional | 12,874 | 16 | 1,839 | 1 | 0.91 | 0.72 |
| RA1-WC-26 | Depositional | 6,897 | 6 | 0 | 0 | 0.44 | 0.30 |
| RA1-WC-27 | Erosional | 2,056 | 46 | 1,084 | 17 | 0.83 | 0.14 |
| RA1-WC-28 | Depositional | 1,149 | 4 | 0 | 0 | 0.70 | 0.83 |
| RA1-WC-30 | Depositional | 7,141 | 18 | 474 | 3 | 0.92 | 0.68 |
| RA1-WC-32 | Depositional | 19,440 | 16 | 1,049 | 2 | 0.90 | 0.61 |
| RA1-WC-41 | Depositional | 4,899 | 18 | 690 | 2 | 0.94 | 0.87 |
| RA1-WC-51 | Depositional | 7,356 | 13 | 920 | 2 | 0.90 | 0.82 |
| RA1-WC-57 | Depositional | 12,672 | 19 | 2,543 | 4 | 0.86 | 0.38 |
| RA1-WC-66 | Depositional | 12,874 | 17 | 0 | 0 | 0.86 | 0.41 |
| RA1-WC-67 | Depositional | 12,486 | 23 | 489 | 4 | 0.90 | 0.45 |
| RA1-4-WC-01 | Depositional | 15,632 | 16 | 230 | 1 | 0.87 | 0.49 |
| RA1-4-WC-07 | Depositional | 16,552 | 12 | 0 | 0 | 0.86 | 0.61 |
| RA1-4-WC-33 | Depositional | 12,644 | 15 | 230 | 1 | 0.87 | 0.52 |
| RA1-4-WC-35 | Depositional | 9,310 | 16 | 230 | 2 | 0.86 | 0.45 |
| RA1-4-WC-36 | Depositional | 5,690 | 28 | 1,480 | 7 | 0.85 | 0.23 |
| RA1-4-WC-37 | Depositional | 18,851 | 15 | 0 | 0 | 0.74 | 0.25 |

Notes: organisms/$m^2$ = organisms per square metre; EPT = Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies).

### 5.3.2 Alternative 4

Of the 22 sites sampled for benthic invertebrates along Alternative 4 (i.e., sites on Alternative 4 and Alternative 1-4), 16 were located in depositional habitat dominated by fine sediments and organic material, and 6 were in erosional habitat dominated by coarser substrates such as gravel and cobble.

Communities in depositional habitats along Alternative 4 were dominated by Chironomidae. Communities in erosional habitat were co-dominated by Oligochaeta (aquatic worms), Pelecypoda (bivalves), and Ephemeroptera. Communities in erosional habitats were more diverse, with a lower representation of chironomids and greater variation in dominant taxa. Representation by Ephemeroptera, Plecoptera, and Trichoptera taxa was greater in erosional habitat. Ephemeroptera was often the second most abundant group in erosional habitat in Alternative 4 sites. Plecoptera taxa were only present in erosional habitat, consistent with the general habitat preferences of this group.

Average total density was greater in depositional habitats (16,411 organisms/$m^2$) compared to the erosional sites sampled (1,122 organisms/$m^2$). Average richness was similar at 19 taxa (depositional) and 22 taxa (erosional). Simpson's diversity index values in depositional habitats indicate a fairly diverse community at all sites on Alternative 4, with a mean value of 0.83. Simpson's evenness index values show greater variability in depositional habitat, with a range of 0.15 to 0.85. Simpson's diversity index at erosional sites had an overall range of 0.77 to 0.94 and a mean value of 0.84. Simpson's evenness index values were more variable among sites, with an overall range from 0.14 to 0.59 (**Table 5-7**).

**Table 5-7: Summary of Benthic Invertebrate Sampling Results in Waterbodies Crossed by Alternative 4**

| Waterbody Crossing ID | Type of Habitat | Total Density (organisms/m$^2$) | Richness (taxa / station) | EPT Density (organisms/m$^2$) | EPT Richness | Simpson's Diversity Index | Simpson's Evenness Index |
|---|---|---|---|---|---|---|---|
| RA4-WC-00 | Depositional | 81,523 | 38 | 5,977 | 3 | 0.91 | 0.30 |
| RA4-WC-02 | Depositional | 8,908 | 30 | 3,032 | 8 | 0.91 | 0.37 |
| RA4-WC-15 | Erosional | 5,287 | 9 | 0 | 0 | 0.77 | 0.54 |
| RA4-WC-18 | Erosional | 25,776 | 17 | 920 | 2 | 0.71 | 0.24 |
| RA4-WC-21 | Depositional | 6,897 | 8 | 460 | 1 | 0.85 | 0.85 |
| RA4-WC-22 | Erosional | 2,842 | 34 | 1,227 | 15 | 0.77 | 0.14 |
| RA4-WC-26 | Erosional | 1,328 | 28 | 215 | 4 | 0.94 | 0.59 |
| RA4-WC-31 | Erosional | 858 | 24 | 47 | 5 | 0.80 | 0.21 |
| RA4-WC-34 | Erosional | 327 | 15 | 68 | 2 | 0.78 | 0.28 |
| RA4-WC-37 | Depositional | 6,437 | 6 | 0 | 0 | 0.73 | 0.63 |
| RA4-WC-42 | Depositional | 16,365 | 22 | 1,839 | 3 | 0.90 | 0.45 |
| RA4-WC-45 | Depositional | 17,069 | 20 | 57 | 1 | 0.73 | 0.19 |
| RA4-WC-55 | Depositional | 10,330 | 22 | 72 | 2 | 0.86 | 0.15 |
| RA4-WC-57 | Depositional | 9,655 | 14 | 230 | 1 | 0.77 | 0.32 |
| RA4-WC-58 | Depositional | 19,080 | 24 | 690 | 1 | 0.87 | 0.33 |
| RA4B-WC-02 | Depositional | 17,945 | 15 | 1,379 | 3 | 0.78 | 0.30 |
| RA1-4-WC-01 | Depositional | 15,632 | 16 | 230 | 1 | 0.87 | 0.49 |
| RA1-4-WC-07 | Depositional | 16,552 | 12 | 0 | 0 | 0.86 | 0.61 |
| RA1-4-WC-33 | Depositional | 12,644 | 15 | 230 | 1 | 0.87 | 0.52 |
| RA1-4-WC-35 | Depositional | 9,310 | 16 | 230 | 2 | 0.86 | 0.45 |
| RA1-4-WC-36 | Depositional | 5,690 | 28 | 1,480 | 7 | 0.85 | 0.23 |
| RA1-4-WC-37 | Depositional | 18,851 | 15 | 0 | 0 | 0.74 | 0.25 |

Notes: organisms/m$^2$ = organisms per square metre, EPT = Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies).

# 5.4 Fish Community and Distribution

## 5.4.1 Alternative 1 and 4

### 5.4.1.1 Construction Disturbance Area

A total of 64 crossings in the existing conditions Construction Disturbance Area are either on waterbodies with documented fish presence or are connected (within 2 km) to waterbodies with documented fish presence (Marshall and Jones, 2011; Royal Ontario Museum, 2016; Scott and Crossman, 1998; Golder, 2013; Ministry of Natural Resources and Forestry, 2003, 2015a, 2020; Government of Ontario, 2015b). Most of the historical fish presence data were gathered during the field survey for the Cliffs Chromite Project (Golder, 2013). Most of the named waterbodies, and some of the smaller unnamed watercourses, have documented fish presence. The waterbodies in the existing conditions Construction Disturbance Area are with defined beds and / or banks are considered likely to have fish present even if there is no documented fish presence. During field surveys, fish were captured at 16 of the 46 sites sampled (**Table 5-8**). Fish species that have been historically documented at each waterbody crossing in the existing conditions Construction Disturbance Area are presented in **Attachment E**.

All six Valued Component fish species have been documented in the aquatics existing conditions Construction Disturbance Area. Based on historical sampling covering the area of the proposed crossing location, Brook Trout have been documented at 14 waterbody crossing locations, including the Albany River, Ogoki River, Colpitts Creek, Wabassi River, Buffaloskin River, Gourlie Creek, and several unnamed watercourses (Golder, 2013; Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b). Burbot have been documented at six waterbody crossing locations, including the Albany River, Colpitts Creek, and at two unnamed watercourses (Golder, 2013; Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b). Northern Pike have been documented at 40 crossing locations including the Albany River, Ogoki River / Patience Lake, Colpitts Creek, Dusey River, Wabassi River, Gourlie Creek, and several unnamed watercourses (Golder, 2013; Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b). Lake Sturgeon have been documented at 13 waterbody crossing locations including the Albany River, Ogoki River / Patience Lake, and several unnamed watercourses (Golder, 2013). Walleye have been documented at 35 waterbody crossing locations, including the Albany River, Ogoki River / Patience Lake, Dusey River, Gourlie Creek, Wabassi River, and several unnamed watercourses (Golder, 2013; Ministry of Natural Resources and Forestry, 2003, 2023a; Government of Ontario, 2015b). Lake Whitefish have been documented at 19 waterbody locations including the Albany River, Ogoki River / Patience Lake, Dusey River, and several unnamed watercourses (Golder, 2013; Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b).

Other large-bodied non-sportfish or sportfish species (e.g., White Sucker, Yellow Perch [Oji-Cree translation, *ajaawes]*) and several species of forage fish (e.g., Mottled Sculpin (*Cottus bairdii*), Emerald Shiner (Oji-Cree translation, *waashgijiiw ginooshench*) (*Notropis atherinoides*), Iowa Darter (*Etheostoma exile*; Oji-Cree translation, *ashaawench*), Brook Stickleback, Longnose Dace (*Rhinichthys cataractae*; Oji-Cree translation, *ozaaw ginooshench*), Blacknose Shiner (*Notropis heterolepis*), Northern Pearl Dace (*Margariscus nachtriebi*; Oji-Cree translation, *shaagawaako ginooshench*), and Common Shiner (*Luxilus cornutus*; Oji-Cree translation, *gwashgwebinew ginooshench*) have been historically documented in the existing conditions Construction Disturbance Area.

A number of fish species have been identified as culturally important to Indigenous communities including Aroland First Nation, Kashechewan First Nation, Fort Albany First Nation, Marten Falls First Nation, and Nibinamik First Nation. These communities have highlighted the importance of species including Brook Trout, Lake Trout, Lake Sturgeon, Northern Pike, Sucker, Walleye, Sauger, Lake Whitefish, Salmon[2], and Rainbow Trout[2] (Dillon, 2024b; Dillon 2024c; Firelight Research Inc., 2024; MNP LPP, 2024a; Marten Falls First Nation, 2023a). Members of Kashechewan First Nation have identified the pristine habitat provided by the Kistachowan Sipi (Albany River) watershed that flows through Kashechewan's traditional territory where a variety of fish are harvested through angling, gillnets, and ice fishing in the winter (MNP LPP, 2024a). In addition to the above, Weenusk First Nation noted the overall cultural importance of fish to the community (MNP LPP, 2024b).

Spring, fall, and winter spawning fish species have the potential to be present in the existing conditions Construction Disturbance Area (**Table 5-9**), with 33 spring spawning species, four fall spawning species, and one winter spawning species. Spring spawning species include Northern Pike, Lake Sturgeon, and Walleye as well as suckers, stickleback, and minnows (**Table 5-8**). Fall spawning species include trout and whitefish species, such as Brook Trout, Lake Trout (Oji-Cree translation, *namegos*), Lake Whitefish, and Cisco (Oji-Cree translation, *namegisooginoshe*). Burbot is the only winter spawning species present. If spawning habitat was identified (e.g., bed substrate type and presence of aquatic vegetation) at a waterbody crossing with the potential to support a species, it was conservatively assumed that suitable spawning conditions were also present (**Table 5-9**).

[2] Rainbow Trout and Salmon sp. have not been historically documented in the literature or sampling for the Project.

**Table 5-8: Summary of Fish Captured in Waterbodies Crossed by the Project During Field Surveys (2019 to 2022)**

| Number of Each Fish Species Captured | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Waterbody Crossing ID** | **Waterbody Name** | **Blacknose Shiner** | **Brook Stickleback** | **Burbot** | **Common Shiner** | **Finescale Dace** | **Fathead Minnow** | **Iowa Darter** | **Johnny Darter** | **Lake Chub** | **Mottled Sculpin** | **Northern Redbelly Dace** | **Northern Pike** | **Pearl Dace** | **Trout-perch** | **White Sucker** | **Yellow Perch** | **Undetermined** | **TOTAL** |
| RA1-4-WC-01 | Unnamed | - | 21 | - | - | 32 | - | - | - | - | - | - | - | - | 138 | - | - | - | **191** |
| RA1-WC-09 | Unnamed | - | 41 | - | - | 48 | - | - | - | - | - | - | 84 | - | 26 | - | - | - | **199** |
| RA1-WC-11 | Ogoki River | - | - | 3 | - | - | - | - | - | - | - | 1 | - | 3 | - | - | - | 1 | **8** |
| RA1-WC-17 | Unnamed | - | - | - | - | - | - | - | 3 | | 6 | | | 1 | - | - | - | - | **10** |
| RA1-WC-22 | Unnamed | - | 6 | - | 14 | 38 | 2 | - | - | - | - | - | - | - | 11 | 2 | - | - | **73** |
| RA1-WC-30 | Unnamed | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | **1** |
| RA1-WC-66 | Unnamed | - | 6 | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **7** |
| RA4-WC-00 | Unnamed | - | 70 | - | - | - | - | 8 | - | - | - | - | - | - | - | - | - | - | **78** |
| RA4-WC-02 | Colpitts Creek | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | **2** |
| RA4-WC-17 | Unnamed | - | 4 | - | - | 49 | 2 | 1 | - | - | - | - | 50 | - | 15 | - | - | - | **121** |
| RA4-WC-21 | Unnamed | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **3** |
| RA4-WC-22 | Unnamed | **1** | - | 1 | 1 | - | - | - | 9 | 1 | 4 | - | - | 1 | - | - | 1 | 1 | **20** |
| RA4-WC-24 | Unnamed | - | 1 | - | - | 19 | - | - | - | - | - | - | - | - | - | - | - | - | **20** |
| RA4-WC-25 | Unnamed | - | 2 | - | 20 | 34 | - | 2 | - | - | - | - | - | - | 12 | 8 | - | - | **78** |
| RA4-WC-26 | Unnamed | 1 | 4 | - | 35 | 34 | - | 4 | - | - | - | - | - | - | 16 | 2 | - | - | **96** |
| RA4-WC-41 | Gourlie Creek | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | **3** |
| **TOTAL** | | **2** | **158** | **4** | **70** | **255** | **4** | **15** | **13** | **1** | **10** | **1** | **134** | **6** | **218** | **12** | **3** | **2** | **910** |

Notes: Blacknose Shiner (*Notropis heterolepis*); Brook Stickleback (*Culaea inconstas*); Burbot (*Lota lota*); Common Shiner (*Luxilus cornutus*); Finescale Dace (*Chrosomus neogaeus*); Fathead Minnow (*Pimephales promelas*); Iowa Darter (*Etheostoma exile*); Johnney Darter (*Etheostoma nigrim*); Lake Chub (*Couesius plumbeus*); Mottled Sculpin (*Cottus bairdii*); Northern Redbelly Dace (*Chrosomus eos*); Northern Pike (*Esox lucius*); Pearl Dace (*Margariscus nachtriebi*); Trout-perch (*Percopsis omiscomaycus*); White Sucker (*Catostomus commersonii*); Yellow Perch (*Perca flavescens*).
- = not captured.

**Table 5-9: Fish Species Likely to Occur in the Local Study Area, their Habitat Preferences, and the Number of Waterbody Crossings with the Potential to Provide Habitat**

| Family | Oji-Cree Name | Common Name[a] | Scientific Name | Preferred Habitat[b] | Spawning Season and Habitat[c] | Waterbody Types where Species was Considered Potentially Present in for the Project and Preferred Spawning Habitat[d] | Number of Waterbody Crossings with Potential to Provide Rearing, Feeding, and Overwintering Habitat[e] | | Number of Waterbody Crossings with Potential to Provide Spawning Habitat in Addition to Rearing, Feeding, and Overwintering Habitat[e] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Alternative 1 | Alternative 4 | Alternative 1 | Alternative 4 |
| **Acipenseridae** | *nameh* | Lake Sturgeon[f,g] | *Acipenser fulvescens* | Cold waters along the bottom of lakes and large watercourses | ▪ Spring spawner<br>▪ Fast flowing watercourses over rocky substrate or woody debris | ▪ Lakes<br>▪ Large (>10 m) watercourses with suitable habitat<br>▪ Albany and Ogoki rivers<br>▪ Spawning in watercourses | 3 | 4 | 1 | 4 |
| **Catostomidae** | *namebin* | Longnose Sucker | *Catostomus catostomus* | Cold waters along the bottom of lakes and watercourses | ▪ Spring spawner<br>▪ Gravel beds in riffle areas in watercourses | ▪ Lakes and watercourses<br>▪ Spawning in watercourses | 47 | 36 | 11 | 13 |
| | *mishguajagash* | Shorthead Redhorse | *Moxostoma macrolepidotum* | Cool waters along the bottom of lakes and watercourses | ▪ Spring spawner<br>▪ Gravel beds in riffle areas in watercourses | ▪ Lakes and watercourses<br>▪ Spawning in watercourses | 47 | 36 | 9 | 13 |
| | *namebin* | Silver Redhorse | *Moxostoma anisurum* | Cool waters along the bottom of lakes and watercourses | ▪ Spring spawner<br>▪ Gravel beds in fast flowing watercourses | ▪ Lakes and watercourses<br>▪ Spawning in watercourses | 38 | 36 | 11 | 14 |
| | *namebin* | White Sucker | *Catostomus commersonii* | Cool waters along the bottom of lakes and large watercourses | ▪ Spring spawner<br>▪ Gravel beds in watercourses | ▪ Lakes and watercourses<br>▪ Spawning in watercourses | 38 | 36 | 11 | 12 |
| **Cottidae** | N/A | Mottled Sculpin | *Cottus bairdii* | Cold waters of lakes and watercourses | ▪ Spring spawner<br>▪ Under a rock or ledge in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 7 | 14 |
| | *ashhawew ginooshe* | Slimy Sculpin | *Cottus cognatus* | Cold waters of lakes and watercourses | ▪ Spring spawner<br>▪ Under a rock or ledge in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 7 | 7 |
| | *emikwaaniiwshtigwan ashaawe* | Spoonhead Sculpin | *Cottus ricei* | Cold waters of deep lakes and fast watercourses | ▪ Spring / summer spawner<br>▪ Lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 7 | 14 |
| **Cyprinidae** | *ginooshench* | Blacknose Shiner | *Notropis heterolepis* | Clear, cool waters of shallow vegetated areas of lakes and slow-moving watercourses with sand, gravel, and silt | ▪ Summer spawner<br>▪ Deposits adhesive eggs over sand or aquatic vegetation in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 14 | 17 |
| | *ginooshench* | Bluntnose Minnow | *Pimephales notatus* | Shallow waters in lakes and watercourses | ▪ Summer spawner<br>▪ Under rocks or woody debris in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 13 | 18 |

| Family | Oji-Cree Name | Common Name[a] | Scientific Name | Preferred Habitat[b] | Spawning Season and Habitat[c] | Waterbody Types where Species was Considered Potentially Present in for the Project and Preferred Spawning Habitat[d] | Number of Waterbody Crossings with Potential to Provide Rearing, Feeding, and Overwintering Habitat[e] | | Number of Waterbody Crossings with Potential to Provide Spawning Habitat in Addition to Rearing, Feeding, and Overwintering Habitat[e] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Alternative 1 | Alternative 4 | Alternative 1 | Alternative 4 |
| | *gwashgwebinew ginooshench* | Common Shiner | *Luxilus cornutus* | Cool, shallow watercourses, and occasionally in lakes | ▪ Spring spawner<br>▪ Under rocks or woody debris in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 7 | 14 |
| | *waashgijiiw ginooshench* | Emerald Shiner | *Notropis atherinoides* | Cool, open waters of lakes and lower reaches of watercourses | ▪ Summer spawner<br>▪ Gravel in lakes and watercourses | ▪ Lakes and watercourses | 53 | 51 | 13 | 16 |
| **Cyprinidae** | *magishtigwaanew ginooshench* | Fathead Minnow | *Pimephales promelas* | Shallow waters in lakes and watercourses | ▪ Spring / summer spawner<br>▪ Under rocks or woody debris in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 33 | 34 |
| | *Waashgijiiw gishooshench* | Finescale Dace | *Chrosomus neogaeus* | Cool lakes and watercourses with instream vegetation and silt and detritus substrate | ▪ Spring spawner<br>▪ Woody debris in watercourses and lakes | ▪ Lakes and watercourses | 53 | 51 | 33 | 34 |
| | *Shooniiyaawaapik ginooshench* | Golden Shiner | *Notemigonus crysoleucas* | Lakes and watercourses with instream vegetation | ▪ Summer spawner<br>▪ Instream vegetation in watercourses and lakes | ▪ Lakes and watercourses | 53 | 51 | 33 | 34 |
| | *ginooshench* | Lake Chub | *Couesius plumbeus* | Cold waters of lakes | ▪ Spring spawner<br>▪ Sand, gravel, or rocks in watercourses and lakes | ▪ Lakes and watercourses | 53 | 51 | 15 | 16 |
| | *ozaaw ginooshench* | Longnose Dace | *Rhinichthys cataractae* | Cool, fast flowing waters of watercourses with rocky substrate or in shallow waters of lakes | ▪ Spring / summer spawner<br>▪ Deposits eggs over substrate in riffles in watercourses | ▪ Lakes and watercourses | 53 | 51 | 10 | 12 |
| | *gwashgwebinew ginooshench* | Mimic Shiner | *Notropis volucellus* | Vegetated areas of lakes and slow-moving watercourses with sand and gravel substrates | ▪ Summer spawner<br>▪ Deposits adhesive eggs over aquatic vegetation | ▪ Lakes and watercourses | 53 | 51 | 30 | 34 |
| | *shaagawaako ginooshench* | Northern Pearl Dace | *Margariscus nachtriebi* | Shallow vegetated areas in cool and cold-water lakes and watercourses | ▪ Spring spawner<br>▪ Deposits eggs in sand or gravel | ▪ Lakes and watercourses | 53 | 51 | 13 | 18 |
| | *ozaawashko ginooshench* | Northern Redbelly Dace | *Chrosomus eos* | Vegetated areas of lakes and slow-moving watercourses with silt and detritus substrates | ▪ Spring / summer spawner<br>▪ Algal beds in lakes and watercourses | ▪ Lakes and watercourses | 53 | 51 | 26 | 29 |

| Family | Oji-Cree Name | Common Name[a] | Scientific Name | Preferred Habitat[b] | Spawning Season and Habitat[c] | Waterbody Types where Species was Considered Potentially Present in for the Project and Preferred Spawning Habitat[d] | Number of Waterbody Crossings with Potential to Provide Rearing, Feeding, and Overwintering Habitat[e] | | Number of Waterbody Crossings with Potential to Provide Spawning Habitat in Addition to Rearing, Feeding, and Overwintering Habitat[e] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Alternative 1 | Alternative 4 | Alternative 1 | Alternative 4 |
| **Cyprinidae** | *Agaachi makadew Bebesi ginooshench* | Spottail Shiner | *Notropis hudsonius* | Clear, cold waters of lakes and watercourses | ▪ Spring spawner<br>▪ Deposits eggs in sand in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 14 | 17 |
| **Esocidae** | *najwabe* | Northern Pike[g] | *Esox lucius* | Cool water of lakes and watercourses with instream vegetation | ▪ Spring spawner<br>▪ Shallow vegetated floodplains of lakes and watercourses | ▪ Lakes and watercourses | 37 | 50 | 27 | 28 |
| **Lotidae** | *mihzhash* | Burbot | *Lota lota* | Cold waters along the bottom of lakes and large watercourses | ▪ Winter spawner<br>▪ Sand or gravel substrate in lakes or large watercourses under ice cover | ▪ Lakes and watercourses<br>▪ Spawning in lakes and large watercourses (bankfull width >5 m)<br>▪ Within 2 km of a lake (connected) | 16 | 17 | 5 | 7 |
| **Gasterosteidae** | *ginooshench* | Brook Stickleback | *Culaea inconstans* | Cool watercourses and lakes | ▪ Spring / summer spawner<br>▪ Constructs organic debris nest | ▪ Lakes and watercourses | 53 | 51 | 53 | 50 |
| | *gayaagaachenchich ginooshench* | Ninespine Stickleback | *Pungitius pungitius* | Cool watercourses and lakes | ▪ Summer spawner<br>▪ Constructs organic debris nest | ▪ Lakes and watercourses | 53 | 51 | 26 | 29 |
| **Percidae** | *ashaawench* | Iowa Darter | *Etheostoma exile* | Along the bottom of clear lakes and watercourses | ▪ Spring spawner<br>▪ Shallow water with woody debris or roots in watercourses and lakes | ▪ Lakes and watercourses | 53 | 51 | 29 | 34 |
| | *ashaawe* | Johnny Darter | *Etheostoma nigrum* | Along the bottom of lakes and watercourses | ▪ Spring spawner<br>▪ Under rocks in watercourses and lakes | ▪ Lakes and watercourses | 53 | 51 | 53 | 51 |
| | *Shaagaawaako ashaawe* | Logperch | *Percina caprodes* | Along the bottom of lakes and watercourses with rocky and sandy substrate | ▪ Spring spawner<br>▪ Sand or gravel substrate in lakes or watercourses | ▪ Lakes and watercourses | 53 | 51 | 14 | 19 |
| **Percidae** | *ashaawench* | River Darter[f] | *Percina shumardi* | Clear, large watercourses, with moderate flows and gravel bottoms | ▪ Spring spawner<br>▪ Shallow areas of large watercourses over sand or gravel | ▪ Large watercourses (bankfull width ≥5 m) | 53 | 51 | 13 | 18 |
| | *gaabaabaatewnaagosich ogaas* | Sauger | *Sander canadensis* | Cool waters in lakes and watercourses | ▪ Spring spawner<br>▪ Sand or gravel substrate in lakes or watercourses | ▪ Lakes and watercourses | 21 | 25 | 7 | 10 |
| | *okaas* | Walleye[h] | *Sander vitreus* | Cool waters of watercourse and lakes | ▪ Spring spawner<br>▪ Gravel or rocky substrate in lakes or watercourses | ▪ Lakes and watercourses | 21 | 25 | 7 | 9 |

| Family | Oji-Cree Name | Common Name[a] | Scientific Name | Preferred Habitat[b] | Spawning Season and Habitat[c] | Waterbody Types where Species was Considered Potentially Present in for the Project and Preferred Spawning Habitat[d] | Number of Waterbody Crossings with Potential to Provide Rearing, Feeding, and Overwintering Habitat[e] | | Number of Waterbody Crossings with Potential to Provide Spawning Habitat in Addition to Rearing, Feeding, and Overwintering Habitat[e] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Alternative 1 | Alternative 4 | Alternative 1 | Alternative 4 |
| | *ajaawes* | Yellow Perch | *Perca flavescens* | Slow moving watercourses and lakes | ▪ Spring spawner<br>▪ Over vegetation or wood debris in lakes and watercourses | ▪ Lakes and watercourses | 34 | 31 | 23 | 23 |
| **Percopsidae** | *Namegosi ashaawench* | Trout-perch | *Percopsis omiscomaycus* | Cool lakes and occasionally watercourses | ▪ Spring / summer spawner<br>▪ Rocky substrates in lakes and watercourses | ▪ Lakes and watercourses | 53 | 51 | 16 | 18 |
| **Salmonidae** | *masamekos* | Brook Trout[g] | *Salvelinus fontinalis* | Cold, well-oxygenated watercourses and lakes | ▪ Fall spawner<br>▪ Gravel substrates in riffles in watercourses or groundwater upwelling areas in lakes | ▪ Lakes and watercourses | 23 | 28 | 5 | 10 |
| **Salmonidae** | *namegisooginoshe* | Cisco | *Coregonus artedi* | Cold, deeper waters of lakes and occasionally large watercourses (bankfull width >5 m) | ▪ Fall spawner<br>▪ Gravel substrates in lakes in shallow or deep water and potentially larger watercourses (bankfull width >5 m) | ▪ Lakes<br>▪ Large watercourses<br>▪ Spawning in lakes | 3 | 3 | 0 | 0 |
| | *namegos* | Lake Trout | *Salvelinus namaycush* | Cold water lakes and occasionally large watercourses (bankfull width >5 m) | ▪ Fall spawner<br>▪ Rocky substrates in deep water lakes | ▪ Lakes<br>▪ Large watercourses<br>▪ Spawning in lakes | 3 | 4 | 2 | 3 |
| **Salmonidae** | *atikameg* | Lake Whitefish[g] | *Coregonus clupeaformis* | Cold, deeper waters of lakes and occasionally large watercourses (bankfull width >5 m) | ▪ Fall spawner<br>▪ Rocky substrates in lakes and potentially larger watercourses | ▪ Lakes<br>▪ Large watercourses<br>▪ Spawning in lakes | 3 | 4 | 2 | 3 |

Notes:
(a) Species list collated from the desktop review and field study (**Attachment B**) (Committee on the Status of Endangered Wildlife in Canada, 2016, 2017; Holm et al., 2010; Eakins, 2023; Golder, 2013; Government of Ontario, 2015b; Marshall and Jones, 2011; Scott and Crossman, 1998). Rainbow Trout and Salmon were identified through Indigenous Knowledge, but have not been added to the species list as no details on location or identification were available.
(b) High-level summary of preferred habitat based on Scott and Crossman (1998) and Holm et al. (2010). Note the temperature descriptions (i.e., warm, cold, and cool) may not directly correspond to the Ministry of Natural Resources thermal regime definitions.
(c) Spawning habitat requirements based on Scott and Crossman (1998), Holm et al. (2010), and Eakins (2023).
(d) Waterbody types where species were considered potentially present were determined using the preferred and spawning habitat characteristics and known distributions (Holm et al., 2010; Eakins, 2023; Golder, 2013; Government of Ontario, 2015b; Marshall and Jones, 2011; Scott and Crossman, 1998).
(e) For each waterbody crossing, if the waterbody type was determined to potentially support that fish species, the waterbody crossing was determined to provide potential habitat for that fish species. For crossings where site-specific data were collected (**Attachment B**), the potential habitat was rated based on the site-specific data.
(f) Southern Hudson Bay – James Bay and Great Lakes – Upper St. Lawrence Populations.
(g) Valued Component fish species.
> = greater than; ≥ = greater than or equal to; m = metre; km = kilometre; N/A = not applicable.

The Ogoki and Albany rivers have been identified by local Indigenous communities as waterbodies with high traditional value. Detailed field survey results for these rivers at the proposed Alternative 1 crossing locations are in **Attachment B**; however, due to their importance to the local Indigenous communities, the existing conditions at the crossings are also summarized in the following sections.

### Ogoki River at Crossing RA1-WC-05

A fish habitat assessment was completed on September 8, 2019, on the Ogoki River at crossing RA1-WC-05. Fish sampling was not completed in September 2019, but the fish community in the Ogoki River is well documented. Large-bodied fish including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Ogoki River as well as several small-bodied forage fish species (e.g., Lake Chub) (Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b; Golder, 2013).

Fish sampling was conducted in the Ogoki River at another crossing location (RA1-WC-11) in June and August 2022. Three Northern Pike, three Burbot, an unknown dace species, and one Mottled Sculpin were captured. Another juvenile Northern Pike and multiple unknown dace species were observed (**Attachment B**, Annex B; Tables B1 to B3).

### Ogoki River at Crossing RA1-WC-11

Fish and fish habitat assessments were completed on June 29, 2022, and August 21, 2022, on the Ogoki River at crossing RA1-WC-11. The fish community in the Ogoki River is well documented. Large-bodied fish including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Ogoki River as well as several small-bodied forage fish species (e.g., Lake Chub) (Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b; Golder, 2013).

In June 2022, fish sampling was conducted by setting three minnow traps for two hours (6 trap hour [trap-h] effort). No fish were captured but a juvenile Northern Pike and multiple unknown dace species were observed (**Attachment B**, Annex B; Tables B1 to B3).

In August 2022, fish sampling was conducted by backpack electrofishing a 235 m stream section for 1,447 seconds. Three Northern Pike, three Burbot, an unknown dace species, and one Mottled Sculpin were captured (catch-per-unit effort = 0.55 fish per 100 seconds) (**Attachment B**, Annex B; Tables B1 to B3).

### Albany River at Crossing RA1-WC-27

A fish and fish habitat assessment was completed on October 24, 2020, on the Albany River at crossing RA1-WC-27. The fish community in the Albany River is well documented; therefore, fishing effort for the Project was minimal.

Large-bodied fish including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Albany River as well as several small-bodied forage fish species (e.g., Lake Chub, Brook Stickleback) (Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b; Golder, 2013). Locations for Brook Trout fishing and Lake Sturgeon spawning were identified in the Albany River within 1 km of the crossing location (Marten Falls First Nation, 2019). Brook Trout spawning locations were identified above Kagiami Falls and Lake Sturgeon spawning below Kagiami Falls. Walleye and Northern Pike also occupy these areas (Dillon, 2024a; Marten Falls First Nation, 2021a, 2023).

Fish sampling was conducted in the Albany River at another crossing location (RA4-WC-34) in September 2021. Two sets of minnow traps (one set with three traps and the second set with two traps) for two hours (10 trap-h total effort). No fish were captured (**Attachment B**, Annex B; Tables B1 to B3).

### Ogoki River at Crossing RA4B-WC-01

A fish habitat assessment was completed on October 15, 2020, on the Ogoki River at crossing RA4B-WC-01. Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window. However, the fish community in the Ogoki River is well documented. Large-bodied fish including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Ogoki River as well as several small-bodied forage fish species (e.g., Lake Chub) (Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b; Golder, 2013).

Fish sampling was conducted in the Ogoki River at the crossing location for Alternative 1 (RA1-WC-11) in June and August 2022. Three Northern Pike, three Burbot, an unknown dace species, and one Mottled Sculpin were captured. Another juvenile Northern Pike and multiple unknown dace species were observed (**Attachment B**, Annex B; Tables B1 to B3).

### Albany River at Crossing RA4-WC-34

Fish and fish habitat assessments were completed on September 6, 2019, October 26, 2020, and September 15, 2021, on the Albany River at crossing RA4-WC-34. The fish community in the Albany River is well documented; therefore, fishing effort for the Project was minimal. Large-bodied fish including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Albany River as well as several small-bodied forage fish species (e.g., Lake Chub, Brook Stickleback) (Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b; Golder, 2013).

Fish sampling was conducted in 2021 by deploying two sets of minnow traps (one set with three traps and the second set with two traps) for two hours (11.2 trap-h total effort). No fish were captured (**Attachment B**, Annex B; Tables B1 to B3).

**Gourlie Creek at Crossing RA4-WC-41**

A fish and fish habitat assessment was completed on June 25, 2022, on Evening Hunting River / Gourlie Creek at crossing RA4-WC-41. A fish harvest netting site was identified on Gourlie Creek approximately 680 m from the crossing location (Marten Falls First Nation, 2019). Fish sampling was conducted by deploying six minnow traps overnight for 26 hours (156 trap-h effort), catching two Trout-perch and one Johnny Darter (catch-per-unit effort = 0.02 fish per trap-h) (**Attachment B**, Annex B; Tables B1 to B3).

### 5.4.1.2 Local and Regional Study Areas

The most common fish species (i.e., including those historically documented in most waterbodies and those captured during field surveys) in the existing conditions Regional Study Area were Northern Pike, White Sucker, Yellow Perch, Walleye, Brook Trout, Brook Stickleback, Burbot, Iowa Darter, and minnows. Lake Sturgeon, Brook Trout, Cisco, Lake Whitefish, Northern Pike, Walleye, and White Sucker have been documented in the Albany River (Golder, 2013; Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b). Brook Trout, Northern Pike, Lake Sturgeon, Lake Chub, Lake Whitefish, Northern Pike, White Sucker, Walleye, and Yellow Perch have been documented in the Ogoki River / Patience Lake (Golder, 2013; Ministry of Natural Resources and Forestry, 2023a; Government of Ontario, 2015b).

There are 16 waterbody crossings that are within the area covered by the Ogoki Forest Management Plan (Long Lake, 2008; **Attachment E**); 15 of these are on Alternative 4. Commercial fishing occurred historically in the Ogoki River / Patience Lake (RA4-WC-15) and many of the lakes in the Ogoki forest management area are used for remote tourism and recreational fishing (Long Lake, 2008). Patience Lake is considered cool water with the most common fish species being Walleye, Northern Pike, Lake Trout, and Brook Trout. Other species include Lake Whitefish, Lake Sturgeon, Burbot, Yellow Perch, Blackfin Cisco (Oji-Cree translation, *wiibichiiw ya'haa*) (*Coregonus nigripinnis*), Cisco, and White Sucker (Long Lake, 2008). Blackfin Cisco were incidentally captured in 2006 during a non-forestry netting exercise, downstream from the Waboose Dam at the Ogoki Reservoir (Long Lake, 2008); however, the Ogoki Reservoir is outside of the existing conditions Regional Study Area and is located over 100 km upstream from the crossing on the Ogoki River / Patience Lake (RA4-WC-15). Furthermore, Blackfin Cisco prefer cold, deep water of 55 to 165 m (Holm et al., 2010; Eakins, 2023) and the water depth at Patience Lake along Alternative 4 (RA4-WC-15) was recorded as being 3.4 m (Golder, 2013). Therefore, Blackfin Cisco were not considered as a potential fish species that could be present in the existing conditions Construction Disturbance Area, Local Study Area, or Regional Study Area.

Waterbodies in the existing conditions Local Study Area are known to support 37 fish species, including the six Valued Component fish species (Lake Sturgeon, Northern Pike, Brook Trout, Walleye, and Lake Whitefish, and Burbot) (**Table 5-9**, **Attachment E**) (Eakins, 2023; Golder, 2013; Government of Ontario, 2015b, 2020; Royal Ontario Museum, 2016; Holm et al., 2010; Marshall and Jones, 2011; Long Lake, 2008, Scott and Crossman, 1998; Ministry of Natural Resources and Forestry, 2003, 2015a, 2020). Fish species within the aquatics existing conditions Local Study Area are targeted by anglers and Indigenous Peoples for recreational and subsistence fishing. The species list in **Table 5-10** is typical of cold and cool water thermal regimes in Ontario and includes forage fish, sportfish, and species of conservation concern. Fish species characteristically found in the cold waterbodies are Lake Sturgeon, Lake Whitefish, and Brook Trout (Holm et al., 2010; Eakins, 2023), while fish species characteristically found in the cool waterbodies are Walleye, Northern Pike, and Yellow Perch (Holm et al., 2010; Eakins, 2023).

Waterbodies within the existing conditions Local and Regional Study Areas are primarily located within Fisheries Management Zone 2, with the northern end of the Project within Fisheries Management Zone 3. Fisheries Management Zones 2 and 3 are located in Ontario's Far North. These zones have few roads, limited access, and limited fishing pressure (Ministry of Natural Resources and Forestry, 2023b). There are no monitoring reports and management plans at this time, and these fisheries management zones do not yet have advisory councils (Ministry of Natural Resources and Forestry, 2023b). Due to the remoteness of the area, much of the recreational fishing is through outfitters, fly-in camps, or guided fishing. Subsistence fishing is an important traditional activity for local Indigenous communities, as identified in the Aroland First Nation Preliminary Existing Conditions Report and the Marten Falls First Nation Land Use and Occupancy Study, where fish species were identified as being culturally important and / or harvested by community members (**Section 3.1**).

Indigenous Knowledge shared by communities, including Aroland First Nation also provided additional context in relation to fish communities and distribution within the Local and Regional Study Area, including observations related to fish health and populations (a specific species was not identified) at Kawashkagama Lake (Shared Value Solutions, 2024).

## Table 5-10: Fish Species Likely to Occur in the Local Study Area and Conservation Ranking

| Family | Oji-Cree Name | Common Name[a] | Scientific Name | Federal | | Provincial | | Thermal Regime[e] |
|---|---|---|---|---|---|---|---|---|
| | | | | Committee on the Status of Endangered Wildlife in Canada [b] | *Species at Risk Act*[b] | Species at Risk in Ontario list[c] | S Rank[d] | |
| Acipenseridae | *nameh* | Lake Sturgeon[f,g] | *Acipenser fulvescens* | **Threatened:** (Great Lakes – Upper St. Lawrence Population)<br>**Special Concern:** (Southern Hudson Bay –James Bay population) | **No Status:** (Great Lakes – Upper St. Lawrence Population)<br>**Special Concern:** (Southern Hudson Bay – James Bay population) | **Endangered:**[h] (Great Lakes – Upper St. Lawrence Population)<br>**Special Concern:** (Southern Hudson Bay – James Bay Population) | **S2:** (Great Lakes – Upper St. Lawrence Population)<br>**S3:** (Southern Hudson Bay – James Bay population) | Cold |
| Catostomidae | *namebin* | Longnose Sucker | *Catostomus catostomus* | N/A | N/A | N/A | S5 | Cold |
| | *mishguajagash* | Shorthead Redhorse | *Moxostoma macrolepidotum* | N/A | N/A | N/A | S5 | Warm |
| | *namebin* | Silver Redhorse | *Moxostoma anisurum* | N/A | N/A | N/A | S4 | Cool |
| | *namebin* | White Sucker | *Catostomus commersonii* | N/A | N/A | N/A | S5 | Cool |
| Cottidae | N/A | Mottled Sculpin | *Cottus bairdii* | N/A | N/A | N/A | S5 | Cool |
| | *ashhawew ginooshe* | Slimy Sculpin | *Cottus cognatus* | N/A | N/A | N/A | S5 | Cold |
| | *emikwaaniiwshtigwan ashaawe* | Spoonhead Sculpin | *Cottus ricei* | Not at Risk | N/A | Not at Risk | S4 | Cold |
| Cyprinidae | *ginooshench* | Blacknose Shiner | *Notropis heterolepis* | N/A | N/A | N/A | S5 | Cool |
| | *ginooshench* | Bluntnose Minnow | *Pimephales notatus* | Not at Risk | N/A | Not at Risk | S5 | Warm |
| | *gwashgwebinew ginooshench* | Common Shiner | *Luxilus cornutus* | N/A | N/A | N/A | S5 | Cool |
| | *waashgijiiw ginooshench* | Emerald Shiner | *Notropis atherinoides* | N/A | N/A | N/A | S5 | Cool |
| | *magishtigwaanew ginooshench* | Fathead Minnow | *Pimephales promelas* | N/A | N/A | N/A | S5 | Warm |
| | *waashgijiiw gishooshench* | Finescale Dace | *Chrosomus neogaeus* | N/A | N/A | N/A | S5 | Cool |
| | *shooniiyaawaapik ginooshench* | Golden Shiner | *Notemigonus crysoleucas* | N/A | N/A | N/A | S5 | Cool |
| | *ginooshench* | Lake Chub | *Couesius plumbeus* | N/A | N/A | N/A | S5 | Cold |
| | *ozaaw ginooshench* | Longnose Dace | *Rhinichthys cataractae* | N/A | N/A | N/A | S5 | Cool |
| | *gwashgwebinew ginooshench* | Mimic Shiner | *Notropis volucellus* | N/A | N/A | N/A | S5 | Warm |
| | *shaagawaako ginooshench* | Northern Pearl Dace | *Margariscus nachtriebi* | N/A | N/A | N/A | S5 | Cool |
| | *ozaawashko ginooshench* | Northern Redbelly Dace | *Chrosomus eos* | N/A | N/A | N/A | S5 | Cool |
| | *Agaachi makadew Bebesi ginooshench* | Spottail Shiner | *Notropis hudsonius* | N/A | N/A | N/A | S5 | Cool |

| Family | Oji-Cree Name | Common Name[a] | Scientific Name | Federal | | Provincial | | Thermal Regime[e] |
|---|---|---|---|---|---|---|---|---|
| | | | | Committee on the Status of Endangered Wildlife in Canada [b] | *Species at Risk Act*[b] | Species at Risk in Ontario list[c] | S Rank[d] | |
| Esocidae | *najwabe* | Northern Pike[f] | *Esox lucius* | N/A | N/A | N/A | S5 | Cool |
| Lotidae | *mihzhash* | Burbot | *Lota lota* | N/A | N/A | N/A | S5 | Cold |
| Gasterosteidae | *ginooshench* | Brook Stickleback | *Culaea inconstans* | N/A | N/A | N/A | S5 | Cool |
| | *gayaagaachenchich ginooshench* | Ninespine Stickleback | *Pungitius pungitius* | N/A | N/A | N/A | S5 | Cool |
| Percidae | *ashaawench* | Iowa Darter | *Etheostoma exile* | N/A | N/A | N/A | S5 | Cool |
| | *ashaawe* | Johnny Darter | *Etheostoma nigrum* | N/A | N/A | N/A | S5 | Cool |
| | *haagaawaako ashaawe* | Logperch | *Percina caprodes* | N/A | N/A | N/A | S5 | Warm |
| | *ashaawench* | River Darter[g] | *Percina shumardi* | **Not at Risk:** Southern Hudson Bay – James Bay population<br>**Endangered:** Great Lakes – Upper St. Lawrence | **N/A:** Southern Hudson Bay – James Bay population<br>**N/A:** Great Lakes – Upper St. Lawrence | **Not at Risk:** Southern Hudson Bay – James Bay population<br>**Endangered:** Great Lakes – Upper St. Lawrence | **S4:** Southern Hudson Bay – James Bay population<br>**S1:** Great Lakes – Upper St. Lawrence | Warm |
| | *gaabaabaatewnaagosich ogaas* | Sauger | *Sander canadensis* | N/A | N/A | N/A | S4 | Cool |
| | *okaas* | Walleye[f] | *Sander vitreus* | N/A | N/A | N/A | S5 | Cool |
| | *ajaawes* | Yellow Perch | *Perca flavescens* | N/A | N/A | N/A | S5 | Cool |
| Percopsidae | *Namegosi ashaawench* | Trout-perch | *Percopsis omiscomaycus* | N/A | N/A | N/A | S5 | Cold |
| Salmonidae | *masamekos* | Brook Trout[f] | *Salvelinus fontinalis* | N/A | N/A | N/A | S5 | Cold |
| | *namegisooginoshe* | Cisco | *Coregonus artedi* | N/A | N/A | N/A | S5 | Cold |
| | *namegos* | Lake Trout | *Salvelinus namaycush* | N/A | N/A | N/A | S5 | Cold |
| | *atikameg* | Lake Whitefish[f] | *Coregonus clupeaformis* | N/A | N/A | N/A | S5 | Cold |

Notes:

(a) Species list collated from the desktop review (**Section 3.1.1**; Committee on the Status of Endangered Wildlife in Canada, 2016, 2017; Royal Ontario Museum, 2016; Eakins, 2023; Golder, 2013; Government of Ontario, 2015b; Ministry of Natural Resources and Forestry, 2023a; Holm et al., 2010; Marshall and Jones, 2011; Scott and Crossman, 1998) and field study (**Attachment B**). Rainbow Trout and Salmon were identified through Indigenous Knowledge but have not been added to the species list as no details on location or identification were available.

(b) Government of Canada, 2023; *Species at Risk Act*, SC 2002.

(c) Holm et al., 2010; Eakins, 2023; Government of Ontario, 2020, 2023.

(d) Holm et al., 2010; Eakins, 2023; Government of Ontario, 2020. S1 = critically imperiled, S2 = imperiled; S3 = vulnerable; S4 = apparently secure; S5 = secure; SNA = not applicable; SU = Unrankable.

(e) Holm et al., 2010; Eakins, 2023; Ministry of Natural Resources and Forestry, 2004.

(f) Valued Component fish species.

(g) Under the Committee on the Status of Endangered Wildlife in Canada, the Northwestern Ontario population of Lake Sturgeon within the Project area includes the Great Lakes – Upper St. Lawrence and Southern Hudson Bay – James Bay populations (Committee on the Status of Endangered Wildlife in Canada, 2017), and the Northwestern Ontario population of River Darter within the Project area includes the Great Lakes – Upper St. Lawrence and Southern Hudson Bay – James Bay populations (Committee on the Status of Endangered Wildlife in Canada, 2016).

(h) Government of Canada 2023; Government of Ontario, 2013; Northwest Region.

N/A = not documented or not listed.

The majority of fish species included in **Table 5-10** are widely distributed throughout the aquatics existing conditions Local Study Area. Lake Sturgeon have a more restricted distribution in the Local Study Area than the other Valued Component fish species due to their habitat requirements for lakes or larger watercourses.

Fish have also been documented in lakes in the existing conditions Local Study Area including Lake Whitefish, Northern Pike, and Walleye in Brundrit Lake (Ministry of Natural Resources and Forestry, 2023a), which is less than 2 km from the unnamed watercourse at crossing RA1-WC-15. Northern Pike have been documented in Byford Lake, which is 2 km from the unnamed watercourse at crossing RA4-WC-19 (Ministry of Natural Resources and Forestry, 2023a) and Northern Pike and Yellow Perch have been documented in Saarimaki Lake (Ministry of Natural Resources and Forestry, 2023a), which is less than 2 km from the unnamed watercourse at crossing RA1-WC-30. Fish have also been documented in lakes within the Regional Study Area that are connected to watercourses crossed by the Project. The closest lakes include Dusey Lake, which is 7 km upstream from the Dusey River at crossing RA1-4-WC-02 and contains Lake Whitefish, Northern Pike, and Walleye (Ministry of Natural Resources and Forestry, 2023a). Burbot, Cisco, Lake Whitefish, Northern Pike, Sauger, Walleye, White Sucker, and Yellow Perch have been documented in Makokibatan Lake, which flows into the Albany River, approximately 50 km upstream from the Albany River crossing at RA1-WC-27.

Lake Trout have not been historically documented in the existing conditions Local Study Area (Golder, 2013; Ministry of Natural Resources and Forestry, 2015b, 2020), as they live primarily in deep lakes. However, Lake Trout have been documented in the Regional Study Area at nine lakes in the Makokibatan – Upper Albany River tertiary watershed (Opichuan, Elbow, Faircloth, Gordon Reid, Kaginagami, Mahamo, Van Poele, Atwood, and Luella lakes) (Ministry of Natural Resources and Forestry, 2015b, 2020). Opichuan Lake is the lake closest to the existing conditions Construction Disturbance Area where Lake Trout have been documented. It flows into Makokibatan Lake and then into the Albany River, approximately 50 km upstream from crossing RA1-WC-27 on the Albany River. The Albany and Ogoki rivers could potentially allow for Lake Trout movement and, therefore, it was conservatively assumed that Lake Trout could be present in waterbodies and large watercourses in the existing conditions Local Study Area and Construction Disturbance Area.

#### 5.4.1.3 Species of Conservation Concern

Lake Sturgeon in the existing conditions Regional Study Area are part of the Southern Hudson Bay – James Bay population, which are listed as Special Concern under the *Species at Risk Act* Schedule 1 (Government of Canada, 2023) and *Species at Risk in Ontario list* (Government of Ontario, 2023) (**Table 5-10**). This population is considered the most robust and least at risk of all the Lake Sturgeon populations in Ontario (Committee on the Status of Species at Risk in Ontario, 2017).

The Southern Hudson Bay-James Bay population of River Darter are federally and provincially listed as "Not at Risk" by both the *Species at Risk in Ontario list* (Government of Ontario, 2023) and the Committee on the Status of Endangered Wildlife in Canada (Committee on the Status of Endangered Wildlife in Canada, 2016), respectively.

Although Blackfin Cisco were incidentally captured in 2006 downstream from the Waboose Dam on the Ogoki Reservoir (Long Lake, 2008; Golder, 2013), they were not considered as a potential fish species that could be present in the existing conditions Construction Disturbance Area, Local Study Area, or Regional Study Area. Blackfin Cisco are not listed under *Species at Risk Act* Schedule 1 (Government of Canada, 2023) but are listed as "Threatened" under Schedule 2 (*Species at Risk Act* Schedule 1 provisions do not apply) (**Table 5-10**). They are listed as "Unrankable" by the Natural Heritage Information Centre (Government of Ontario, 2015a) and "Data Deficient" under the federal Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2023) and the *Species at Risk in Ontario list* (Government of Ontario, 2023).

#### 5.4.1.4 Invasive Species

Rock Bass (*Ambloplites rupestris*), a native fish species, are believed to be present in the Far North in very limited numbers but may be expanding their range (Marshall and Jones, 2011). In the 1970s, Rock Bass were documented in lakes at the headwaters of the Berens River, and one single specimen was recorded in Lake St. Joseph at the headwaters of the Albany River in the 1960s (Marshall and Jones, 2011). In 2001, Rock Bass were documented in Makokibatan Lake and in the Ogoki River system (Marshall and Jones, 2011). The additional documentation of Rock Bass in the Far North could be evidence of the fish expanding their range north, potentially in response to climate warming (Marshall and Jones, 2011). The infiltration of Rock Bass into the littoral fish communities of the Far North may be considered invasive, at least regionally (Marshall and Jones, 2011).

Smallmouth Bass (*Micropterus dolomieu*) were also documented in 2009 at the Albany Forks (Albany-Kenogami Junction) in the existing conditions Regional Study Area, having previously only been captured in the Moose River (Oji-Cree translation, *Mooz 'O' Ziibih*) basin (Seyler, 1997 in Marshall and Jones, 2011). It is possible that Smallmouth Bass are also colonizing the Regional Study Area due to climate warming (Marshall and Jones, 2011).

# 5.5 Existing Environment Characterization by Valued Component Fish Species

To provide an estimate of the overall quantity of habitat for each Valued Component fish species in the Alternatives 1 and 4 rights-of-way, the estimated (or measured, when assessed in the field) bankfull width at each waterbody crossing with potential for that species was multiplied by a width of 100 m for the Route Alternative right-of-way to approximate the quantity of habitat in the right-of-way in square metres.

## 5.5.1 Lake Sturgeon

Lake Sturgeon inhabit large river and lake systems, preferring the shoal areas of large rivers and lakes, where they feed on aquatic invertebrates. Lake Sturgeon spawn in late spring / early summer in relatively shallow, fast-flowing water (usually below waterfalls, rapids, or dams) with gravel and boulders at the bottom or on shoals in large rivers with strong currents and at depths of 0.6 to 4.5 m. Lake Sturgeon are broadcast spawners and migrate up to 400 km from lakes to spawning rivers as soon as ice-off occurs, although movement under ice has also been observed. Smaller movements occur seasonally, where Lake Sturgeon move from warm, shallow waters to cooler, deeper waters in summer, returning to the shoal areas in the fall and back to deeper waters for winter (Scott and Crossman, 1998). These bottom dwellers prefer gravel or mud substrates and remain active throughout the winter. Overwintering is usually in moderate depths in lake habitat (Golder, 2011) but may be near the mouth of larger rivers with depths of 7 to 12 m and soft substrates (i.e., mud or sand) (Rusak and Mosindy, 1997).

The distribution of Lake Sturgeon in the aquatics existing conditions Local Study Area is considered to be limited to the large rivers, including the Albany and Ogoki rivers and one additional large watercourse on Route Alignment 4 (RA4-WC-22), where suitable spawning habitat was identified during the field survey. Lake Sturgeon are considered to be potentially present in 7 of the 91 waterbody crossings in the existing conditions Construction Disturbance Area based on their documented distribution and on site-specific habitat data collection at waterbody crossings.

Based on the information presented, there is potential for Lake Sturgeon to occur in the aquatics existing conditions Local Study Area at:

- Three waterbody crossings along Alternative 1 right-of-way; and
- Four waterbody crossings along Alternative 4 right-of-way.

There is approximately 3.8 ha of potential Lake Sturgeon habitat on Alternative 1 right-of-way and 5.4 ha of potential Lake Sturgeon habitat on Alternative 4 right-of-way (**Table 5-11**).

The Albany and Ogoki rivers and the unnamed watercourse at crossing RA4-WC-22 are assumed to provide spawning, rearing, and / or overwintering habitat for Lake Sturgeon. Habitat presence was conservatively estimated based on the general distribution and basic habitat requirements of Lake Sturgeon, aerial reconnaissance and desktop review data, and site-specific habitat data collection at a subset of waterbody crossings.

**Table 5-11: Estimate of Habitat Available for Lake Sturgeon in Alternative 1 and 4 Rights-of-Way**

| Route | Number of Crossings with Habitat Available for Lake Sturgeon | Sum of Bankfull Widths (m) | Estimated Area of Habitat Available at Crossings[(a)] | |
|---|---|---|---|---|
| | | | ($m^2$) | (ha) |
| Alternative 1 right-of-way | 3 | 383 | 38,330 | 3.8 |
| Alternative 4 right-of-way | 4 | 545 | 54,520 | 5.4 |
| **Total** | **7** | **928** | **92,850** | **9.3** |

Notes:
Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
(a) Based on assumed distribution of Lake Sturgeon and considering presence in large waterbodies in the Route Alternative rights-of-way.
m = metre; $m^2$ = square metre; ha = hectare.

## 5.5.2 Walleye

Walleye, also known as Yellow Pickerel, are a cool water species that occur primarily in lakes and large watercourses where water is turbid or where there is sufficient cover to provide shelter in daylight. Walleye spawn in late spring, primarily along gravel, boulder, or cobble along inshore areas of lakes or nearby tributaries in areas with fast-flowing, white water downstream from falls and other barriers. Walleye are broadcast spawners, with egg incubation occurring in the interstitial spaces of the large substrate. Overwintering occurs in similar habitat to rearing; however, strong currents are avoided (Scott and Crossman, 1998). Ice may be used as cover during winter in shallow waters, while depth and turbid waters may be used as cover in deeper waters (Scott and Crossman, 1998). Overwintering habitat is sought once water temperatures decrease to approximately 5°C (Paragamian, 1989).

Walleye are documented throughout the aquatics existing conditions Local Study Area and are conservatively estimated to be present in 46 of the 91 waterbody crossings in the existing conditions Construction Disturbance Area based on their documented distribution and on site-specific habitat data collection at waterbody crossings. This is a conservative assumption, as it is unlikely that all the waterbodies with suitable habitat would be occupied by Walleye.

Based on the information presented, there is potential for Walleye to occur in the aquatics Local Study Area at:

- 21 waterbody crossings along Alternative 1 right-of-way; and
- 25 waterbody crossings along Alternative 4 right-of-way.

There is approximately 8.0 ha of potential Walleye habitat on Alternative 1 right-of-way and 10.8 ha of potential Walleye habitat on Alternative 4 right-of-way (**Table 5-12**). These waterbodies are conservatively assumed to provide spawning, rearing, and / or overwintering habitat for Walleye. Habitat presence was conservatively estimated based on the general distribution and basic habitat requirements of Walleye, aerial reconnaissance and desktop review data, and site-specific habitat data collection at a subset of waterbody crossings. This is a conservative assumption and should consider that not every waterbody identified will have suitable habitat to support all Walleye life stages (i.e., fry, juvenile, and adult). Walleye are considered widely distributed in the existing conditions Local Study Area and are likely to be abundant in cool water lakes and watercourses where habitat is appropriate and therefore are assumed to present in most waterbodies in the Local Study Area.

**Table 5-12: Estimate of Habitat Availability for Walleye in Alternative 1 and 4 Rights-of-Way**

| Route | Number of Crossings with Habitat Available for Walleye | Sum of Bankfull Widths (m) | Estimated Area of Habitat at Crossings[(a)] | |
|---|---|---|---|---|
| | | | ($m^2$) | (ha) |
| Alternative 1 right-of-way | 21 | 799 | 79,940 | 8.0 |
| Alternative 4 right-of-way | 25 | 1,078 | 107,790 | 10.8 |
| **Total**[(b)] | **39** | **1,877** | **187,730** | **18.8** |

Notes:
Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. In addition, overlapping sites on Alternatives 1 and 4 are included in both Alternative 1 and 4 but only counted once in the total; therefore, the totals do not match the sum of the Route Alternatives.
(a) Conservatively assumes Walleye to be present at all crossings in the Route Alternative rights-of-way.
(b) Seven crossings overlap on both Alternative 1 and Alternative 4 and are included in each route but only counted once in the totals.
m = metre; $m^2$ = square metre; ha = hectare.

## 5.5.3 Brook Trout

Brook Trout, also known as Speckled Trout, occur in clear, cold, well-oxygenated watercourses and lakes (Holm et al., 2010; Eakins, 2023). During the summer, as water temperature increases, they may move to deep, colder waters. Brook Trout typically spawn in the fall, in watercourses with gravel substrates.

However, Brook Trout spawning can also occur in lakes with a groundwater influence and moderate current. Movement upstream to spawning areas usually occurs just prior to spawning, with males arriving ahead of females. Eggs are deposited in redds created by the female (Scott and Crossman, 1998). Overwintering generally occurs in lakes or in watercourses with suitable depth and dissolved oxygen levels below the ice. Brook Trout typically overwinter in deep water (i.e., greater than 1 m) in areas with a low velocity (i.e., less than 15 cubic metres per second [$m^3/s$]), cover, and groundwater discharge (Chisholm et al., 1987; Cunjak and Power, 1986). They prefer woody debris cover, followed by vegetation and undercut banks (Cunjak, 1996).

Brook Trout are documented throughout the aquatics existing conditions Regional Study Area and could be present in 51 of the 91 waterbody crossings in the existing conditions Construction Disturbance Area based on their documented distribution and on site-specific habitat data collection at waterbody crossings. This is a conservative assumption, as it is unlikely that all the waterbodies with suitable habitat would be occupied by Brook Trout.

Based on the information presented, there is potential for Brook Trout to occur in the aquatics Local Study Area at:

- 23 waterbody crossings along Alternative 1 right-of-way; and
- 28 waterbody crossings along Alternative 4 right-of-way.

There is approximately 8.1 ha of potential Brook Trout habitat on the Alternative 1 right-of-way and 11.2 ha of potential Brook Trout habitat on the Alternative 4 right-of-way (**Table 5-13**). These waterbodies are conservatively assumed to provide spawning, rearing, and / or overwintering habitat for Brook Trout. Habitat presence was conservatively estimated based on the general distribution and basic habitat requirements of Brook Trout, aerial reconnaissance and desktop review data, and site-specific habitat data collection at a subset of waterbody crossings. This is a conservative assumption and should consider that not every waterbody identified will have suitable habitat to support all Brook Trout life stages (i.e., fry, juvenile, and adult). Brook Trout are considered common in the existing conditions Local Study Area, and they are likely to be abundant in small, cold-water watercourses with gravel substrates and are therefore assumed to be present in many waterbodies in the existing conditions Local Study Area. Indigenous Knowledge shared by communities, including Aroland First Nation, has noted observations of population decline for Brook Trout over the last five years, with one participant noting that they are not able to catch the same volume of fish as they used to in the past (Shared Value Solutions, 2024).

Another community member noting that they had previously fished Brook Trout in the Albany River all their life and now were not able to catch any, stating the following:

> *"Well, my concern is here [at the Albany River]. This is the concern I have because of the trout population. Because there's something happening with the brook trout on the Albany River. They're not there anymore. There should be three, four, five-pound brook trout in there. This is what we're trying to figure out. What's going on? Because I've seen a decline in the population. And some of, like, you know, my nephews, they're starting to see that too because I'm bringing that up to them. Where are these trout? We've been fishing that place all our lives and we know where they are, where they're supposed to be but they're not there."* (Shared Value Solutions, 2024).

**Table 5-13: Estimate of Habitat Availability for Brook Trout in Alternative 1 and 4 Rights-of-Way**

| Route | Number of Crossings with Habitat Available for Brook Trout | Sum of Bankfull Widths (m) | Area of Habitat at Crossings[a] | |
|---|---|---|---|---|
| | | | ($m^2$) | (ha) |
| Alternative 1 right-of-way | 23 | 810 | 80,965 | 8.1 |
| Alternative 4 right-of-way | 28 | 1,123 | 112,340 | 11.2 |
| **Total**[b] | **43** | **1,933** | **193,305** | **19.3** |

Notes:
Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. In addition, overlapping sites on Alternatives 1 and 4 are included in both Alternative 1 and 4 but only counted once in total; therefore, the totals do not match the sum of the Route Alternatives.
(a) Conservatively assumes Brook Trout to be present at all crossings in the Route Alternative rights-of-way.
(b) Eight crossings overlap on both Alternative 1 and Alternative 4 are included in each route but only counted once in the totals.
m = metre; $m^2$ = square metre; ha = hectare.

### 5.5.4 Northern Pike

Northern Pike, also known as Jackfish, are a cool water species that occur primarily in the weedy bays of lakes and slow, meandering, heavily vegetated waterbodies. Northern Pike spawn in early spring, within lacustrine and riverine habitats characterized by slow moving water and abundant emergent and submergent aquatic vegetation (e.g., marshes and river floodplains). The exact timing of spawning is determined by water temperature and occurs when the water is between 4 and 11°C, often when ice is still present on the surface of the waterbody. Northern Pike are broadcast spawners, with fertilized eggs that stick to vegetation and incubate (Holm et al., 2010; Eakins, 2023). Overwintering occurs primarily in deep and slower moving sections of large rivers, with some individuals retreating to deep lake habitats (Alaska Department of Fish and Game, n.d.).

Northern Pike are documented throughout the aquatics existing conditions Local Study Area and are considered to be potentially present in 77 of the 91 waterbody crossings in the existing conditions Construction Disturbance Area based on their documented distribution and site-specific habitat data collection at waterbody crossings. This is a conservative assumption, as it is unlikely that all the waterbodies with suitable habitat would be occupied by Northern Pike.

Based on the information presented, there is potential for Northern Pike to occur in the aquatics Local Study Area at:

- 37 waterbody crossings along Alternative 1 right-of-way; and
- 40 waterbody crossings along Alternative 4 right-of-way.

There is approximately 10.2 ha of potential Northern Pike habitat on Alternative 1 and 12.0 ha of potential Northern Pike habitat on Alternative 4 (**Table 5-14**). These waterbodies are conservatively assumed to provide spawning, rearing, and / or overwintering habitat for Northern Pike. Habitat presence was conservatively estimated based on the general distribution and basic habitat requirements of Northern Pike, aerial reconnaissance and desktop review data, and site-specific habitat data collection at a subset of waterbody crossings. This is a conservative assumption and should consider that not every waterbody identified will have habitat to support all Northern Pike life stages (i.e., fry, juvenile, and adult). Northern Pike are considered widely distributed in the existing conditions Local Study Area, and they are likely to be abundant in small, cool water lakes and watercourses with instream vegetation and are therefore assumed to be present in most waterbodies in the existing conditions Local Study Area.

**Table 5-14: Estimate of Habitat Availability for Northern Pike in Alternative 1 and 4 Rights-of-Way**

| Route | Number of Crossings with Habitat Available for Northern Pike | Sum of Bankfull Widths (m) | Area of Habitat at Crossings[a] | |
|---|---|---|---|---|
| | | | ($m^2$) | (ha) |
| Alternative 1 right-of-way | 37 | 1,023 | 102,340 | 10.2 |
| Alternative 4 right-of-way | 40 | 1,202 | 120,270 | 12.0 |
| **Total**[b] | **68** | **2,225** | **222,610** | **22.2** |

Notes:
Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. In addition, overlapping sites on Alternatives 1 and 4 are included in both Alternative 1 and 4 but only counted once in total; therefore, the totals do not match the sum of the Route Alternatives.
(a) Conservatively assumes Northern Pike to be present at all crossings in the Route Alternative rights-of-way.
(b) Nine crossings overlap on both Alternative 1 and Alternative 4 are included in each route but only counted once in the totals.
m = metre; $m^2$ = square metre; ha = hectare.

### 5.5.5 Lake Whitefish

Lake Whitefish are a cool water species that occur primarily in lakes and large rivers. Lake Whitefish move to shallow waters in the fall to spawn in lacustrine and riverine habitats. Spawning shoals consist of shallower water (i.e., less than 5 m deep) with boulder, cobble, and gravel substrates (Holm et al., 2010; Eakins, 2023; Scott and Crossman, 1998). Eggs are deposited within the interstitial spaces of shoals, remain there over winter, and hatch in April or May (Committee on the Status of Endangered Wildlife in Canada, 2005; Scott and Crossman, 1998). After spawning, adult whitefish return to deep water habitat to overwinter (Richardson et al., 2001). By early summer, the young fish leave the shallow, inshore habitats for the deeper water (Scott and Crossman, 1998). Lake Whitefish are a preferred species (with Walleye) for subsistence consumption in the Far North (Marshall and Jones, 2011).

The distribution of Lake Whitefish in the aquatics existing conditions Local Study Area is considered to be limited to large rivers such as the Albany and Ogoki rivers and are considered to be potentially present in seven of the 91 waterbody crossings in the existing conditions Construction Disturbance Area based on their documented distribution and on site-specific habitat data collection at waterbody crossings. This is a conservative assumption, as it is unlikely that all of the waterbodies with suitable habitat would be occupied by Lake Whitefish.

Based on the information presented, there is potential for Lake Whitefish to occur in the aquatics existing conditions Local Study Area at:

- Three waterbody crossings along Alternative 1 right-of-way; and
- Four waterbody crossings along Alternative 4 right-of-way.

There is approximately 3.8 ha of potential Lake Whitefish habitat on Alternative 1 and 5.5 ha of potential Lake Whitefish habitat on Alternative 4 (**Table 5-15**).

These waterbodies are conservatively assumed to provide spawning, rearing, and / or overwintering habitat for Lake Whitefish. Habitat presence was conservatively estimated based on the general distribution and basic habitat requirements of Lake Whitefish, aerial reconnaissance and desktop review data, and site-specific habitat data collection at a subset of waterbody crossings. The estimate assumes that every waterbody that meets the minimum habitat requirements will be occupied by Lake Whitefish. This is a conservative assumption and should consider that not every waterbody identified will have habitat to support all Lake Whitefish life stages (i.e., fry, juvenile, and adult). Lake Whitefish are considered widely distributed in the existing conditions Local Study Area and are likely to be abundant in cold water lakes and larger watercourses and are therefore assumed to be present in large waterbodies in the existing conditions Local Study Area.

**Table 5-15: Estimate of Habitat Availability for Lake Whitefish in Alternative 1 and 4 Rights-of-Way**

| Route | Number of Crossings with Habitat Available for Lake Whitefish | Sum of Bankfull Widths (m) | Area of Habitat at Crossings[(a)] | |
|---|---|---|---|---|
| | | | ($m^2$) | (ha) |
| Alternative 1 right-of-way | 3 | 383 | 38,330 | 3.8 |
| Alternative 4 right-of-way | 4 | 545 | 54,520 | 5.5 |
| **Total** | **7** | **928** | **92,850** | **9.3** |

Notes:
Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
(a) Conservatively assumes Lake Whitefish to be present at all crossings in the Route Alternative rights-of-way.
m = metre; $m^2$ = square metre; ha = hectare.

## 5.5.6 Burbot

Burbot (Oji-Cree name *mihzhash*) are a coldwater species and the only fresh water fish species from the cod family (*Gadidae*) (Richardson et al., 2001). Burbot occur primarily in moderate to deep lakes and large watercourses (Scott and Crossman ,1998, McPhail, 2007, Eakins, 2023) and are considered to frequently occur in the Far North of Ontario (Marshall and Jones, 2011). Burbot spawn in the winter, under the ice, between January and March. Spawning usually occurs in lakes over sand or gravel bottoms of shallow bays or on gravel shoals (Scott and Crossman, 1998) but also in low-velocity areas of rivers over fine gravel and sand (McPhail, 2007). Eggs are released into the water and drift for a short distance before settling to bottom (Scott and Crossman, 1998; McPhail, 2007). Adult Burbot are benthic and are rarely found in waters less than 2 m deep (McPhail, 2007).

Burbot are documented throughout the aquatics existing conditions Regional Study Area, including the Albany River, and are considered to be potentially present in 33 of the 91 waterbody crossings in the existing conditions Construction Disturbance Area based on their documented distribution and on site-specific habitat data collection at waterbody crossings. This is a conservative assumption, as it is unlikely that all the waterbodies with suitable habitat would be occupied by Burbot.

Based on the information presented, there is potential for Burbot to occur in the aquatics existing conditions Local Study Area at:

- 16 waterbody crossings along Alternative 1 right-of-way; and
- 17 waterbody crossings along Alternative 4 right-of-way.

There is approximately 7.4 ha of potential Burbot habitat on Alternative 1 and 9.3 ha of potential Burbot habitat on Alternative 4 (**Table 5-16**).

These waterbodies are conservatively assumed to provide spawning, rearing, and / or overwintering habitat for Burbot. Habitat presence was conservatively estimated based on the general distribution and basic habitat requirements of Burbot, aerial reconnaissance and desktop review data, and site-specific habitat data collection at a subset of waterbody crossings. The estimate assumes that every waterbody that meets the minimum habitat requirements will be occupied by Burbot. This is a conservative assumption and should consider that not every waterbody identified will have habitat to support all Burbot life stages (i.e., fry, juvenile, and adult). Burbot are considered widely distributed in the existing conditions Local Study Area and likely to be abundant in cold water lakes and larger watercourses and are therefore assumed to be present in larger waterbodies in the existing conditions Local Study Area.

**Table 5-16: Estimate of Habitat Availability for Burbot in Alternative 1 and 4 Rights-of-Way**

| Route | Number of Crossings with Habitat Available for Burbot | Sum of Bankfull Widths (m) | Area of Habitat at Crossings[(a)] | |
|---|---|---|---|---|
| | | | ($m^2$) | (ha) |
| Alternative 1 right-of-way | 16 | 738 | 73,840 | 7.4 |
| Alternative 4 right-of-way | 17 | 935 | 93,450 | 9.3 |
| **Total**[(b)] | **29** | **1,673** | **167,290** | **16.7** |

Notes:
Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. In addition, overlapping sites on Alternatives 1 and 4 are included in both Alternative 1 and 4 but only counted once in total; therefore, the totals do not match the sum of the Route Alternatives.
(a) Conservatively assumes Burbot to be present at all crossings in the Route Alternative rights-of-way.
(b) Four crossings overlap on both Alternative 1 and Alternative 4 are included in each route but only counted once in the totals.
m = metre; $m^2$ = square metre; ha = hectare.

## 5.6 Restricted Activity Timing Windows

Restricted activity timing windows are designed to protect fish during spawning migrations and other critical life history stages (i.e., spawning, egg incubation, and fry emergence). Restricted activity timing windows are determined by the Ministry of Natural Resources for water features in Ontario. The restricted activity timing window in the spring covers migration and spawning for spring spawning species, and the completion of egg incubation and fry emergence. The restricted activity timing window in the fall begins with migration to fall spawning areas and continues through egg incubation and emergence the following spring. The Project is in the Northwest Region of Ontario for designation of the restricted activity timing windows (Fisheries and Oceans Canada, 2013). The restricted activity timing window for each species is listed in **Table 5-17**.

### Table 5-17: Restricted Activity Timing Windows by Fish Species

| Species | Restricted Activity Timing Window |
|---|---|
| Burbot, Brook Trout, Cisco | September 1 to June 15 |
| Lake Sturgeon | May 1 to June 30 |
| Lake Whitefish | September 15 to May 31 |
| Lake Trout | September 1 to May 31 |
| Northern Pike, Sucker sp. | April 1 to June 15 |
| Walleye | April 1 to June 20 |
| Spring spawning small-bodied species from the Cottidae, Cyprinidae, Gasterosteidae, Percidae (excluding Walleye), and Percopsidae families[(a)] | April 1 to June 15 |

Source: Fisheries and Oceans Canada, 2013.
Notes:
(a) Species listed in **Table 5-10**.
Sp. = species.

# 6 Selection of the Preferred Route

Following the collection of existing conditions information on the existing conditions study areas described in **Section 4.7**, the Project Team undertook an exercise to select a Preferred Route. The methodology and detailed results of this exercise are described in the *Environmental Assessment / Impact Statement Report* and are summarized at a high level in **Section 6.1**. The Preferred Route includes the footprint of any temporary features such as pits and quarries and the temporary infrastructure for construction including access roads, staging areas, camps, debris, and / or timber stockpiles. The effects assessment was completed using the identified Preferred Route.

## 6.1 Alternative Segments and Routes Within Each Segment

To simplify the alternatives evaluation, the alternatives were divided into three separate segments based on their geographical locations. The segments were determined so that any alternative route in one segment could connect with any alternative route in the next segment, allowing for decisions to be made based on the environment in each segment and not based on the whole. This approach considers the variable environmental conditions within the Project Study Area, allowing for flexibility to avoid sensitive natural features encountered within the Construction Disturbance Area for each segment instead of requiring decision makers to balance trade-offs of one long route versus the other.

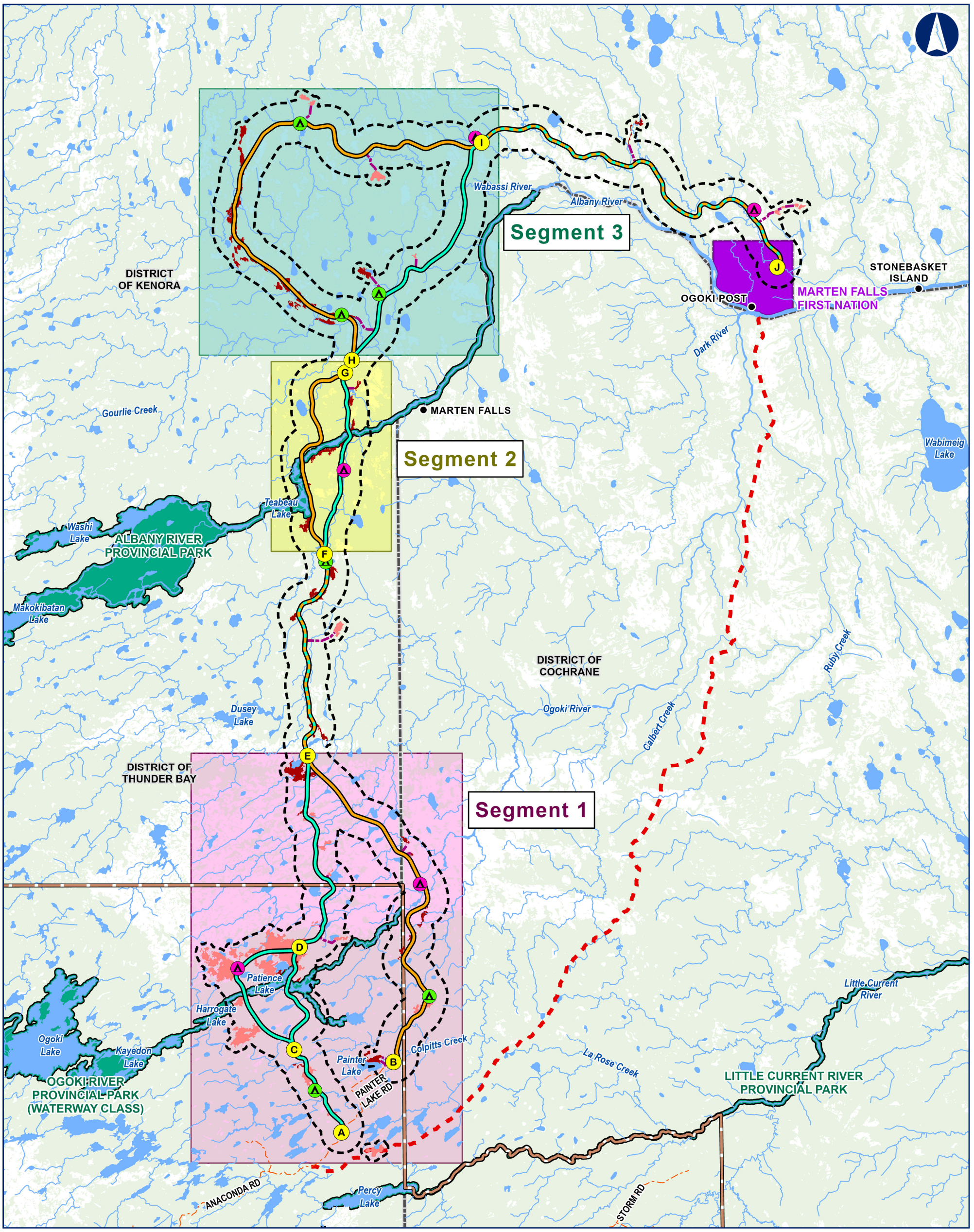
## 6.2 Preferred Route

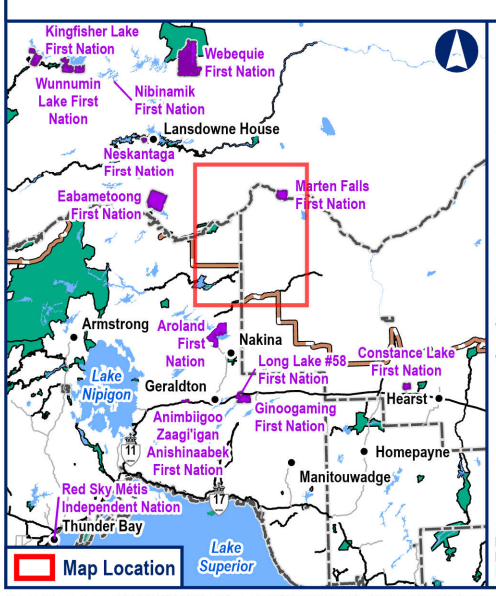
The selection of the Preferred Route within each segment involved a thorough analysis of technical, economic, natural, social, and cultural factors. The route alternative evaluation considered the potential effects and standard or known mitigation approaches to determine the net positive or negative effects of each alternative; it was completed using the reasoned argument (trade-off) method. The reasoned argument method qualitatively compares the advantages and disadvantages of each alternative including the relative significance of the potential residual effects.

After completing these steps, obtaining direction from the community of Marten Falls First Nation and Aroland First Nation, and collecting input from the public and regulators, the Proponent identified a Preferred Route alignment for each segment:

- Segment 1 – Ogoki Crossing: Alternative 1;
- Segment 2 – Albany Crossing: Alternative 4; and
- Segment 3 – North of the Albany: Alternative 4.

The combination of segments 1, 2, and 3 create the final Preferred Route.




**Legend**

- Segment Node
- Project Study Area
- Segment 1
- Segment 2
- Segment 3

**Construction Disturbance Area**

Route Alternatives (100 m Right-of-Way)

- Alternative 1
- Alternative 4

Potential Camp Site

- 50 Persons (108 m x 150 m)
- 200 Persons (108 m x 150 m)
- Approximate Access Road to Potential Construction Camp (10 m Width)

Potential Aggregate Source

- Bedrock
- Sand and gravel
- Approximate Access Road to Potential Aggregate Site (10 m Width)

**General Features**

- Resource / Recreation Road
- MFFN Existing Winter Access Road
- Watercourse
- Waterbody
- First Nation Reserve
- District Municipal Boundary
- Far North Boundary
- Provincial Park

**Data Source:**
Base Data: Provided by MNRF 2023; Route Infrastructure - Provided by AECOM 2021. Contains Information licensed under the Government Licence Ontario.

**Notes:**
First Nation Reserves of MFFN CAR Neighboring Indigenous Communities are shown within the inset extent.

# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Route Alternatives and Segments

0 5 10 20
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

January 2026 | 1:450,000 * when printed 11"x17"

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**Figure 6-1**

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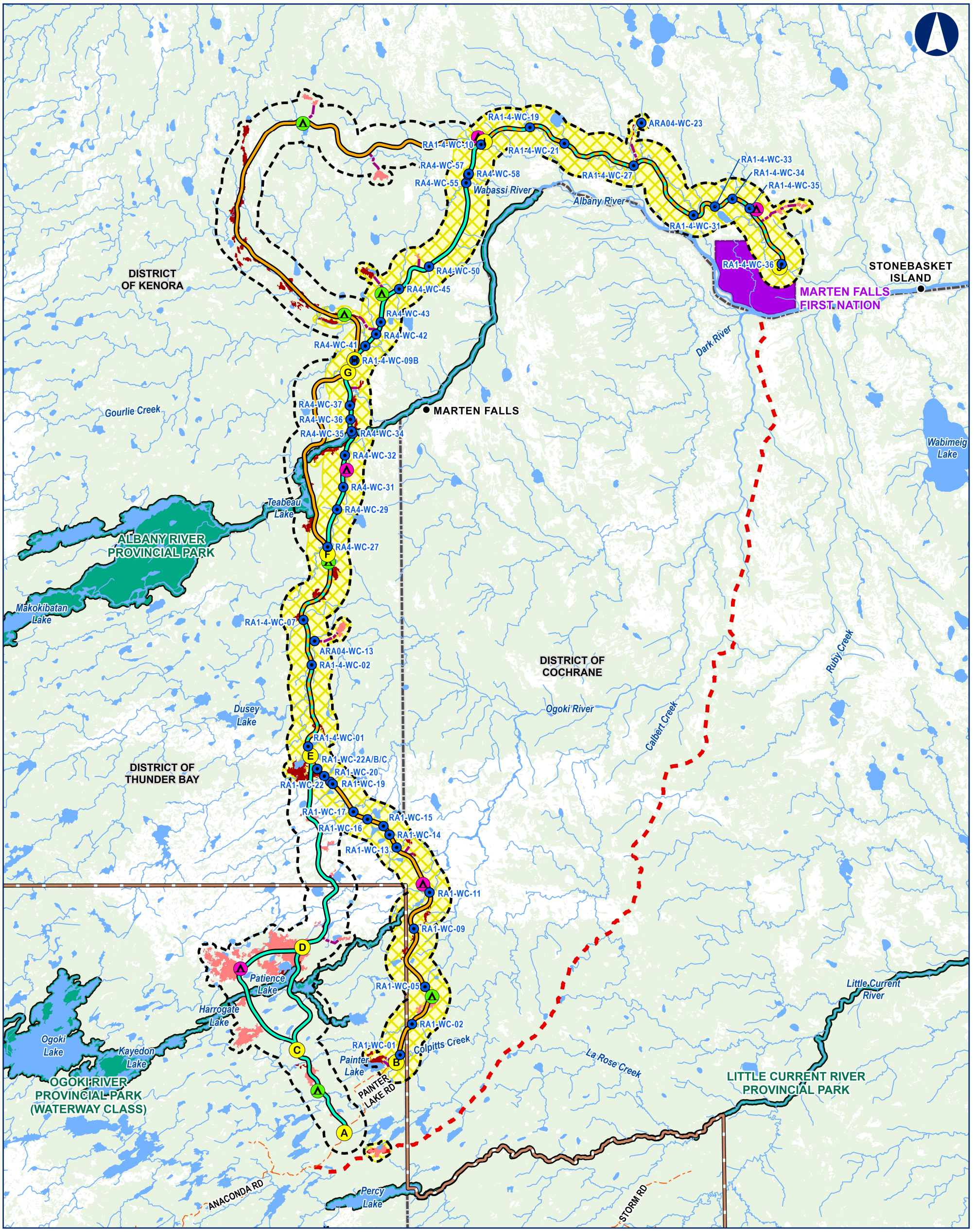


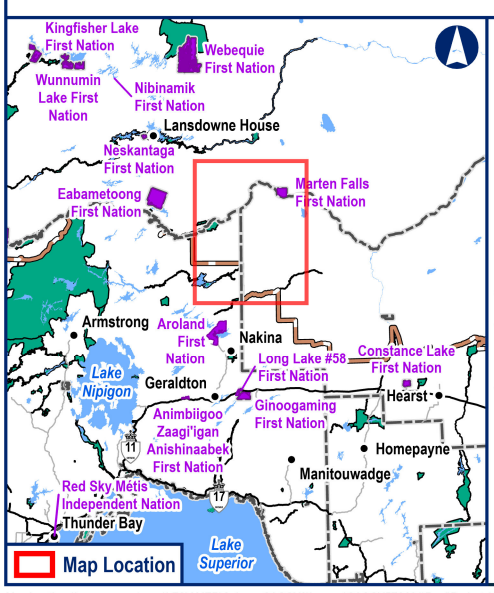


**Legend**

- Water Crossing
- Segment Node
- Project Study Area
- Final Route Recommendation

**Construction Disturbance Area**

Route Alternatives (100 m Right-of-Way)

- Alternative 1
- Alternative 4

N/A

- Alternative 1 and Alternative 4

Potential Camp Site

- 50 Persons (108 m x 150 m)
- 200 Persons (108 m x 150 m)

Potential Aggregate Source

- Bedrock
- Sand and gravel
- Approximate Access Road to Potential Aggregate Site (10 m Width)

**General Features**

- Resource / Recreation Road
- MFFN Existing Winter Access Road
- Watercourse
- Waterbody
- First Nation Reserve
- District Municipal Boundary
- Far North Boundary
- Provincial Park

**Data Source:**
Base Data: Provided by MNRF 2023; Route Infrastructure - Provided by AECOM 2021. Contains Information licensed under the Government Licence Ontario.

**Notes:**
First Nation Reserves of MFFN CAR Neighboring Indigenous Communities are shown within the inset extent.

# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Final Route Recommendation

0 5 10 20
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

January 2026 | 1:450,000 * when printed 11"x17"

Rev:00

**Figure 6-2**

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Map location: \\na.aecomnet.com\LFS\AMER\Calgary-CACGY3\Legacy\CACGY5FS001\Prod\Projects\60593122\900-CAD_GIS\920-929 (GIS-Graphics)\Design\01_Reports_2024\Route Recommendation\PRJ_MFCAR_Final Route Recommendation_60593122.aprx Figure: MAP_Fig6-2_MFCAR_PerferredRouteWatercrossings_60593122
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# 7 Residual Effects Assessment

Effects assessment results are provided for the Preferred Route, with consideration of the temporal boundaries of the Project as described in **Section 4.2**. This includes the potential effects (positive, negative, and neutral), mitigation and enhancement measures, and an assessment of residual effects.

## 7.1 Summary of Project Components and the Existing Environment

A total of 45 waterbodies are crossed by the Preferred Route, including the Dusey (RA1-4-WC-02), Buffaloskin (RA1-4-WC-31), Ogoki (RA1-WC-05 and RA1-WC-11), Albany (RA4-WC-34), and the Wabassi (RA4-WC-55) rivers (**Table 7-1**). The larger waterbodies (i.e., greater than 5 m bankfull width) along the Preferred Route provide year-round fish habitat including spawning, rearing, feeding, and overwintering habitat. The smaller waterbodies may not provide overwintering habitat due to low oxygen levels and limited depth, but can provide suitable habitat for spawning, rearing, and feeding for portions of the year, typically in early spring and after the spring freshet. Spring and fall spawners are found throughout the Construction Disturbance Area (**Table 7-1**). Benthic invertebrates were found throughout the Construction Disturbance Area, and fairly diverse communities were found at all sites that were sampled (**Section 5.3**).

Waterbodies along the Preferred Route and temporary access route are known to support the six Valued Component fish species (Lake Sturgeon, Northern Pike, Brook Trout, Walleye, Lake Whitefish, and Burbot). Lake Sturgeon, Walleye, and Lake Whitefish all inhabit lakes and large rivers (**Table 7-2**). Lake Sturgeon are known to be present in three waterbody crossings (all along the Preferred Route, none on temporary access route), Walleye are present at 28 waterbody crossings (19 along the Preferred Route, 9 along temporary access route), and Lake Whitefish are present at three waterbody crossings (all along the Preferred Route, none on temporary access route). Brook Trout are present at 28 waterbody crossings (20 along the Preferred Route, 8 along temporary access route), and inhabit clear, cold, well-oxygenated watercourses and lakes. Northern Pike are present at 51 waterbody crossings (34 along the Preferred Route, 17 along temporary access route), and prefer weedy bays of lakes and slow, meandering, and heavily vegetated waterbodies. Burbot are present at 19 waterbody crossings (13 along the Preferred Route, 6 along temporary access route) and prefer moderate to deep lakes and large watercourses.

Each of the 45 waterbody crossings along the Preferred Route will have permanent waterbody crossing structures installed, including 13 culverts, 22 clear span bridges, and 10 multi-span bridges (**Table 7-1**). For temporary access roads, there will be 24 temporary waterbody crossings, including 6 culverts, 12 clear span bridges, and 6 multi-span bridges (**Table 7-3**).

The restricted activity timing windows for each waterbody crossing will be finalized by the Ministry of Natural Resources during permitting, but restricted activity timing windows have been proposed in the *Environmental Assessment / Impact Statement Report,* as they are a key mitigation measure. For each waterbody crossing, if a fish species was documented in the tertiary watershed or if the waterbody type was considered to provide spawning habitat for certain fish species, then the waterbody was determined to provide potential spawning habitat for that fish species and the timing window for that species (**Table 5-17**) was applied (**Table 7-1**). Spawning habitat requirements for each species are outlined in **Section 5.5** and were determined using known life history characteristics for each fish species (Scott and Crossman, 1998; Holm et al., 2010).

All waterbodies had the spring restricted activity timing window applied due to the known or likely presence of spring spawning fish. Waterbodies with suspected or known fall fish spawning habitat had a fall restricted activity timing window applied beginning on September 1 for waterbodies that have potential Cisco, Brook Trout, or Lake Trout spawning habitat, and beginning on September 15 for waterbodies that have potential Lake Whitefish spawning habitat. These restricted activity timing windows also cover waterbodies with potential Burbot spawning habitat documented throughout the Project footprint.

**Table 7-1: Existing Conditions, Crossing Infrastructure, and Restricted Activity Timing Windows Along the Preferred Route**

| Waterbody Crossing ID[a] | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential | Proposed Crossing Structure[b] | Proposed Restricted Activity Timing Windows[c] |
|---|---|---|---|---|---|---|---|---|---|---|
| RA1-4-WC-01 | Unnamed | F | 1.3 | 3 | 0.7 | Or, Si | AV, UC, OV | Habitat suitable for fish species adapted to waterbodies with fine substrates and abundant vegetation. | Culvert | September 1 to June 20 |
| RA1-4-WC-02 | Dusey River | F, RF | 34.7 | 44 | 1.3 | Co, Bo, Gr, Sa, Si | Sub, D / T, WD, AV | Variety of habitat units and mixed substrates is suitable for a range of small- and large-bodied fish species. Overwintering habitat present. | Multi-span bridge | September 1 to June 20 |
| RA1-4-WC-07 | Unnamed | F | 6 | N/A | 1.5 | Or | D / T, AV | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. | Multi-span bridge | September 1 to June 20 |
| RA1-4-WC-09B | Unnamed | F | 3 | 3 | 3 | Or, Si | N/A | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. | Culvert | September 1 to June 20 |
| RA1-4-WC-10 | Unnamed | F | 6 | 6 | 1.5 | Or | D / T, AV, WD | Habitat present for small-bodied fish species adapted to waterbodies with fine substrates. | Clear span bridge | September 1 to June 20 |
| RA1-4-WC-19 | Unnamed | F | 35 | 27 | 1.5 | Or | D / T, AV | Habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. | Multi-span bridge | September 1 to June 20 |
| RA1-4-WC-21 | Unnamed | F | 5.5 | 6 | 1.2 | Or | AV, D / T | Habitat present for fish species adapted to fine substrates and abundant vegetation. | Multi-span bridge | September 1 to June 20 |
| RA1-4-WC-27 | Unnamed | F | 4 | 4 | 1 | Or | N/A | Habitat present for fish species adapted to waterbodies with fine substrates. | Clear span bridge | September 1 to June 20 |
| RA1-4-WC-31 | Buffaloskin River | F | 7 | 8 | 0.78 | Or | WD | Suitable habitat present for fish adapted to fine substrates. | Clear span bridge | September 1 to June 20 |
| RA1-4-WC-33 | Unnamed | F | 5.2 / 2.0 | 5.7 | 0.6 / 0.7 | Or | AV, OV | Suitable habitat present for small-bodied fish adapted to fine substrates. | Culvert | April 1 to June 15 |
| RA1-4-WC-34 | Unnamed | F | 20 | 25 | N/A | Or | N/A | Habitat present for small-bodied fish species adapted to waterbodies with fine substrates. | Clear span bridge | September 1 to June 20 |
| RA1-4-WC-35 | Unnamed | F, IP | 2.7 | 3.2 | 0.7 | Or, Sa | UC, WD, D / T, AV, OV | Suitable habitat present for small-bodied fish. Overwintering habitat present. | Clear span bridge | April 1 to June 15 |
| RA1-4-WC-36 | Unnamed | F | 14.5 | 15.5 | >2 | N/A | D / T, AV, WD, OV | Suitable habitat present for fish adapted to fine substrates. Overwintering habitat present. | Clear span bridge | September 1 to June 20 |
| RA1-WC-01 | Unnamed | IP, F, RF, P, R | 4.75 | 5.5 | 0.5 | Or, Bo, Co, Si, Sa | D / T, AV, WD, Sub, OV | Variety of habitat units and mixed substrates is suitable for a range of small- and large-bodied fish species. Overwintering habitat present. | Clear span bridge | September 1 to June 20 |
| RA1-WC-02 | Unnamed | F, P, RA | 8 | 8 | 1.3 | Bo, Co, Si | D / T, Sub, WD, OV | Habitat suitable for a range of small- and large-bodied fish due to depths and mixed substrates. Overwintering habitat present. | Clear span bridge | September 1 to June 20 |

| Waterbody Crossing ID[a] | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential | Proposed Crossing Structure[b] | Proposed Restricted Activity Timing Windows[c] |
|---|---|---|---|---|---|---|---|---|---|---|
| RA1-WC-05 | Ogoki River | R, RF | 48 | 73 | >1.5 | Bo, Co, Gr, Sa | Sub, D / T, WD, AV | Large- and small-bodied fish historically documented. Habitat suitable for a range of fish due to depths and mixed substrates. Overwintering habitat present. | Multi-span bridge | September 1 to June 30 |
| RA1-WC-09 | Unnamed | IP | 2.1 | 2.4 | 2.6 | Or | UC, WD, OV | Habitat suitable for small-bodied fish species. | Culvert | April 1 to June 15 |
| RA1-WC-11 | Ogoki River | F, R | 100 | 110 | 2 | Co, Si, Or | D / T, Sub, AV | Habita suitable for a range of fish due to depths and mixed substrates. Large- and small-bodied fish historically documented. Overwintering habitat present. | Multi-span bridge | September 1 to June 30 |
| RA1-WC-13 | Unnamed | RF, R | 9 | 9 | N/A | Co, Bo | Sub | Habitat suitable for small-bodied fish and Northern Pike. | Clear span bridge | September 1 to June 20 |
| RA1-WC-14 | Unnamed | F | 3 | 3.5 | 1.2 | Or, Si | D / T, WD, UC | Habitat suitable for small-bodied fish species adapted to fine substrates and low dissolved oxygen. | Clear span bridge | April 1 to June 15 |
| RA1-WC-15 | Unnamed | F | 22 | 4 | N/A | Or | AV | Habitat suitable for small-bodied fish and Northern Pike. | Clear span bridge | September 1 to June 20 |
| RA1-WC-16 | Unnamed | F | 50 / 70 | 6.5 | 1.7 | Or | D / T, AV | Habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. | Clear span bridge | September 1 to June 20 |
| RA1-WC-17 | Unnamed | R | 9 | 10 | 0.9 | Gr, Sa, Si, Co, Bo, Or | D / T, Sub, AV, WD, UC, OV | Habitat present for small- and large-bodied fish. Overwintering habitat present. | Clear span bridge | September 1 to June 20 |
| RA1-WC-19 | Unnamed | F | 20 | 2 | 1 | Or, Si | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. | Clear span bridge | April 1 to June 15 |
| RA1-WC-20 | Unnamed | F, IP | 2 | 2 | <1 | Or | N/A | Habitat suitable for small-bodied fish species adapted to organic substrates. | Culvert | April 1 to June 15 |
| RA1-WC-22 | Unnamed | F, IP | 50 | 17 | 1 | Or, Si | D / T, AV, WD | Habitat suitable for small- and large-bodied fish. Limited overwintering habitat | Clear span bridge | September 1 to June 20 |
| RA1-WC-22A | Unnamed | F | 20 | 2 | N/A | Or, Si | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. | Clear span bridge | April 1 to June 15 |
| RA1-WC-22B | Unnamed | F | 20 | 2 | N/A | Or, Si | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. | Clear span bridge | April 1 to June 15 |
| RA1-WC-22C | Unnamed | F | 20 | 2 | N/A | Or, Si | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. | Clear span bridge | April 1 to June 15 |
| RA4-WC-27 | Unnamed | F | 53 | 178 | >1 | Or | D / T, AV, WD | Habitat present for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. | Multi-span bridge | September 1 to June 20 |
| RA4-WC-29 | Unnamed | R | 8 | 8 | <1 | Or | N/A | Poorly defined channel in a wetland with sections of ponded water. Habitat may be present for small-bodied fish species. | Clear span bridge | September 1 to June 20 |
| RA4-WC-31 | Unnamed | R, F | 2.5 | 3 | 0.4 | Sa, Co, Bo, Gr | WD, OV, Sub | Habitat suitable for fish that are adapted to fine / organic substrates. | Culvert | September 1 to June 20 |

| Waterbody Crossing ID[(a)] | Waterbody Name | Habitat Types | Mean Wetted Width (m) | Mean Bankfull Width (m) | Mean Water Depth (m) | Bed Substrate | Instream Cover | Fish Habitat Potential | Proposed Crossing Structure[(b)] | Proposed Restricted Activity Timing Windows[(c)] |
|---|---|---|---|---|---|---|---|---|---|---|
| RA4-WC-32 | Unnamed | F, IP | 50 | 3 | <1 | Or | N/A | Poorly defined channel / flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. | Clear span bridge | September 1 to June 20 |
| RA4-WC-34 | Albany River | R | 50 | 70 | >2 | Bo, Sa, Co, Gr | D / T, Sub | Large- and small-bodied fish historically documented. Habitat suitable for a wide range of fish. Overwintering habitat present. | Multi-span bridge | September 1 to June 30 |
| RA4-WC-35 | Unnamed | R | 1.3 | 1.7 | 0.3 | Gr, Si, Sa, Or | WD, UC | Habitat suitable for fish that are adapted to fine / organic substrates. | Culvert | September 1 to June 20 |
| RA4-WC-36 | Unnamed | F | 1 | N/A | N/A | Or, Si | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. | Culvert | April 1 to June 15 |
| RA4-WC-37 | Unnamed | F | 9 | 6 | >1.5 | Or, Si | D / T, OV, AV | Habitat suitable for fish that are adapted to fine / organic substrates and aquatic vegetation. | Clear span bridge | September 1 to June 20 |
| RA4-WC-41 | Gourlie Creek | R | 31 | 34 | 1.5 | Sa, Si | D / T | The deep, wide, flat habitat likely provides overwintering and spawning habitat. | Multi-span bridge | September 1 to June 20 |
| RA4-WC-42 | Unnamed | F | 4 | 6 | 0.9 | Or, Si | AV, WD, OV | Habitat suitable for fish that are adapted to fine / organic substrates, aquatic vegetation and woody debris. | Culvert | September 1 to June 20 |
| RA4-WC-43 | Unnamed | IP | 25 | N/A | <0.8 | Or | N/A | Poorly defined channel / flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. | Culvert | September 1 to June 20 |
| RA4-WC-45 | Unnamed | F | 7 | 10 | 1.1 | Si, Or | WD | Habitat suitable for fish that are adapted to fine / organic substrates, flooded vegetation and woody debris. | Clear span bridge | April 1 to June 15 |
| RA4-WC-50 | Unnamed | F | 1 | 2 | N/A | Or | N/A | Habitat is suitable for small-bodied fish adapted to fine substrates. | Culvert | September 15 to June 15 |
| RA4-WC-55 | Wabassi River | R | 45 | 50 | 1.2 | Sa, Co, Gr, Bo | D / T, AV, Sub, UC | Habitat suitable for all fish due to wide variety of substrates available. Overwintering habitat present. | Multi-span bridge | September 1 to June 20 |
| RA4-WC-57 | Unnamed | F | 2 | 2 | 0.5 | Or, Si, Sa, Bo | WD, AV, OV, UC | Habitat suitable for fish that are adapted to fine / organic substrates and aquatic vegetation. | Culvert | September 1 to June 20 |
| RA4-WC-58 | Unnamed | F | 5 | 15 | 0.8 | Or | AV, WD, OV | Habitat suitable for fish that are adapted to fine / organic substrates and woody debris. | Culvert | September 1 to June 20 |

Notes:
(a) Refer to Figures 2-1 to 2-7 in Attachment B for waterbody crossing locations.
(b) Proposed for the *Environmental Assessment / Impact Statement Report*; may change during detailed design.
(c) Proposed for the *Environmental Assessment / Impact Statement Report*; will be finalized by the Ministry of Natural Resources during permitting.
m = metre; N/A = not applicable; < = less than; > = greater than; RF = Riffle; RA = Rapid; R = Run; F = Flat; IP = Impoundment; P=Pool; Or = organics; Si = silt; Sa = sand; Gr = gravel; Co = cobble; Bo = boulder; Sub = substrate; WD = woody debris; D / T = depth / turbulence; AV = aquatic vegetation; OV = overhanging vegetation; UC = undercut banks.

## Table 7-2: Summary of Existing Conditions within the Preferred Route

| Valued Component | Construction Disturbance Area | | Local Study Area | Regional Study Area |
|---|---|---|---|---|
| | Preferred Route | Temporary Access Route | | |
| **Nameh**[(a)]<br>**Lake Sturgeon (*Acipenser fulvescens*)** | ■ Three crossings have the potential for rearing, feeding, or overwintering habitat and, of these, two crossings have the potential for spawning habitat.<br>■ There is approximately 2.6 ha of habitat for Lake Sturgeon, including 1.5 ha of spawning habitat. | ■ No crossings have the potential for rearing, feeding, overwintering, or spawning habitat. | ■ Can complete life cycle in the Local Study Area | ■ Can complete life cycle in the Regional Study Area<br>■ Present in larger watercourses including Albany and Ogoki rivers |
| **Okaas**[(a)]<br>**Pickerel**[(b)]<br>**Walleye (*Sander vitreus*)** | ■ 19 crossings have the potential for rearing, feeding, or overwintering habitat and, of these, 8 crossings have the potential for spawning habitat.<br>■ There is approximately 7.1 ha of habitat for Walleye, including 4.1 ha of spawning habitat. | ■ Nine crossings have the potential for rearing, feeding, or overwintering habitat and, of these, five crossings have the potential for spawning habitat.<br>■ There is approximately 0.2 ha of habitat for Walleye, including 0.1 ha of spawning habitat. | ■ Can complete life cycle in the Local Study Area | ■ Can complete life cycle in the Regional Study Area |
| **Masamekos**[(a)]<br>**Speckled Trout**[(b)] **/ Brook Trout (*Salvelinus fontinalis*)** | ■ 20 crossings have the potential for rearing, feeding, or overwintering habitat and, of these, 7 crossings have the potential for spawning habitat.<br>■ There is approximately 7.1 ha of habitat for Brook Trout, including 3.7 ha of spawning habitat. | ■ Eight crossings have the potential for rearing, feeding, or overwintering habitat and, of these, three crossings have the potential for spawning habitat.<br>■ There is approximately 0.2 ha of habitat for Brook Trout, including 0.1 ha of spawning habitat. | ■ Can complete life cycle in the Local Study Area<br>■ Considered common in Local Study Area | ■ Can complete life cycle in the Regional Study Area<br>■ Abundant in small, cold watercourses |
| **Najwabe**[(a)]<br>**Northern Pike (*Esox lucius*)** | ■ 34 crossings have the potential for rearing, feeding, or overwintering habitat and, of these, 24 crossings have the potential for spawning habitat.<br>■ There is approximately 8.1 ha of habitat for Northern Pike, including 6.7 ha of spawning habitat. | ■ 17 crossings have the potential for rearing, feeding, or overwintering habitat and, of these, 12 crossings have the potential for spawning habitat.<br>■ There is approximately 0.3 ha of habitat for Northern Pike, including 0.2 ha of spawning habitat. | ■ Can complete life cycle in the Local Study Area<br>■ Considered widely distributed in the Local Study Area | ■ Can complete life cycle in the Regional Study Area<br>■ Abundant in small, cool water lakes and watercourses with instream vegetation |
| **Atikameg**[(a)]<br>**Lake Whitefish (*Coregonus clupeaformis*)** | ■ Three crossings have the potential for rearing, feeding, or overwintering habitat and, of these, two crossings have the potential for spawning habitat.<br>■ There is approximately 2.6 ha of habitat for Lake Whitefish, including 1.5 ha of spawning habitat. | ■ No crossings have the potential for rearing, feeding, overwintering, or spawning habitat. | ■ Can complete life cycle in the Local Study Area<br>■ Considered widely distributed in the Local Study Area | ■ Can complete life cycle in the Regional Study Area<br>■ Abundant in cold water lakes and larger watercourses<br>■ Present in Albany and Ogoki rivers |
| **Mihzhash**[(a)]<br>**Ling**[(b)]<br>**Burbot (*Lota lota*)** | ■ 13 crossings have the potential for rearing, feeding, or overwintering habitat and, of these, 5 crossings have the potential for spawning habitat.<br>■ There is approximately 6.4 ha of habitat for Burbot, including 2.8 ha of spawning habitat. | ■ Six crossings have the potential for rearing, feeding, or overwintering habitat and, of these, three crossings have the potential for spawning habitat.<br>■ There is approximately 0.1 ha of habitat for Burbot, including 0.1 ha of spawning habitat. | ■ Can complete life cycle in the Local Study Area<br>■ Considered widely distributed in the Local Study Area | ■ Can complete life cycle in the Regional Study Area<br>■ Present in Albany River<br>■ Abundant in cold water lakes and larger watercourses |

Notes:
(a) Oji-Cree name.
(b) Local English language name.
ha = hectare.

**Table 7-3: Number of Proposed Crossings Structures and Area Impacts at Waterbody Crossings Along the Preferred Route and Temporary Access Roads**

| Road | Crossing Structure | | | Total |
|---|---|---|---|---|
| | Culvert | Clear Span Bridge | Multi-span Bridge | |
| **Number of Proposed Waterbody Crossings** | | | | |
| Preferred Route | 13 | 22 | 10 | **45** |
| Temporary Access | 6 | 12 | 6 | **24** |
| **Total** | **19** | **34** | **16** | **69** |
| **Area Impacted of Proposed Waterbody Crossings (ha)** | | | | |
| Preferred Route | 0.7 | 1.6 | 6.1 | **8.3** |
| Temporary Access | 0.2 | 1.7 | 2.5 | **4.4** |
| **Total** | **0.9** | **3.3** | **8.6** | **12.7** |

ha = hectare.

## 7.2 Project–Environment Interactions

The analysis of Project–environment interactions for fish and fish habitat that are likely to have a potential effect is provided in **Table 7-4**.

**Table 7-4: Project–Environment Interactions**

| Project Phase | Project Activities | Valued Component | Indicator | Description of Potential Effects |
|---|---|---|---|---|
| **Construction** | ■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon (*Acipenser fulvescens)*<br>■ Walleye (*Sander vitreus*)<br>■ Speckled Trout / Brook Trout (*Salvelinus fontinalis*)<br>■ Northern Pike (*Esox lucius*)<br>■ Lake Whitefish (*Coregonus clupeaformis*)<br>■ Burbot (*Lota lota*) | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality through physical alteration of waterbodies |
| | ■ Clearing of the right-of-way and temporary access roads<br>■ Constructing the Community Access Road<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality through changes to riparian vegetation |
| | ■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Survival and reproduction | ■ Injury or mortality of fish from instream construction |
| | ■ Clearing of the right-of-way and temporary access roads<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to habitat quality from release of sediment at waterbody crossings |
| | ■ Clearing of the right-of-way and temporary access roads<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology |
| | ■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas) | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Distribution and connectivity<br>■ Survival and reproduction | ■ Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures, affecting fish access to habitats |
| | ■ Clearing of the right-of-way and temporary access roads<br>■ Constructing the Community Access Road | ■ Lake Sturgeon<br>■ Walleye | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels |

| Project Phase | Project Activities | Valued Component | Indicator | Description of Potential Effects |
|---|---|---|---|---|
| | ■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas) | ■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | | |
| | ■ Blasting rock | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Survival and reproduction | ■ Blasting-related injuries or mortality to fish |
| | ■ Clearing of the right-of-way and temporary access roads<br>■ Blasting rock<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quality from the deposition of air contaminants and fugitive dust emissions |
| | ■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas) | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Survival and reproduction | ■ Changes to fish survival and reproduction from improved public access to recreational angling areas |
| | ■ Clearing of the right-of-way and temporary access roads<br>■ Blasting rock<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Construction of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas)<br>■ Decommissioning of temporary infrastructure | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Survival and reproduction | ■ Changes to fish survival and reproduction from spills of fuel or other materials |
| **Operation and Maintenance** | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality through physical alteration of waterbodies |
| | ■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality through changes to riparian vegetation |

| Project Phase | Project Activities | Valued Component | Indicator | Description of Potential Effects |
|---|---|---|---|---|
| | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology |
| | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Distribution and connectivity<br>■ Survival and reproduction | ■ Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures, affecting fish access to habitats |
| | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels |
| | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Habitat quantity and quality | ■ Changes to fish habitat quality from the deposition of air contaminants and fugitive dust emissions |
| | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Survival and reproduction | ■ Changes to fish survival and reproduction from improved public access to recreational angling areas |
| | ■ Operating the Community Access Road and permanent access roads<br>■ Maintaining[(a)] the Community Access Road and permanent access roads, including bridges and culverts | ■ Lake Sturgeon<br>■ Walleye<br>■ Speckled Trout / Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | ■ Survival and reproduction | ■ Changes to fish survival and reproduction from spills of fuel or other materials |

Notes:
(a) Includes general maintenance (e.g., grading, erosion control, and dust suppression), seasonal maintenance (e.g., vegetation clearing, snow clearing, sanding, and bridge and culvert maintenance), and special maintenance (e.g., ditches, slope failures, and road settlement / break-up).

# 7.3 Assessing Residual Effects

This section presents the potential effects from **Section 7.2** and mitigation and enhancement measures to prevent or reduce effects on fish and fish habitat Valued Components; where residual Project effects are predicted to occur (**Section 7.3.1**), these residual effects are brought forward for assessment and characterization into **Section 7.3.2** and into the cumulative effects assessment for fish and fish habitat Valued Components in **Section 8**. Potential effects, mitigation and enhancement measures, and residual effects are summarized in **Section 7.3.1**.

## 7.3.1 Potential Effects, Mitigation and Enhancement Measures, and Predicted Residual Effects

This section presents the potential effects, mitigation, and enhancement measures and determines whether there are residual Project effects for fish and fish habitat Valued Components. The fish and fish habitat Valued Components were discussed together as the potential effects for each of the Valued Components are similar. All mitigation and enhancement measures are presented in categories (e.g., general, riparian vegetation, and instream construction); a summary of the potential effects, mitigation and enhancement measures, and residual effects is provided in **Section 7.3.1.12**.

### 7.3.1.1 Changes to Fish Habitat Quantity and Quality Through Physical Alterations of Waterbodies

#### 7.3.1.1.1 Potential Effects

**Construction**

The Construction of the Community Access Road has the potential for direct and indirect effects that could cause negative changes to fish habitat quantity and quality through physical alteration of waterbodies. Permanent waterbody crossing structures are required on the Preferred Route and temporary waterbody crossing structures are required along the temporary access roads. These waterbody crossings have the potential to directly affect fish habitat quantity and quality in each of the waterbodies where they are installed. Where new waterbody crossing structures are proposed, the primary preferred structures to be used are culverts, clear span bridges, and multi-span bridges. For temporary crossings, culverts, clear span bridges, and ice bridges will be used.

Disturbances that may affect fish habitat directly from Construction of waterbody crossings include:

- Operation of heavy machinery in the waterbody for installation of a crossing structure;
- Installation of isolation structures;

- Bank treatments, site preparation, and restoration / reclamation;
- Placement of structures (e.g., piers and culverts), fill, or other materials in the waterbody; and
- Removal of temporary crossing structures.

Effects on fish habitat from work in a waterbody during Construction have the potential to affect fish and fish habitat through the following:

- Changes in the waterbody bed (from disturbance);
- Changes in food supply (i.e., effects on benthic invertebrate communities);
- Changes in flows from the installation of isolation structures during in-water construction;
- Changes in the composition and size of bed material; and / or
- Changes in the bank configuration or materials.

Direct habitat effects can include alteration or loss of specific habitat features, such as pools, aquatic vegetation, and bed materials that ultimately lead to loss or impairment of habitat functions, such as overwintering, spawning, and rearing habitat for fish or lower trophic levels. These direct habitat effects may result in changes in the food supply, which may be reflected in altered fish community structure and productivity.

Aroland First Nation noted concerns associated with how Lake Sturgeon might be impacted by new watercourse crossings, noting that the species is sensitive to habitat disturbances (Shared Value Solutions, 2024). Along the Preferred Route, a total of approximately 8.3 ha of aquatic habitat will be lost or altered from the waterbody crossing structures, including 0.7 ha of habitat lost for culverts, 1.6 ha altered for clear span bridges, and 6.1 ha altered for multi-span bridges (**Table 7-3**). This includes approximately 2.6 ha of habitat for Lake Sturgeon, 7.1 ha of habitat for Walleye, 7.1 ha of habitat for Brook Trout, 8.1 ha of habitat for Northern Pike, 2.6 ha of habitat for Lake Whitefish, and 6.4 ha of habitat for Burbot could be altered or lost.

Along the temporary access roads, a total of approximately 4.4 ha of aquatic habitat will be altered from the waterbody crossing structures, including 0.2 ha of habitat altered for culverts, 1.7 ha altered for clear span bridges, and 2.5 ha altered for multi-span bridges (**Table 7-3**). This includes approximately 0.2 ha of habitat for Walleye, 0.2 ha of habitat for Brook Trout, 0.3 ha of habitat for Northern Pike, and 0.1 ha of habitat for Burbot could be altered or lost. No habitat for Lake Sturgeon or Lake Whitefish was present on the temporary access roads.

This may include a loss of gravel spawning habitat for the Valued Component fish species such as Brook Trout, Walleye, Burbot, or Lake Sturgeon, a loss of shoal spawning habitat for the Valued Component fish species such as Lake Whitefish, or a loss of aquatic vegetation spawning habitat for fish species that spawn in aquatic vegetation such as Northern Pike.

The effects depend on the types of habitat at the crossing site, the type of crossing structure used, and the timing of the construction. If work is required below the high-water mark (e.g., installation of fill or a culvert), work may temporarily or permanently affect the section of fish habitat where the work below the high-water mark is located. Additionally, fish communities can be negatively affected by in-water work that occurs during certain periods in their life history or at certain life stages; for example, this can include movements to spawning areas, spawning and egg incubation, or eggs and newly hatched fry.

**Operation and Maintenance**

Direct and indirect effects on fish habitat quantity and quality from physical alteration of waterbodies may also occur during Operation and Maintenance of the Community Access Road. Disturbances that may affect fish habitat directly from Operation and Maintenance of waterbody crossings include:

- Bridge and culvert maintenance; and
- Debris removal from crossing structures.

As described above for Construction, direct effects on fish habitat from work in a waterbody during Operation and Maintenance can affect fish habitat through changes in the composition and size of bed material, changes in the bank configuration or materials, and associated changes in food supply (i.e., effects on benthic invertebrate communities). The effects depend on the habitat at the crossing site and the timing of the activities.

#### 7.3.1.1.2 Mitigation and Enhancement Measures

**Construction**

Mitigation and enhancement measures and best management practices that will be implemented during Construction are as follows:

- General:
  - Follow best management practices and environmental approval conditions, permits, or authorizations issued for the Project including those issued from Fisheries and Oceans Canada (a Request for Review will be prepared for Fisheries and Oceans Canada. Fisheries and Oceans Canada will determine whether to provide a Letter of Advice or if a *Fisheries Act* Authorization is required) and the Ministry of Natural

Resources (permits will be required from the Ministry of Natural Resources under the *Lakes and Rivers Improvement Act*).

- Where feasible, areas of sensitive fish habitat and fishing areas that have been identified through the Indigenous Knowledge program in pre-construction design will be avoided.
- Limit the Project footprint to the extent feasible.
- Use existing access roads where possible, recognizing that existing access is limited.
- Complete work as quickly as possible to shorten the duration of disturbance.
- Decommission and rehabilitate temporary access roads, staging areas, camps, and debris and / or timber stockpiles following Construction, where not needed for Operation and Maintenance activities.

- Waterbody crossings:
  - Design permanent waterbody crossing structures to accommodate climate change considerations.
  - Use existing waterbody crossing structures where possible. Minimize the number of waterbody crossings required for the Project.
  - During detailed design, complete site-specific fish and fish habitat and surface water surveys using methods similar to those outlined in **Section 4.3** to support engineering and Fisheries and Oceans Canada and the Ministry of Natural Resources permitting at waterbody crossings where work below the high-water mark is proposed. Submit designs of waterbody crossings as required for permit applications to Fisheries and Oceans Canada and the Ministry of Natural Resources. Surveys may also be required at select sites where work above the high-water mark is proposed based on Fisheries and Oceans Canada and the Ministry of Natural Resources permitting requirements.
  - Have Environmental Monitors and Indigenous Environmental Monitors on site during construction to confirm that all waterbodies crossed by the Preferred Route right-of-way and access roads have been identified and documented in the waterbody crossing list. The Environmental Monitors will monitor the installation, use, and removal of waterbody crossing structures. The Environmental Monitors will confirm that the appropriate waterbody crossing structure is being used and that the required Fisheries and Oceans Canada and the Ministry of Natural Resources approvals and permits are in place.
  - If new waterbodies are identified prior to construction, contract an Aquatics Specialist to assess the waterbody. Depending on the nature of the waterbody, recommendations for construction methods, appropriate mitigation and

enhancement measures, and permitting requirements will be made by the Aquatics Specialist and, if necessary, local First Nation communities and appropriate regulatory agencies including Fisheries and Oceans Canada and the Ministry of Natural Resources will be engaged. This will allow for the appropriate mitigation and enhancement measures to be implemented during construction at each waterbody crossing at a site-specific level, which will reduce or avoid potential effects on habitat quantity and quality. If new waterbodies are identified during construction, clearly flag the waterbody and suspend activity within 30 m of the location until an Aquatic Specialist has assessed the waterbody and determined a suitable course of action, which may include contacting Fisheries and Oceans Canada and the Ministry of Natural Resources.

- Construct waterbody crossings in a manner that maintains downstream flows and fish passage and follows conditions of permits or authorizations issued for the Project by Fisheries and Oceans Canada and the Ministry of Natural Resources.
- Construct, operate, remove, decommission, and rehabilitate all waterbody crossing structures, if appropriate, following best management practices and environmental approval conditions, including Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a) and *Standards and Codes of Practice* (2025b,c).
- Avoid constructing in sensitive habitats (e.g., spawning areas and groundwater upwellings) where feasible.
- Construct or install waterbody crossing structures in a manner that protects the banks from erosion, maintains downstream flows in the waterbody, and follows the requirements of permits or authorizations issued for the Project from Fisheries and Oceans Canada and the Ministry of Natural Resources.
- Fording of a waterbody is not permitted, unless approved by the Ministry of Natural Resources and Fisheries and Oceans Canada. As per Fisheries and Oceans Canada's *Codes of Practice* (2025b), limit fording to a one-time event (over and back) and use only if an existing crossing at another location is not available or practical to use. If repeated crossings of the waterbody are required, a crossing structure will be installed. Permits are expected to be required from Ministry of Natural Resources for any use of a ford.

- Instream Construction:
  - Complete instream construction in isolation of flowing water (i.e., use isolation methods for the installation and removal of culverts where surface water exists at the time of construction).

- For isolations / diversions, maintain 100% downstream flow.
- Use erosion-resistant fill material below the high-water level within the floodplain of a waterbody.
- Upon removal of the temporary crossing materials, return the waterbody banks to their original profile if needed and stabilize and revegetate disturbed areas, as necessary, to prevent soil erosion.
- Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles a minimum of 30 m away from the ordinary high-water mark of a waterbody, where possible.

- Restricted Activity Timing Window:
  - Avoid construction during a fish and fish habitat restricted activity timing window, where feasible. Work may not be conducted during the proposed restricted activity timing window unless approval is obtained from the Ministry of Natural Resources and Fisheries and Oceans Canada. Proposed restricted activity timing windows were assigned to avoid work during sensitive life history periods or life stages for all fish that may be present in each waterbody, including movements to spawning areas, spawning and egg incubation, or eggs and newly hatched fry (**Table 7-1**). The restricted activity timing windows for each waterbody crossing will be finalized by the Ministry of Natural Resources during permitting.
  - For permanent and temporary waterbody crossing structures, the proposed restricted activity timing window will be applicable if:
    - Any work is completed below the high-water mark (e.g., installation or removal of fill or culverts, bridge supports below the high-water mark, one-time ford).
    - The waterbody is frozen and an ice bridge / snow fill is constructed.
    - Beaver dam removals are required.
  - For permanent and temporary waterbody crossing structures, the proposed restricted activity timing window will not be applicable:
    - If all work is completed above the high-water mark (e.g., installation or removal of a clear span bridge with no fill or supports below the high-water mark).
    - If work is completed below the high-water mark and approval is obtained from Ministry of Natural Resources and Fisheries and Oceans Canada prior to construction.
    - When using the existing and installed waterbody crossing structures, where no modifications are required.

- Riparian Vegetation:
  - Maintain buffer zones of 30 m around waterbodies and limit clearing of riparian vegetation to the extent practical and to the requirement of the access road and alignment clearing width only.
- Sediment and Erosion Control:
  - Install, monitor, and manage appropriate erosion and sedimentation control measures to minimize or avoid sediment mobilization from the disturbed area to drainages or waterbodies and in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020). Adequate and appropriate erosion and sedimentation control materials shall be on site and available prior to commencement of construction.

**Operation and Maintenance**

The following mitigation and enhancement measures will be implemented during the Operation and Maintenance Phase:

- Regularly inspect and maintain culverts and bridges to prevent blockages from forming and causing ponding or backwater effects. Where culverts and bridges are installed at fish-bearing waterbodies, follow Fisheries and Oceans Canada's *Codes of Practice* for debris removal activities (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and fish stranding can be avoided) (Fisheries and Oceans Canada, 2025b); and
- Operate waterbody crossing structures in consideration of best management practices and environmental approval conditions, including the Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (Fisheries and Oceans Canada, 2025a).

#### 7.3.1.1.3 Predicted Residual Effects

**Construction**

Changes in fish habitat quantity and quality through physical alteration of waterbodies in Construction will be minimized by effective implementation of the mitigation and enhancement measures. However, changes in fish habitat quantity and quality through physical alteration of waterbodies are predicted to occur, as for some crossings, the waterbody crossing may be installed below the high-water mark and potentially occur in the restricted activity timing window.

Therefore, changes in fish habitat quantity and quality through physical alteration of waterbodies was predicted to result in a residual effect during Construction and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

Changes in fish habitat quantity and quality through physical alteration of waterbodies in Operation and Maintenance will be minimized by effective implementation of the mitigation and enhancement measures. However, changes in fish habitat quantity and quality through physical alteration of waterbodies may occur for some crossings where removal of temporary waterbody crossing structures and debris removal may involve work below the high-water mark and potentially occur in the restricted activity timing window. Therefore, changes in fish habitat quantity and quality through physical alteration of waterbodies was predicted to result in a residual effect during Operation and Maintenance, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.2 Changes to Fish Habitat Quantity and Quality Through Changes to Riparian Vegetation

#### 7.3.1.2.1 Potential Effects

**Construction**

During Construction, riparian vegetation will be cleared along the Community Access Road right-of-way and temporary access roads. Mechanical or chemical clearing or removal of riparian vegetation has the potential to directly and indirectly affect fish habitat during Construction through the following:

- Changes in water temperature (from reduced shading);
- Changes in food supply (plants and organic debris that fall into the waterbody [allochthonous inputs]);
- Changes in light levels in water (from removed riparian vegetation);
- Changes in habitat structure and cover (change in channel stability, overhead cover, inputs of woody debris); and
- Change in sediment concentrations (from increased runoff and erosion; addressed in **Section 7.3.1.4**).

Studies have shown increases in temperatures in watercourses and lakes near extensive forest harvesting operations (e.g., Holtby, 1988; Macdonald et al., 2003; Steedman et al., 2001; Johnson and Jones, 2000). Changes in allochthonous inputs may decrease the amount of habitat structure for aquatic organisms, change the sediment and nutrient concentrations, and decrease the food supply (Fisheries and Oceans Canada, 2025a).

The Ministry of Natural Resources and Forestry (2010b) indicates that changes to riparian vegetation have the greatest potential to influence water temperatures and allochthonous inputs for watercourses less than 12 m wide. Woody debris provides habitat for fish by slowing water flow, creating backwater areas, and providing cover. Bank stability is promoted by the presence of woody debris.

In total, approximately 2.6 ha of habitat for Lake Sturgeon, 7.3 ha of habitat for Walleye, 7.3 ha of habitat for Brook Trout, 8.4 ha of habitat for Northern Pike, 2.6 ha of habitat for Lake Whitefish, and 6.5 ha of habitat for Burbot could be altered or lost along the Preferred Route and temporary access roads (**Table 7-2**).

**Operation and Maintenance**

During Operation and Maintenance, additional clearing may occur within the riparian zone from clearing vegetation on road shoulders (e.g., mowing grass and removing brush and small trees). This clearing may directly and indirectly affect fish habitat through the changes described above for Construction.

### 7.3.1.2.2 Mitigation and Enhancement Measures

**Construction**

In addition to the general and riparian vegetation Construction Phase mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**. The following mitigation and enhancement measures and best management practices will be implemented during Construction:

- Riparian Vegetation:
  - Clear and revegetate the riparian zone, including above and below the high-water mark, following Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a) and the Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990), and *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (2010a) and its associated *Background Rationale* document (2010b).
  - Maintain a 30 m riparian buffer around waterbodies, where feasible.
  - Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion.

- Consider the restricted activity timing windows for the timing of clearing riparian vegetation (**Section 7.3.1.1.2**).

In Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), the riparian buffer is defined as trees, shrubs, and other vegetation on waterbody bank from the high-water level upland for 30 m. However, in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (Ministry of Natural Resources and Forestry, 2010a), the recommended riparian buffer (called the area of concern) varies from 30 to 90 m depending on the slope of the land adjacent to waterbodies. This is measured from the edge of the vegetation communities capable of providing an effective barrier to the movement of sediment (Ministry of Natural Resources and Forestry, 2010a). The 30 m setback from the ordinary high-water mark was selected based on Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), best management practices and the mitigation and enhancement measures that will be in place for the Project. The recommended riparian buffer to maintain aquatic resources and functions varies in literature; however, a 30 m riparian buffer is considered sufficient to reduce or avoid effects on bank stability, maintain benthic communities, and protect fish habitat (Environment Canada, 2013; The District of Muskoka Planning and Economic Development Department, 2003; and the references cited within). During detailed design, the riparian buffer may be increased around certain waterbodies with a high slope if it is determined to be suitable or necessary to protect the waterbody from sediment mobilization.

Clearing activities at some crossings may be subject to the restricted activity timing window. Proposed restricted activity timing windows were assigned to avoid work during sensitive life history periods or life stages for all fish that may be present in each waterbody, including movements to spawning areas, spawning and egg incubation, or eggs and newly hatched fry (**Table 7-2**). The restricted activity timing windows for each waterbody crossing will be finalized by the Ministry of Natural Resources during permitting, and the application of the restricted activity timing window for riparian clearing activities at crossings will be determined by the Ministry of Natural Resources and Fisheries and Oceans Canada during permitting.

**Operation and Maintenance**

In addition to the Operation and Maintenance Phase mitigation and enhancement measures outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures will be implemented during Operation and Maintenance:

- Maintain a 30 m riparian buffer around waterbodies, where feasible; and

- Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion.

#### 7.3.1.2.3 Predicted Residual Effects

**Construction**

With the effective implementation of mitigation and enhancement measures, effects on water temperatures, allochthonous inputs, or fish habitat from changes to riparian vegetation are predicted to be minor. However, as there will be a local scale effect at some waterbody crossings, changes in riparian vegetation that may affect water temperature, food supply, light levels, and habitat structure during Construction were predicted to result in a residual effect, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

Similar to the description above for Construction, there may be a local scale effect at some waterbody crossings during Operation and Maintenance, and therefore, changes in riparian vegetation that may affect water temperature, food supply, light levels, and habitat structure were predicted to result in a residual effect and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.3 Injury or Mortality of Fish from Instream Construction

#### 7.3.1.3.1 Potential Effects

**Construction**

During instream construction of the waterbody crossings on the Community Access Road and temporary access roads, there is the potential for physical injury or mortality of fish to occur. This can occur from the operation of heavy machinery in the water or the placement of fill or other materials in the waterbody where fish are present. If required for diversions during instream construction, the use of intakes or pumps can also cause entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.

#### 7.3.1.3.2 Mitigation and Enhancement Measures

**Construction**

In addition to all of the Construction Phase mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures and best management practices will be implemented during instream construction:

- For isolations / diversions, appropriately screen water intakes or pumps to prevent entrainment or impingement of fish (Fisheries and Oceans Canada, 2025a) and follow measures for design and installation of intake end of pipe fish screens to protect fish (Fisheries and Oceans Canada, 2025a); and
- Obtain a *Licence to Collect Fish for Scientific Purposes* from the Ministry of Natural Resources and have Aquatics Specialists rescue and relocate fish within the isolated workspace prior to construction in the isolated workspace.

#### 7.3.1.3.3 Predicted Residual Effects

**Construction**

In-water work during the restricted activity timing window may result in the mortality of fish or eggs for spawning species that may use the area. Therefore, injury or mortality of fish due to instream construction is predicted to result in a residual effect, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.4 Changes to Fish Habitat Quality from Release of Sediment at Waterbody Crossings

#### 7.3.1.4.1 Potential Effects

**Construction**

Increases in the concentration of suspended sediment can result directly from disturbance and resuspension of bed materials during construction of waterbody crossings or from the discharge of water to watercourses from other activities (e.g., dewatering pits and quarries) or indirectly from site runoff (e.g., clearing of riparian vegetation). This could increase total suspended solids and turbidity in the downstream aquatic ecosystems and result in a negative effect on surface water quality. Exposure to suspended sediment can affect the health of fish with effects ranging from minor physiological stress to mortality. The magnitude of the effect depends on a combination of the suspended sediment concentration and the duration of exposure.

Fine sediment can also result in downstream sediment deposition that alters substrate composition and modifies the suitability of habitat for fish. Deposited sediments have the potential to directly affect the availability and suitability of fish habitat by (CCME, 1999):

- Changes in aquatic plants from smothering, affecting cover and spawning and / or rearing habitat for fish;
- Changes in the bed conditions, which can reduce habitat suitability for the incubation of developing fish eggs;
- Changes in habitat from in-filling pools and reducing the size of riffle areas, consequently reducing the habitat available for juvenile and adult fish;
- Changes in habitat conditions, reducing benthic invertebrate and forage fish populations and shifting fish species composition; and
- Changes in interstitial spaces between gravel particles by in-filling, which can prevent the emergence of fry.

**Operation and Maintenance**

Similar to Construction, increases in the concentration of suspended sediment can result directly from disturbance and resuspension of bed materials during Operation and Maintenance of waterbody crossings or indirectly from runoff. This could increase total suspended solids and turbidity in the downstream aquatic ecosystems and affect the availability and suitability of fish habitat as outlined above for Construction.

#### 7.3.1.4.2 Mitigation and Enhancement Measures

**Construction**

In addition to the Construction Phase mitigation and enhancement measures and best management practices outlined in **Sections 7.3.1.1** and **7.3.1.2**, the following mitigation and enhancement measures and best management practices will be implemented during Construction:

- General:
  - Recontour disturbed areas to restore drainage patterns and the approximate preconstruction profile.
  - Implement the relevant mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a).
- Instream Construction:
  - Postpone instream construction if excessive flows or flood conditions are present or anticipated. Resume activities when water levels have subsided or equipment / techniques suitable for conditions are deployed.

- To the extent practical, and while complying with all appropriate mitigation and enhancement measures, complete work below the high-water mark as quickly as possible to shorten the duration of disturbance.
- Construct or install waterbody crossings in a manner that protects the banks from erosion, maintains downstream flows in the waterbody, and follows permits or authorizations issued for the Project from Fisheries and Oceans Canada and the Ministry of Natural Resources.
- Avoid bank grading to accommodate temporary bridges where possible. Restrictions on grading may be required as part of waterbody crossing permits from Fisheries and Oceans Canada and the Ministry of Natural Resources.

- Sediment and Erosion Control:
  - Install, monitor, and manage appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during construction and in accordance Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020).
  - Develop and follow a Sediment and Erosion Control Plan in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020).
  - Temporary erosion control measures must be:
    - Properly installed.
    - Installed before or immediately after initial disturbance.
    - Inspected and properly maintained (e.g., repaired, replaced, or supplemented with functional materials) throughout construction until permanent erosion control is established or reclamation is complete.

### Operation and Maintenance

In addition to the Operation and Maintenance mitigation and enhancement measures outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures will be implemented during Operation and Maintenance:

- Sediment and Erosion Control:
  - Install, monitor, and manage appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during maintenance activities.
  - Develop and follow a Sediment and Erosion Control Plan.

#### 7.3.1.4.3 Predicted Residual Effects

**Construction**

Changes in fish habitat quality from release of sediment during road construction and land disturbance at waterbody crossings is predicted to result in a residual effect and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

Similar to the description above for Construction, changes in fish habitat quality from release of sediment during Operation and Maintenance at waterbody crossings is predicted to result in a residual effect and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.5 Changes to Fish Habitat Quantity and Quality From Placement of Waterbody Crossing Structures and Changes in Channel Morphology

#### 7.3.1.5.1 Potential Effects

**Construction**

Channel morphology features, such as pools, riffles, and runs, provide a variety of habitat uses for fish. During Construction, changes in channel morphology and habitat use could potentially occur through alterations in the shape, stability, and bank composition. The placement of waterbody crossing structures has the potential to directly and indirectly affect fish habitat through the following:

- Changes in sediment inputs from erosion and bed and bank instabilities, upsetting the channel's ability to transport water and sediment; and
- Changes in the channel width during Construction (e.g., culvert installation), which could affect flow velocities that could in turn affect channel geomorphology (e.g., bankfull width and depth, bed material composition, ratio of pools to riffles, and composition of riparian vegetation).

As a result, these changes in channel morphology can affect fish habitat quantity and quality and potentially fish survival, reproduction, and distribution. In total, approximately 2.6 ha of habitat for Lake Sturgeon, 7.3 ha of habitat for Walleye, 7.3 ha of habitat for Brook Trout, 8.4 ha of habitat for Northern Pike, 2.6 ha of habitat for Lake Whitefish, and 6.5 ha of habitat for Burbot could be altered or lost along the Preferred Route and temporary access roads (**Table 7-2**).

Waterbody crossing construction may cause small-scale changes in channel morphology and the changes may occur over longer periods and might not be evident for several years after Construction during Operation and Maintenance.

**Operation and Maintenance**

During Operation and Maintenance, changes to channel morphology from the placement of waterbody crossing structures has the potential to affect fish habitat through the following:

- Longer term changes in sediment inputs from erosion and bed and bank instabilities, upsetting the channel's ability to transport water and sediment; and
- Changes in the channel width during Operation and Maintenance (e.g., blocked culvert), which could affect flow velocities that could in turn affect channel geomorphology (e.g., bankfull width and depth, bed material composition, ratio of pools to riffles, and composition of riparian vegetation).

### 7.3.1.5.2 Mitigation and Enhancement Measures

**Construction**

The Construction mitigation and enhancement measures and best management practices outlined in **Sections 7.3.1.1** and **7.3.1.4** will be implemented**.**

**Operation and Maintenance**

The Operation and Maintenance mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1** will be implemented.

### 7.3.1.5.3 Predicted Residual Effects

**Construction**

Changes to fish habitat quantity and quality from placement of waterbody structures and changes in channel morphology and crossing structures is predicted to result in a residual effect during Construction and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

Changes to fish habitat quantity and quality from placement of waterbody structures and changes in channel morphology and crossing structures is predicted to result in a residual effect during Operation and Maintenance and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.6 Changes to Fish Survival, Reproduction, and Distribution from the Placement of Waterbody Crossing Structures, Affecting Fish Access to Habitats

#### 7.3.1.6.1 Potential Effects

**Construction**

Placement of waterbody crossing structures in waterbodies in Construction can cause potential changes in fish accessibility to habitat (i.e., where the crossing structure forms a barrier to fish passage), which can cause habitat fragmentation. For example, a physical or velocity barrier between rearing and spawning habitat may remove access to habitat, resulting in loss of habitat at the crossing location and a loss of access to habitat upstream from the crossing, which can ultimately affect the stability of a self-sustaining population. Habitat fragmentation can be a concern especially where there is more than one crossing in the waterbody or if there are multiple crossings in a small watershed. Concerns relating to how the placement of waterbody crossing structures may affect fish access to habitat has been highlighted as a concern by Indigenous communities who have shared Indigenous Knowledge with respect to the Project (Firelight Research Inc., 2024).

**Operation and Maintenance**

Waterbody crossing structures can also cause a barrier during Operation and Maintenance from blockages or changes to the structure over time.

#### 7.3.1.6.2 Mitigation and Enhancement Measures

**Construction**

In addition to the mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1** and **Section 7.3.1.4**, the following mitigation and enhancement measures and best management practices will be implemented during Construction:

- Waterbody Crossing:
  - Where a channel allows for fish passage, design and install culverts in fish-bearing waterbodies to allow for fish passage to meet Ministry of Natural Resources and Foresty's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Standards and Code of Practices* (2025b,c) and fish passage guidelines (Katopodis and Gervais, 2016; Di Rocco and Gervais, 2024).

**Operation and Maintenance**

The Operation and Maintenance Phase mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1** will be implemented.

#### 7.3.1.6.3 Predicted Residual Effects

**Construction**

Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures affecting fish access to habitats during Construction is predicted to result in a residual effect and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures affecting fish access to habitats during Operation and Maintenance is predicted to result in a residual effect and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.7 Changes to Fish Habitat Quantity and Quality due to Changes in Hydrology or Groundwater That May Alter Drainage Patterns and Increase or Decrease Drainage Flows and Surface Water Levels

#### 7.3.1.7.1 Potential Effects

**Construction**

Changes in drainage patterns and increases or decreases in drainage flows and surface water levels beyond the natural range of variation during Construction could lead to changes in fish habitat quantity and quality. Groundwater baseflow is seasonally important to local waterbodies and natural environment features (e.g., vegetation, fish and fish habitat, and wetlands). Construction activities, including dewatering of pits and quarries, have the potential to locally influence groundwater discharge as baseflow to these features. Changes in waterbody flow have the potential to directly and indirectly affect fish habitat through the following:

- Changes in spawning, rearing, feeding, migration, and overwintering habitat of fish-bearing waterbodies;
- Changes in the waterbody productivity and availability of food for fish (e.g., benthic invertebrates);
- Changes in the presence of macrophytes, which provide cover, spawning material, or food for fish; and
- Changes in the local hydrogeological environment by increasing, decreasing, or redirecting groundwater flows, resulting in local groundwater table lowering or raising and alteration of flow pathways.

These potential changes in groundwater flow pathways are linked to surface water quantity (i.e., water levels) and subsequently fish habitat quantity and quality.

**Operation and Maintenance**

Changes in drainage patterns and drainage flows and surface water levels beyond the natural range of variation during Operation and Maintenance could also lead to changes in fish habitat quantity and quality. For example, ponding and backwater effects could occur from blockages of culverts.

### 7.3.1.7.2 Mitigation and Enhancement Measures

**Construction**

In addition to the Construction mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures and best management practices will be implemented during Construction:

- Develop and maintain surface water management and erosion control infrastructure to minimize potential for changes to infiltration rates;
- For any water taking activities, acquire a Permit to Take Water from the Ministry of Environment Conservation and Parks during the permitting and detailed design stage of the Project; and
- Implement the mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a).

**Operation and Maintenance**

The Operation and Maintenance mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1** will be implemented.

### 7.3.1.7.3 Predicted Residual Effects

**Construction**

Changes to hydrology or groundwater during Construction may alter drainage patterns and increase or decrease drainage flows and surface water levels, which could affect fish habitat quantity and quality. Therefore, a residual effect is predicted, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

Changes to hydrology or groundwater during Operation and Maintenance may alter drainage patterns and increase or decrease drainage flows and surface water levels, which could affect fish habitat quantity and quality. Therefore, a residual effect is predicted, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.8 Blasting-Related Injuries or Mortality to Fish

#### 7.3.1.8.1 Potential Effects

**Construction**

Blasting in or near water produces post-detonation compressive shock waves characterized by a rapid rise to a high peak pressure followed by a rapid decay to below ambient hydrostatic pressure. Pressure changes and vibrations caused by blasting during Project construction have potential to cause injury or mortality of fish in nearby waterbodies. This potential effect has been noted as a concern by Indigenous communities, including Aroland First Nation – in particular, for activities taking place in close proximity to the Painter and Anaconda Lake Road waterbody crossings due to many overnight camp / cabins sites being located nearby (Shared Value Solutions, 2024). Post-detonation compression shock waves caused by detonations of explosives in or near water can cause internal damage to the swim bladder and other soft organs of fish and cause changes to fish behaviour (Wright, 1982; Wright and Hopky, 1998; Godard et al., 2008). The severity of effects is related to the type of explosive, method of detonation, distance away from fish, water depth, and the weight and pattern of the charge(s). The species, size, and life stage of fish also plays a role in the severity of effects of blasting. Fish eggs incubating in spawning beds near blasting zones can also be damaged by movement of the substrate in which eggs are embedded, causing mortality or disrupting development (Wright, 1982; Faulkner et al., 2008). Peak particle velocities (i.e., vibrations) can increase mortality of incubating eggs close to blasting zones (Wright, 1982). Fly rock also has the potential to alter, disrupt, or destroy fish habitat.

**Operation and Maintenance**

Blasting in pits and quarries during Operation and Maintenance may cause blasting-related injuries or mortality to fish as described above for Construction.

### 7.3.1.8.2 Mitigation and Enhancement Measures

**Construction**

In addition to the general construction mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures and best management practices related to blasting will be implemented during Construction:

- Use explosives only if alternate methods of excavation to remove materials for foundation systems and roads are not feasible;
- Complete blasting near fish-bearing waterbodies outside the proposed restricted activity timing window for all blasting operations;
- Prepare and implement a Blasting and Communication Management Plan that is in accordance with Ontario Provincial Standard Specification *General Specifications for the Use of Explosives* (2014) and describes specific measures that would be implemented if blasting is required; and
- For blasting operations, follow the overpressure and vibration guidelines outlined in the Ontario Provincial Standard Specification *General Specifications for the Use of Explosives* (2014) and *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky, 1998):
    - **Overpressure guideline**—Explosives are not to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous water pressure change (i.e., overpressure) greater than 100 kilopascals (kPa) where fish are present. The overpressure guideline applies year-round in any fish-bearing waterbody near the blast.
    - **Vibration guideline**—Explosives are not to be detonated that produce, or are likely to produce, a peak particle velocity greater than 13 millimetres per second (mm/s) in a spawning bed during the period of egg incubation. The vibration guideline applies during the restricted activity timing window in the waterbody near the blast.

**Operation and Maintenance**

In addition to the general Operation and Maintenance mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.8.2** for blasting during Construction will be implemented during Operation and Maintenance.

#### 7.3.1.8.3 Predicted Residual Effects

**Construction**

Blasting is predicted to result in no residual effect on fish habitat quantity and quality or fish survival, reproduction, and distribution in waterbodies crossed by the Project, with the effective application of all mitigation and enhancement measures. Therefore, this interaction was not carried forward to the residual effects characterization.

**Operation and Maintenance**

Blasting is predicted to result in no residual effect on fish habitat quantity and quality or fish survival, reproduction, and distribution in waterbodies crossed by the Project, with the effective application of all mitigation and enhancement measures. Therefore, this interaction was not carried forward to the residual effects characterization.

### 7.3.1.9 Changes to Fish Habitat Quality from the Deposition of Air Contaminants and Fugitive Dust Emissions

#### 7.3.1.9.1 Potential Effects

**Construction**

Changes to air contaminants and fugitive dust emissions resulting from the Project during Construction could lead to changes in constituent concentrations in water in the receiving environment, which could affect fish habitat quantity and quality. This potential effect has been noted as a concern by Indigenous communities, including Aroland First Nation, Fort Albany First Nation, and Weenusk First Nation (Firelight Research Inc., 2024; MNP LPP, 2024b; Shared Value Solutions, 2024).

Construction of the Project is expected to generate air contaminants and fugitive dust emissions, with the main sources of emissions being:

- Exhaust from vehicles, construction equipment, and generators (including diesel);
- Land clearing activities and slash pile burning;
- Material handling and hauling activities including extraction, dozing, and grading;
- Travel along access roads; and
- Reclamation of temporary access roads and staging areas.

Fish are vulnerable to harm from air pollution, and their responses to air pollution may differ depending on exposure and vulnerability. Air pollution can harm fish through the following:

- Changes in the quality of the habitats in which they live and the availability and quality of their food supplies (Environment and Climate Change Canada, 2012); and
- Changes in water quality, which can influence fish habitat availability and distribution, microbial activity and nutrient cycles, food webs, and ecosystem interactions from air contaminants and dust emissions and subsequent deposition (USFWS, 1982).

Effects from air pollutants may result in widespread disruption of the structure and function of ecosystems in developed areas (USFWS, 1982). Rates of dust deposition and accumulation are dependent on the rate of supply from the source, wind speed, precipitation events, topography, and vegetation cover.

**Operation and Maintenance**

Changes to air contaminants and fugitive dust emissions from Operation and Maintenance could also lead to changes in constituent concentrations in water in the receiving environment, which could affect fish habitat quantity and quality. Operation and Maintenance of the Project is expected to generate air contaminants and fugitive dust emissions, with the main sources of emissions being:

- Exhaust from vehicles and operations and maintenance equipment;
- Travel along access roads and the Community Access Road; and
- Reclamation of temporary access roads and staging areas that may occur during Operation and Maintenance.

### 7.3.1.9.2 Mitigation and Enhancement Measures

**Construction**

In addition to the general and riparian vegetation construction mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures and best management practices will be implemented during Construction:

- Implement the air quality mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a); and
- Burn of slash piles subject to agreements with Indigenous communities and landowners and obtainment of permits and approvals by appropriate regulatory agencies.

**Operation and Maintenance**

In addition to the Operation and Maintenance mitigation and enhancement measures outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures will be implemented during Operation and Maintenance:

- Prepare and implement a Dust / Air Quality Management Plan for Operation and Maintenance; and
- Implement dust control practices (e.g., wetting with water and implementation of speed limits), as required.

### 7.3.1.9.3 Predicted Residual Effects

**Construction**

Under existing conditions, concentrations of suspended particulate matter, nitrogen dioxide, sulphur dioxide, carbon monoxide, and particulate matter were observed to be below the relevant criteria (i.e., the lowest applicable criteria) along the Community Access Road. Predicted concentrations from Project activities in combination with background air quality are expected to be below the relevant criteria along the Community Access Road after effective implementation of standard mitigation and enhancement measures.

The surface water quality assessment (WSP, 2026a) used the results from the screening level assessment of air emissions during the Construction Phase to predict effects from air contaminants and fugitive dust emissions to water quality criteria; no residual effect on surface water quality is predicted. No changes to trophic status (including primary or secondary productivity) would therefore be expected.

Air contaminants and fugitive dust emissions and subsequent deposition during Construction are predicted to result in no residual effect on water quality and, as a result, fish habitat quantity and quality; therefore, this interaction was not carried forward to the residual effects characterization.

**Operation and Maintenance**

Similar to the above for Construction, predicted concentrations from Project activities during Operation and Maintenance in combination with background air quality are expected to be below the relevant criteria along the Community Access Road after effective implementation of standard mitigation and enhancement measures. Based on the surface water quality assessment (WSP, 2026a), no residual effect on surface water quality is predicted.

Air contaminants and fugitive dust emissions and subsequent deposition during Operation and Maintenance are predicted to result in no residual effect on water quality and, as a result, fish habitat quantity and quality; therefore, this interaction was not carried forward to the residual effects characterization.

### 7.3.1.10 Changes to Fish Survival and Reproduction from Improved Public Access to Recreational Angling Areas

#### 7.3.1.10.1 Potential Effects

**Construction**

The development of the Community Access Road and permanent access roads could negatively affect the survival and reproduction of harvested Valued Component fish species through increased access to waterbodies that have harvested species such as Brook Trout, Lake Sturgeon, Walleye, Northern Pike, Lake Whitefish, or Burbot during Construction.

Improved public access to recreational angling areas can affect fish survival and reproduction during Operation and Maintenance through the following:

- Changes in harvest pressure from recreational anglers, small communities close to the Project, and from construction workers while on site; and
- Potential increased introduction or spread of invasive species and pathogens.

The construction of the Community Access Road and access roads will expand access to a broader range of individuals and groups. However, the region will remain relatively remote with the nearest urban centre (Thunder Bay with a population of approximately 110,000) being over 430 km from Marten Falls First Nation. Therefore, a large influx of recreational anglers is not expected. This is consistent with research showing that recreational fishers are less likely to travel great distances to fish (Hunt and Lester, 2009; deKerckhove et al., 2015); for example, Ontario anglers drive an average of 225 km to access fishing stocks (deKerckhove et al., 2015). Similarly, research has demonstrated that sustainable levels of recreational fishing are likely to occur in fishing locations farther than 100 km from population centres of 100,000 people, where fishing locations tend to remain relatively unexploited (Post et al., 2002, 2008); this would apply to the proposed Project location. There are also numerous accessible fisheries (high in surplus fishable production) in northern Ontario and within close proximity to Thunder Bay and Dryden (deKerckhove et al., 2015) such that there would be a low number of recreational fishers travelling to the proposed Project to find suitable fishing locations.

Additionally, participation in fishing has been declining as indicated by national recreational fishing survey results from 48.8 million days fished in 1995 to 15.6 million days fished in 2020 (Ministry of Natural Resources and Forestry, 2010b and references cited within; Hunt et al., 2022), further indicating that a large influx of recreational fishers is not expected.

However, it is expected that there will be some increase in harvest pressure from recreational anglers and fishers from local communities as a result of the Project and that most of the harvest pressure from access related to the Project will be on larger waterbodies with known productive fisheries. Smaller waterbodies may experience periodic fishing activity and may be vulnerable to overharvesting, but it is likely that locations with higher value fisheries will be targeted (Hunt and Lester, 2009). It is expected that waterbodies that are likely to attract the greatest number of recreational fishers due to the Project have Valued Component species abundances that can support an increase in fishing pressure.

Marten Falls First Nation, Aroland First Nation, and Weenusk First Nation have noted concerns related to impacts on fish related to increased harvest pressures (Marten Falls First Nation, 2023; MNP LPP, 2024b; Shared Value Solutions, 2024). In particular, Marten Falls First Nation have highlighted concerns related to overfishing due to increased access to the area (Marten Falls First Nation, 2023). One community member from Aroland First Nation noted the following regarding this concern, *“The first thing I thought about was the wilderness, the animals would be disturbed. If the road goes through there, they’re travelling routes would be disrupted. And also, their feeding might be disrupted. As for the fish, I think if they build bridges and all that, it’s easier access for humans to go harvest. To me, that would be very destructive for the wildlife and fishery."* (Shared Value Solutions, 2024). Aroland First Nation noted concerns associated with how Lake Sturgeon might be impacted by increased public access resulting in additional pressures due to more people fishing in the area (Shared Value Solutions, 2024).

The lack of control in fish transport and release (Litvak and Mandrak, 1993; Drakes and Mandrak, 2014) provides opportunity for the release of non-native and / or invasive species into waterbodies. Non-native and invasive species may compete with local native fauna and the transport of boats and fish across waterbodies has the potential to introduce pathogens and diseases (Anderson et al., 2014; Killian et al., 2012).

### Operation and Maintenance

The ongoing Operation and Maintenance of the Community Access Road may continue to allow increased harvest pressure from recreational anglers and fishers from small communities close to the Project.

### 7.3.1.10.2 Mitigation and Enhancement Measures

**Construction**

In addition to the general Construction mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures and best management practices will be implemented during Construction:

- Decommission and reclaim temporary pits, quarries, and other temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles at the end of construction; and
- Implement best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species.

**Operation and Maintenance**

The Operation and Maintenance mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1** will be implemented.

### 7.3.1.10.3 Predicted Residual Effects

**Construction**

Increase in harvest pressure on waterbodies during Construction is anticipated where access has been improved or created as a result of the Project, but most is expected to be on larger waterbodies with known productive fisheries. Smaller waterbodies may experience periodic fishing activity and may be vulnerable to overharvesting, but locations with higher value fisheries (e.g., Valued Component species) offer more appeal to recreational fishers (Hunt and Lester, 2009).

Potential changes in angler pressure (including recreational tourists, construction workers, and local communities) and fish harvest will continue to be managed by the Ministry of Natural Resources and Fisheries and Oceans Canada, the government agencies mandated to manage fisheries resources (i.e., fisheries management zones, fish restricted access timing windows, and fish catch limits). Furthermore, fishing is managed as a public resource through provincial licensing requirements and by establishing rules in terms of season length, catch limits, and catch-and-release rules for waterbodies near the Project.

As an increase to public access to fish is anticipated and, in turn, increased exploitation and potential for invasive species and disease transfer, it is predicted that a residual effect could occur, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

A continued increase in harvest pressure on waterbodies during Operation and Maintenance is also anticipated where access has been improved or created as a result of the Project. As a result, it is predicted that a residual effect could occur, and this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.11 Changes to Fish Survival and Reproduction from Spills of Fuel or Other Materials

#### 7.3.1.11.1 Potential Effects

**Construction**

Spills during the Construction that occur in high enough concentrations could directly and indirectly affect fish survival and reproduction through the following:

- Changes in water quality can cause direct acute / chronic toxicity to fish, affect reproduction survival, cause ecosystem changes and, as a result, changes in survival, reproduction, richness, diversity, and recruitment; and
- Changes in the quality of surface water, groundwater, and sediments can, in turn, affect fish reproduction and survival.

Spills are generally local in nature; however, literature has demonstrated that the introduction of deleterious materials into a waterbody can have acute and chronic effects on an ecosystem (Austin, 1999; Bucke, 1997; Crossman et al., 1974; Fitzsimons, 1995). Indigenous communities including Aroland First Nation, Marten Falls First Nation, and Weenusk First Nation have also noted concerns related to impacts on fish associated with contamination (i.e., spills of fuel or other materials), particularly for Lake Sturgeon (Dillon, 2024a,b; Marten Falls First Nation, 2023; MNP LPP, 2024b).

**Operation and Maintenance**

Spills during the Operation and Maintenance could also lead to changes in could affect fish survival and reproduction. As described above for Construction, Spills are generally local in nature; however, literature has demonstrated that the introduction of deleterious materials into a waterbody can have acute and chronic effects on an ecosystem (Austin, 1999; Bucke, 1997; Crossman et al., 1974; Fitzsimons, 1995). Indigenous communities including Aroland First Nation and Marten Falls First Nation, have also noted concerns related to impacts on fish associated with contamination (i.e., spills of fuel or other materials), particularly for Lake Sturgeon (Dillon, 2024a,b; Marten Falls First Nation, 2023).

### 7.3.1.11.2 Mitigation and Enhancement Measures

**Construction**

In addition to the Construction mitigation and enhancement measures and best management practices outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures and best management practices will be implemented during Construction:

- Prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred;
- Have equipment for containing spills on site. Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in onsite work areas, and / or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents;
- Refuel, service, and maintain vehicles and equipment in designated areas at temporary construction camps and temporary laydown areas a minimum of 120 m from waterbodies;
- Wash, refuel, and service machinery to prevent any deleterious substances from entering a waterbody (Fisheries and Oceans Canada, 2025a);
- Store fuel and other materials for the machinery to prevent any deleterious substances from entering a waterbody (Fisheries and Oceans Canada, 2025a);
- Register aboveground storage tanks under and in compliance with applicable federal and provincial legislation;
- Meet the Ontario *Technical Standards and Safety Act, 2000* (Government of Ontario, 2000) and Canada's *Dangerous Goods Transportation Act* (Government of Canada, 1992) for the transportation, storage, and handling of fuels;
- Have machinery and equipment arrive on site in a clean condition and inspect and maintain routinely to avoid fluid leaks; and
- Train individuals working on site and handling hazardous materials about best practices for the transportation of dangerous goods to avoid negatively affecting fish and fish habitat by introducing hazardous materials into the environment.

**Operation and Maintenance**

In addition to the Operation and Maintenance mitigation and enhancement measures outlined in **Section 7.3.1.1**, the following mitigation and enhancement measures will be implemented during Operation and Maintenance:

- Meet the Ontario *Technical Standards and Safety Act, 2000* (Government of Ontario, 2000) and Canada's *Dangerous Goods Transportation Act, 1992* (Government of Canada, 1992) for the transport, storage, and handling of fuels required for maintenance;
- Have machinery and equipment arrive on site in a clean condition and inspect and maintain routinely to avoid fluid leaks during maintenance; and
- Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion.

### 7.3.1.11.3 Predicted Residual Effects

**Construction**

It is recognized that, even with the best planning and the implementation of mitigation and enhancement measures, the potential exists for accidents and malfunctions during Construction. As such, measurable changes (i.e., residual effects) to surface water quality in the form of increases to the concentrations of chemical constituents in receiving waterbodies could occur in the event of the wash-off from accidental spills or leaks to nearby waterbodies. Based on the information presented, this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

**Operation and Maintenance**

It is recognized that, even with the best planning and the implementation of mitigation and enhancement measures, the potential exists for accidents and malfunctions during Operation and Maintenance. As such, measurable changes (i.e., residual effects) to surface water quality in the form of increases to the concentrations of chemical constituents in receiving waterbodies could occur in the event of the wash-off from accidental spills or leaks to nearby waterbodies. Based on the information presented, this interaction was carried forward to the residual effects characterization (**Section 7.3.2**).

### 7.3.1.12 Summary of Potential Effects, Mitigation and Enhancement Measures, and Identification of Residual Effects

**Table 7-5** provides a summary of the potential effects due to Project–environment interactions during Construction and Operation and Maintenance of the Project, mitigation and enhancement measures, and the identification of residual effects described in previous sections.

**Table 7-5: Summary of Potential Effects, Mitigation and Enhancement Measures, and Predicted Residual Effects on Fish and Fish Habitat**

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing of the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish habitat quantity and quality through physical alterations of waterbodies | ■ Follow best management practices and environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Fisheries and Oceans Canada (a Request for Review will be prepared for Fisheries and Oceans Canada. Fisheries and Oceans Canada will determine whether to provide a Letter of Advice or if a *Fisheries Act* Authorization is required) and the Ministry of Natural Resources (permits will be required from the Ministry of Natural Resources under the *Lakes and Rivers Improvement Act*).<br>■ Limit the Project footprint to the extent feasible.<br>■ Use existing access roads where possible.<br>■ Complete work as quickly as possible to shorten the duration of disturbance.<br>■ Decommission and rehabilitate temporary access roads, staging areas, camps, and debris and / or timber stockpiles following construction, where not needed for Operation and Maintenance activities.<br>■ Design permanent waterbody crossing structures to accommodate climate change considerations.<br>■ Use existing waterbody crossing structures where possible. Minimize the number of waterbody crossings required for the Project.<br>■ During detailed design, complete site-specific fish and fish habitat and surface water surveys to support engineering and Fisheries and Oceans Canada and the Ministry of Natural Resources permitting at waterbody crossings where work below the high-water mark is proposed. Submit designs of waterbody crossings as required for permit applications to Fisheries and Oceans Canada and the Ministry of Natural Resources. Surveys may also be required at select sites where work above the high-water mark is proposed based on Fisheries and Oceans Canada and the Ministry of Natural Resources permitting requirements.<br>■ Have Environmental Monitors and Indigenous Environmental Monitors on site during construction to confirm that all waterbodies crossed by the Preferred Route right-of-way and access roads have been identified and documented in the waterbody crossing list. The Environmental Monitors will monitor the installation, use, and removal of waterbody crossing structures. The Environmental Monitors will confirm that the appropriate waterbody crossing structure is being used and that the required Fisheries and Oceans Canada and the Ministry of Natural Resources approvals and permits are in place.<br>■ If new waterbodies are identified prior to construction, contract an Aquatics Specialist to assess the waterbody. Depending on the nature of the waterbody, recommendations for construction methods, appropriate mitigation and enhancement measures, and permitting requirements will be made by the Aquatics Specialist and, if necessary, local First Nation communities and appropriate regulatory agencies including the Ministry of Natural Resources and Fisheries and Oceans Canada will be engaged. This will allow for the appropriate mitigation and enhancement measures to be implemented during construction at each waterbody crossing at a site-specific level, which will reduce or avoid potential effects on habitat quantity and quality. If new waterbodies are identified during construction, clearly flag the waterbody and suspend activity within 30 m of the location until an Aquatic Specialist has assessed the waterbody and determined a suitable course of action, which may include contacting Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Construct waterbody crossings in a manner that maintains downstream flows and fish passage and follows conditions of permits or authorizations issued for the Project by Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Construct, operate, remove, decommission, and rehabilitate all waterbody crossing structures, if appropriate, following best management practices and environmental approval conditions, including the Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a) and *Standards and Codes of Practice* (2025b,c).<br>■ Avoid constructing in sensitive habitats (e.g., spawning areas, groundwater upwellings) where feasible. | Residual effects on fish habitat quantity and quality through physical alteration of waterbodies |

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| | | | | ■ Construct or install waterbody crossing structures in a manner that protects the banks from erosion, maintains downstream flows in the waterbody, and follows permits or authorizations issued for the Project from Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Fording of a waterbody is not permitted, unless approved by the Ministry of Natural Resources and Fisheries and Oceans Canada. As per Fisheries and Ocean Canada's Code of Practice (2025b), limit fording to a one-time event (over and back) and use only if an existing crossing at another location is not available or practical to use. If repeated crossings of the waterbody are required, a crossing structure will be installed. Permits are expected to be required from Ministry of Natural Resources for any use of a ford.<br>■ Complete instream construction in isolation of flowing water (i.e., use isolation methods for the installation and removal of culverts where surface water exists at the time of construction).<br>■ For isolations / diversions, maintain 100% downstream flow.<br>■ Use erosion resistant fill material below the high-water level within the floodplain of a waterbody.<br>■ Upon removal of the temporary crossing materials, return the waterbody banks to their original profile if needed and stabilize disturbed areas, as necessary, to prevent soil erosion.<br>■ Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles a minimum of 30 m away from the ordinary high-water mark of a waterbody, where possible.<br>■ Avoid construction during a fish and fish habitat restricted activity timing window, where feasible. Work may not be conducted during the proposed restricted activity timing window unless approval is obtained from the Ministry of Natural Resources and Fisheries and Oceans Canada. Proposed restricted activity timing windows were assigned to avoid work during sensitive life history periods or life stages for all fish that may be present in each waterbody, including movements to spawning areas, spawning and egg incubation, or eggs and newly hatched fry. The restricted activity timing windows for each waterbody crossing will be finalized by the Ministry of Natural Resources during permitting.<br>■ For permanent and temporary waterbody crossing structures, the proposed restricted activity timing window will be applicable if:<br>○ Any work is completed below the high-water mark (e.g., installation or removal of fill or culverts, bridge supports below the high-water mark, one-time ford).<br>○ The waterbody is frozen and an ice bridge / snow fill is constructed.<br>○ Beaver dam removals are required.<br>■ For permanent and temporary waterbody crossing structures, the proposed restricted activity timing window will not be applicable:<br>○ If all work is completed above the high-water mark (e.g., installation or removal of a clear span bridge with no fill or supports below the high-water mark).<br>○ If work is completed below the high-water mark and approval is obtained from Ministry of Natural Resources and Fisheries and Oceans Canada prior to construction.<br>○ When using the existing and installed waterbody crossing structures, where no modifications are required.<br>■ Maintain buffer zones of 30 m around waterbodies and limit clearing of riparian vegetation to the extent practical and to the requirement of the access road and alignment clearing width only.<br>■ Sediment and Erosion Control:<br>■ Install, monitor, and manage appropriate erosion and sedimentation control measures to minimize or avoid sediment mobilization from the disturbed area to drainages or waterbodies and in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020). Adequate and appropriate erosion and sedimentation control materials shall be on site and available prior to commencement of construction. | |
| | ■ Operating the Preferred Route<br>■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Regularly inspect and maintain culverts and bridges to prevent blockages from forming and causing ponding or backwater effects. Where culverts and bridges are installed at fish-bearing waterbodies, follow Fisheries and Oceans Canada's *Codes of Practice* for debris removal activities (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and fish stranding can be avoided) (Fisheries and Oceans Canada, 2025b). | |

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| | | | | ■ Operate waterbody crossing structures in consideration of best management practices and environmental approval conditions, including the Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a) and Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990). | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and install culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish habitat quantity and quality through changes to riparian vegetation | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Clear and revegetate the riparian zone, including above and below the high-water mark, following Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a), Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), and the Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990), and *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (2010a) and its associated *Background Rationale document* (2010b).<br>■ Maintain a 30 m riparian buffer around waterbodies, where feasible.<br>■ Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth and duff layer undisturbed to prevent erosion).<br>■ Consider the restricted activity timing windows for waterbodies for the timing of clearing riparian. | Residual effects on fish habitat quantity and quality through changes to riparian vegetation |
| | ■ Operating the Preferred Route<br>■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Maintain a 30 m riparian buffer around waterbodies, where feasible.<br>■ Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth and duff layer undisturbed to prevent erosion. | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and install culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Injury or mortality of fish from instream construction | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Instream Construction:<br>○ For isolations / diversions, appropriately screen water intakes or pumps to prevent entrainment or impingement of fish (Fisheries and Oceans Canada, 2025a) and follow measures for design and installation of intake end of pipe fish screens to protect fish (Fisheries and Oceans Canada, 2025a).<br>○ Obtain a *Licence to Collect Fish for Scientific Purposes* from the Ministry of Natural Resources and have Aquatics Specialists rescue and relocate fish within the isolated workspace prior to construction in the isolated workspace. | Residual injury or mortality of fish from instream construction |

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and install culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes in habitat quality from release of sediment at waterbody crossings | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies and Changes to fish habitat quantity and quality through changes to riparian vegetation.*<br>■ Implement the relevant mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a).<br>■ Recontour disturbed areas to restore drainage patterns and the approximate preconstruction profile.<br>■ Postpone instream construction if excessive flows or flood conditions are present or anticipated. Resume activities when water levels have subsided or equipment / techniques suitable for conditions are deployed.<br>■ To the extent practical, and while complying with all appropriate mitigation and enhancement measures, complete work below the high-water mark as quickly as possible to shorten the duration of disturbance.<br>■ Construct or install waterbody crossings in a manner that protects the banks from erosion, maintains downstream flows in the waterbody, and follows permits or authorizations issued for the Project from Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Avoid bank grading to accommodate temporary bridges where possible. Restrictions on grading may be required as part of waterbody crossing permits from Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Install, monitor, and manage appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during construction and in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020).<br>■ Develop and follow a Sediment and Erosion Control Plan in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020).<br>■ Temporary erosion control measures must be:<br>○ Properly installed.<br>○ Installed before or immediately after initial disturbance.<br>○ Inspected and properly maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established or reclamation is complete. | Residual effects on habitat quality from release of sediment land disturbance during road construction at waterbody crossings |
| | ■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Install, monitor, and manage appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during maintenance activities.<br>■ Develop and follow a Sediment and Erosion Control Plan. | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and install culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies* and *Changes in habitat quality from release of sediment land disturbance during road construction at waterbody crossings.* | Residual effects on fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology |
| | ■ Operating the Preferred Route | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* | |

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| | ■ Maintaining the Preferred Route and permanent bridges and culverts | | | | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and install culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures, affecting fish access to habitats | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies* and *Changes in habitat quality from release of sediment land disturbance during road construction at waterbody crossings.*<br>■ Waterbody Crossing:<br>○ Where a channel allows for fish passage, design and install culverts in fish-bearing waterbodies to allow for fish passage to meet Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Standards and Code of Practices* (2025b, c) and fish passage guidelines (Katopodis and Gervais, 2016; Di Rocco and Gervais, 2024). | Residual effects on fish survival, reproduction, and distribution from the placement of waterbody crossing structures, affecting fish access to habitats |
| | ■ Operating the Preferred Route<br>■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and install culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Develop and maintain surface water management and erosion control infrastructure to minimize potential for changes to infiltration rates.<br>■ Implement the mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a). | Residual effects on fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels |
| | ■ Operating the Preferred Route<br>■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* | |

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Blasting rock | Construction | Blasting-related injuries or mortality to fish | ■ Follow the Construction mitigation and enhancement measures outlined in Changes to *fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Use explosives only if alternate methods of excavation to remove materials for foundation systems and roads is not feasible.<br>■ Complete blasting near fish-bearing waterbodies outside the proposed restricted activity timing window for all blasting operations.<br>■ Prepare and implement a Blasting and Communication Management Plan that is in accordance with Ontario Provincial Standard Specification *General Specifications for the Use of Explosives* (2014) and describes specific measures that would be implemented if blasting is required.<br>■ For blasting operations, follow the overpressure and vibration guidelines outlined in the Ontario Provincial Standard Specification *General Specifications for the Use of Explosives* (2014) and Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky, 1998):<br>○ **Overpressure guideline**—Explosives are not to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous water pressure change (i.e., overpressure) greater than 100 kPa where fish are present. The overpressure guideline applies year-round in any fish-bearing waterbody near the blast.<br>○ **Vibration guideline**—Explosives are not to be detonated that produce, or are likely to produce, a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation. The vibration guideline applies during the restricted activity timing window in the waterbody near the blast. | No residual effect |
| | | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies*.<br>■ Follow the Construction mitigation and enhancement measures outlined in *Blasting-related injuries or mortality to fish.* | N/A |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish habitat quality from the deposition of air contaminants and fugitive dust emissions | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies*.<br>■ Implement the air quality mitigation measures as described in surface water quality assessment (WSP, 2026a).<br>■ Burn slash piles subject to agreements with Indigenous communities, landowners, and to permits and approvals by appropriate regulatory agencies. | No residual effect |
| | | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies*.<br>■ Prepare and implement a Dust / Air Quality Management Plan.<br>■ Implement dust control practices (e.g., wetting with water and implementation of speed limits), as required. | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish survival and reproduction from improved public access to recreational angling areas | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Decommission and reclaim temporary pits and quarries and the temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles at the end of construction. Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act*.<br>■ Implement best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species. | Residual effects on fish survival and reproduction from improved public access to recreational angling areas |

| Valued Component | Project Activities | Project Phase | Description of Potential Effect | Mitigation and Enhancement Measures | Predicted Residual Effect |
|---|---|---|---|---|---|
| | ■ Operating the Preferred Route<br>■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* | |
| Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | ■ Clearing the right-of-way<br>■ Constructing the Community Access Road<br>■ Constructing bridges and installing culverts<br>■ Constructing, operating, and decommissioning temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles | Construction | Changes to fish survival and reproduction from spills of fuel or other materials | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies*.<br>■ Prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred.<br>■ Have equipment for containing spills on site. Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas, and / or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents.<br>■ Refuel, service, and maintain vehicles and equipment in designated areas at temporary construction camps and temporary laydown areas a minimum of 120 m from waterbodies.<br>■ Wash, refuel, and service machinery to prevent any deleterious substances from entering a waterbody (Fisheries and Oceans Canada, 2025a).<br>■ Store fuel and other materials for the machinery in to prevent any deleterious substances from entering a waterbody (Fisheries and Oceans Canada, 2025a).<br>■ Register aboveground storage tanks under and in compliance with applicable federal and provincial legislation.<br>■ Meet Canada's *Transportation of Dangerous Goods Act*, 1992 (Government of Canada, 1992) and the Ontario *Technical Standards and Safety Act*, 2000 (Government of Ontario, 2000) and for the transportation, storage, and handling of fuels.<br>■ Have machinery and equipment arrive on site in a clean condition and inspect and maintain routinely to avoid fluid leaks.<br>■ Train individuals working on site and handling hazardous materials about best practices for the transportation of dangerous goods to avoid negatively affecting fish and fish habitat by introducing hazardous materials into the environment. | Residual effects on fish survival and reproduction from spills of fuel or other materials |
| | ■ Operating the Preferred Route<br>■ Maintaining the Preferred Route and permanent bridges and culverts | Operation and Maintenance | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in Changes to fish habitat quantity and quality through physical alterations of waterbodies.<br>■ Meet *Canada's Transportation of Dangerous Goods Act*, 1992 (Government of Canada, 1992) and Ontario *Technical Standards and Safety Act*, 2000 (Government of Ontario, 2000) and for the transport, storage, and handling of fuels required for maintenance.<br>■ Have machinery and equipment arrive on site in a clean condition and inspect and maintain routinely to avoid fluid leaks during maintenance.<br>■ Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion. | |

Notes: kPa = kilopascal; m = metre; % = percent; mm/s = millimetre per second.

### 7.3.2 Characterization of Predicted Residual Effects

Assuming effective implementation of mitigation and enhancement measures presented in **Table 7-5**, residual effects as a result of the Project are predicted for Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot and are included in the assessment and characterization of predicted residual effects and cumulative effects assessment. Predicted residual effects are characterized according to the effect characteristics of context, direction, magnitude, geographic extent, duration, frequency, reversibility, and likelihood (**Section 4.4.2.4**). A description of the predicted residual effects of the Project on fish and fish habitat and a determination of significance and prediction confidence are presented in the following sections and summarized in **Table 7-6**.

#### 7.3.2.1 Residual Effects on Fish Habitat Quantity and Quality through Physical Alteration of Waterbodies

**Construction**

With the effective implementation of the mitigation and enhancement measures (detailed in **Section 7.3.1.1** and **Table 7-5**), it is anticipated that residual effects on fish habitat quantity and quality through physical alteration of waterbodies during Construction will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Mitigation and enhancement measures outlined in **Sections 7.3.1** and **7.3.1.12** are standard for linear development projects and based on best practices. Key mitigation and enhancement measures include:

- Selecting waterbody crossing structures based on site characteristics;
- Where feasible, avoiding work in or near water during the restricted activity timing windows for the protection of fish and fish habitat and during periods of increased flow or precipitation;
- Developing and implementing post-construction maintenance and monitoring programs that will limit potential for changes to morphology; and
- Following conditions in permits from the Ministry of Natural Resources and Fisheries and Oceans Canada.

As described in **Section 2.1.2**, a waterbody crossing structure was proposed based on bankfull width for each waterbody identified in the crossing list (i.e., culverts, clear span bridges, and bridges with piers and abutments); the type of crossing structure for individual waterbodies may change during detailed design based on site-specific conditions. Bridges will be designed to meet the 1-in-100-year flood scenario design and fish passage requirements. Culverts will be closed- or open-bottom depending on fisheries sensitivities and soil conditions and designed to accommodate fish passage, where appropriate.

Due to the large scale of the Project, crossing structures may need to be installed or removed at some sites within the restricted activity timing windows. For these locations, the timing will be included in permit applications to Fisheries and Oceans Canada, and the Ministry of Natural Resources and site-specific mitigation and enhancement measures will be implemented based on the mitigation and enhancement measures in **Section 7.3.1**.

Permit applications for bridge and culvert crossings will be prepared for the Ministry of Natural Resources under the *Lakes and Rivers Improvement Act*. A Request for Review under the *Fisheries Act* will be submitted to Fisheries and Oceans Canada. Based on Fisheries and Oceans Canada's review, an application for authorization under the *Fisheries Act* will be prepared, if required, which would include an offsetting plan. If required by Fisheries and Oceans Canada, the offsetting plan would include habitat enhancement measures or habitat creation to offset losses associated with the Project.

Changes to fish habitat quantity and quality through physical alteration of waterbodies from waterbody crossings installed above the high-water mark are expected to be neutral during Construction, as no in-water work is required and no direct effect on habitat would occur.

Residual effects on fish habitat quantity and quality will be direct for changes in the waterbody bed, composition and size of bed material, and changes in bank configuration or materials from Project activities, which may subsequently cause indirect effects on fish habitat quantity and quality from changes in the food supply (i.e., benthic invertebrate communities) and flows from the installation of isolation structures during in-water construction.

Changes to fish habitat quantity and quality from waterbody crossings installed below the high-water mark are expected to be negative in direction and localized (i.e., restricted to the Construction Disturbance Area) during Construction. Magnitude is expected to be low as a result of minor changes to habitat at the crossing location without loss of function or individuals. The overall habitat will remain functional with the potential for a small decrease in productivity for fish and benthic invertebrates as a food supply for fish where a crossing is placed. The duration is considered long term and irreversible for permanent crossings and short to medium term for temporary crossings that are removed during or at the end of Construction. The effect is considered infrequent as the crossing structure will be installed once and the probability of occurrence is unlikely where the proposed work is above the high-water mark and certain where the proposed work is below the high-water mark.

Physical alteration of the waterbodies is expected to result in minor effects on fish habitat quantity or quality with effective implementation of mitigation and enhancement measures. Habitat of the Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot) is anticipated to remain stable and functional but there may be a minor decrease in productivity from physical alteration of the waterbodies.

However, the Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no effects on aquatic biodiversity would be expected.

### Operation and Maintenance

With the effective implementation of the mitigation and enhancement measures (detailed in **Section 7.3.1.1** and **Table 7-5**), it is anticipated that residual effects on fish habitat quantity and quality through physical alteration of waterbodies during Operation and Maintenance will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Mitigation and enhancement measures outlined in **Sections 7.3.1** and **7.3.1.12** are standard for linear development projects and based on best practices. Key mitigation and enhancement measures include:

- Regularly inspecting and maintaining culverts and bridges to prevent blockages from forming and causing ponding or backwater effects;
- Where culverts and bridges are installed at fish bearing waterbodies, following Fisheries and Oceans Canada's *Codes of Practice* for debris removal activities;
- Where feasible, avoiding work in or near water during the restricted activity timing windows for the protection of fish and fish habitat and during periods of increased flow or precipitation; and
- Operating waterbody crossing structures in consideration of best management practices and environmental approval conditions.

Similar to Construction, residual effects on fish habitat quantity and quality will be direct for changes in the waterbody bed, composition and size of bed material, and changes in bank configuration or materials from Project activities, which may subsequently cause indirect effects on fish habitat quantity and quality from changes in the food supply (i.e., benthic invertebrate communities) and flows from the installation of isolation structures during in-water construction.

Changes to fish habitat quantity and quality from works and activities below the high-water mark during Operation and Maintenance are expected to be negative in direction, restricted to the Construction Disturbance Area, and with a negligible magnitude (minor change that does not reduce productivity or function). Effects will be short term (i.e., limited to the period instream works [days]) reversible, infrequent, and possible.

Physical alteration of waterbodies during Operation and Maintenance is expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from physical alteration to waterbodies during Operation and Maintenance on the populations of Valued Component fish species (Lake Sturgeon,

Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

#### 7.3.2.2 Residual Effects on Fish Habitat Quantity and Quality through Changes to Riparian Vegetation

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.2** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects on fish habitat quantity and quality through changes to riparian vegetation will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Maintaining the 30 m riparian buffer around each waterbody where feasible; and
- Decommissioning and rehabilitating the temporary waterbody crossings.

To minimize effects on waterbodies, a riparian buffer of 30 m around waterbodies will be maintained, where feasible (**Section 7.3.1.2.2**).

Due to the large scale of the Project and to accommodate timing windows for other sensitive species (i.e., migratory bird nesting period), clearing of riparian vegetation may need to occur within the restricted activity timing windows as outlined in **Section 7.3.1.2**. If approval from the Ministry of Natural Resources and Fisheries and Oceans Canada is obtained and the potential for negative effects can be reduced or avoided, clearing of riparian areas may be completed during the restricted activity timing window.

Residual effects on fish habitat quantity and quality will be direct for changes in habitat structure and cover (e.g., change in channel stability, overhead cover, and inputs of woody debris), which may subsequently cause indirect effects on fish habitat quantity and quality from changes in water temperature, food supply, light, and sediment concentrations.

Effects on fish habitat quantity and quality through physical changes to riparian vegetation during Construction are expected to be negative in direction, restricted to the Construction Disturbance Area, and with a negligible magnitude (minor change that does not reduce productivity or function). The effect is considered to be infrequent as clearing will occur once, and the probability of occurrence is possible. Disturbance to fish habitat through changes to riparian vegetation is anticipated to be reversible for temporary crossings and irreversible for permanent crossings; therefore, the duration is expected to be medium term for temporary crossings and long term for permanent crossings.

Changes to riparian vegetation during Construction are expected to result in negligible residual effects on fish habitat availability with effective implementation of the mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from changes to riparian vegetation on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

**Operation and Maintenance**

Effects on fish habitat quantity and quality through physical changes to riparian vegetation during Operation and Maintenance are expected to be negative in direction, restricted to the Construction Disturbance Area, and with a negligible magnitude (minor change that does not reduce productivity or function). The effect is considered to be medium term and reversible, infrequent, and possible.

Similar to Construction, residual effects on fish habitat quantity and quality will be direct for changes in habitat structure and cover (e.g., change in channel stability, overhead cover, and inputs of woody debris), which may subsequently cause indirect effects on fish habitat quantity and quality from changes in water temperature, food supply, light, and sediment concentrations.

Changes to riparian vegetation during Operation and Maintenance are expected to result in negligible residual effects on fish habitat availability with effective implementation of the mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from changes to riparian vegetation on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

#### 7.3.2.3 Residual Injury or Mortality of Fish from Instream Construction

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.3** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects on injury or mortality of fish from instream construction will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Completing all instream construction in isolation of flowing water;

- Screening water intakes and pumps to prevent entrainment and impingement of fish;
- Having aquatics specialists rescue and relocate fish within the isolated workspace prior to construction; and
- When possible, completing construction outside of the restricted activity timing window.

The use of an isolation structure and conducting a fish rescue will minimize potential for injury or mortality during in-water construction activities. However, if fish are missed during the fish rescue, there may be individual fish that would not survive the construction work. Also, due to the short timeframe of the timing windows, it is expected that work will be completed below the high-water mark during the restricted activity window at some sites. If spawning fish have accessed the area prior to isolation, eggs or young-of-year may be present. However, the work will take place in a small area of the channel; therefore, only a small proportion of the population would be affected.

Injury or mortality of fish from instream construction is expected to be direct, negative in direction and restricted to the Construction Disturbance Area. Magnitude is considered negligible, as the incidental death of individual fish, if it were to occur, would not be expected to disrupt population dynamics or affect local productivity. The duration is short term as the effect would be limited to the period of instream construction (i.e., weeks). The effect is considered infrequent and the probability of occurrence is possible.

Injury or mortality of fish from instream construction may result in a minor loss of individual fish near the work location including the Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot), but measurable effects on the productivity of the waterbodies for fish are anticipated to be minor with the implementation of appropriate mitigation and enhancement measures. The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

#### 7.3.2.4 Residual Effects on Habitat Quality from the Release of Sediment at Waterbody Crossings

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.4** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects on fish habitat quality through the release of sediment will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Using isolation methods for the installation of culverts or multi-span bridges;
- Installing sediment and erosion control measures before construction;

- Inspecting and maintaining erosion and sediment control measures; and
- Returning the banks to their original profile and stabilizing disturbed areas after construction.

Changes to habitat quality for fish and benthic invertebrates as a food source for fish from release of sediment during road construction and land disturbance at waterbody crossings are expected to be negative in direction. Taking into account mitigation and enhancement measures and best management practices, the magnitude is considered to be negligible. Effects will be direct, restricted to a local scale, infrequent, and short term (i.e., limited to the period of instream construction activity [weeks]). The probability of occurrence is unlikely where the proposed work is above the high-water mark and possible where the proposed work is below the high-water mark. However, mitigation and enhancement measures, including the use of isolations during in-water construction and sediment and erosion control measures, will limit effects on fish and benthic invertebrate habitat.

Changes in habitat quality and associated effects on fish downstream from crossings from the release of sediment during road construction at waterbody crossings and from land disturbance are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from the release of sediment at waterbody crossings on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

**Operation and Maintenance**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.4** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects on fish habitat quality through the release of sediment will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Installing, monitoring, and managing appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during maintenance activities; and
- Developing and following a Sediment and Erosion Control Plan.

Changes to habitat quality for fish and benthic invertebrates as a food source for fish from release of sediment during Operation and Maintenance at waterbody crossings are expected to be negative in direction. Taking into account mitigation and enhancement measures and best management practices, the magnitude is considered to be negligible. Effects will be direct, restricted to a local scale, infrequent, and short term. The probability of occurrence is unlikely.

Changes in habitat quality and associated effects on fish downstream from crossings from the release of sediment during Operation and Maintenance at waterbody crossings are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from the release of sediment at waterbody crossings on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

#### 7.3.2.5 Residual Effects on Fish Habitat Quantity and Quality from the Placement of Waterbody Crossing Structures and Changes in Channel Morphology

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.5** and **Table 7-5**) and the use of best management practices, it is anticipated that changes to channel morphology affecting fish habitat quantity and quality from the placement of waterbody crossing structures during Construction will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. The key mitigation and enhancement measures include:

- Designing and installing culverts for the waterbody such that the channel is not constricted and to minimize potential for scour and erosion; and
- Installing, monitoring, and managing appropriate erosion and sediment control measures.

For any structures placed below the high-water mark, design and mitigation, and enhancement measures will limit potential for changes to morphology. Temporary waterbody crossings will be decommissioned and rehabilitated during and after completion of Construction, which is expected to last approximately three to ten years.

Where work is proposed above the high-water mark, changes in channel morphology affecting fish habitat quantity and quality from placement of waterbody crossing structures are expected to be neutral in direction.

Where the proposed work is below the high-water mark, changes in channel morphology affecting fish habitat quantity and quality from placement of waterbody crossing structures are expected to be negative in direction, negligible in magnitude, within the Construction Disturbance Area, continuous, and the probability of occurrence is possible. The duration is expected to be medium term for temporary crossings and long term for permanent crossings.

Residual effects on fish habitat quantity and quality would be indirect, as Project activities could affect sediment inputs and flow velocities which may result in effects to fish habitat quantity and quality through changes in channel geomorphology (e.g., bankfull width and depth, bed material composition, ratio of pools to riffles, and composition of riparian vegetation).

Changes in fish habitat quantity and quality from changes to channel morphology during Construction from the placement of waterbody crossing structures are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated change on the function or productivity of the habitat from the changes to channel morphology on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

**Operation and Maintenance**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.5** and **Table 7-5**) and the use of best management practices, it is anticipated that changes to channel morphology affecting fish habitat quantity and quality from the Operation and Maintenance of waterbody crossing structures will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Regularly inspecting and maintaining culverts and multi-span bridges, if installed, to prevent blockages from forming and causing ponding or backwater effects; and
- Monitoring and managing for erosion and sedimentation control.

Changes in channel morphology affecting fish habitat quantity and quality are expected to be neutral in direction during Operation and Maintenance where work was conducted above the high-water mark during Construction (e.g., clear span bridges).

Where work was conducted below the high-water mark during Construction (e.g., culverts, multi-span bridges), changes in channel morphology affecting fish habitat quantity and quality from Operation and Maintenance of waterbody crossing structures is expected to be negative in direction, negligible in magnitude, and within the Construction Disturbance Area. The effect is considered to be short term, infrequent, and possible. Similar to Construction, Residual effects on fish habitat quantity and quality would be indirect, as Project activities could affect sediment inputs and flow velocities which may result in effects to fish habitat quantity and quality through changes in channel geomorphology (e.g., bankfull width and depth, bed material composition, ratio of pools to riffles, and composition of riparian vegetation).

Changes in fish habitat quantity and quality from changes to channel morphology from the Operation and Maintenance of waterbody crossing structures are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated change on the function or productivity of the habitat from the changes to channel morphology on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

#### 7.3.2.6 Residual Effects on Fish Survival, Reproduction, and Distribution from the Placement of Waterbody Crossing Structures, Affecting Fish Access to Habitats

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.6** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects in access to habitat during Construction from placement of waterbody crossing will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Using existing access roads where possible to limit disturbance caused by construction; and
- Designing and installing culverts in fish-bearing waterbodies to allow for fish movement as appropriate to meet Ministry of Natural Resources and Fisheries and Oceans Canada guidelines.

Residual effects on fish survival, reproduction, and distribution from changes in fish access to habitats from placement of waterbody crossing structures are expected to be neutral where the proposed work is above the high-water mark (e.g., clear span bridges).

Where the proposed work is below the high-water mark (e.g., installation of a culvert), residual effects are direct, negative in direction, negligible in magnitude, local in geographic extent, infrequent, reversible, and the probability of occurrence is possible. For any structures placed below the high-water mark, design, mitigation and enhancement measures will limit potential for changes in fish access to habitat.

Changes in access to habitat during Construction from placement of waterbody crossing are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from the changes in access to habitats on the

populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. There are no anticipated changes to distribution or migration patterns of the Valued Components and therefore no changes to aquatic biodiversity.

**Operation and Maintenance**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.6** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects in access to habitat during Operation and Maintenance from placement of waterbody crossing will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. The key mitigation and enhancement measure involves inspecting and maintaining culverts to prevent blockages.

Effects on fish survival, reproduction, and distribution from changes in fish access to habitats are expected to be neutral in direction during Operation and Maintenance where work was conducted above the high-water mark during Construction (e.g., clear span bridges). Where work was conducted below the high water mark during Construction (e.g., culverts), changes during Operation and Maintenance are expected to be direct, negative in direction, negligible in magnitude, local in geographic extent, medium term, infrequent, and possible.

Changes in access to habitat during Operation and Maintenance are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from the changes in access to habitats on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective.

There are no anticipated changes to distribution or migration patterns of the Valued Components and therefore no changes to aquatic biodiversity.

### 7.3.2.7 Residual Effects on Fish Habitat Quantity and Quality due to Changes in Hydrology or Groundwater that may Alter Drainage Patterns and Increase or Decrease Drainage Flows and Surface Water Levels

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.7** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects in fish habitat quantity and quality from changes to hydrology or

groundwater from Construction will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. A key mitigation and enhancement measure includes completing instream activity in the shortest timeframe practical to minimize the duration and severity of disturbance.

Effects on surface water quantity and quality, and water quality from short-term water taking and discharges from Construction are expected to result in negligible residual effects (WSP, 2026a). Therefore, effects on fish habitat quantity and quality from changes in hydrology or groundwater from Construction activities that may alter drainage patterns and increase or decrease drainage flows and surface water levels are expected to be indirect, negative in direction, negligible in magnitude, local in geographic extent, long term, infrequent, irreversible, and unlikely to occur.

Effects on fish habitat quantity and quality from changes to hydrology or groundwater from Construction are expected to result in negligible residual effects on fish habitat quantity and quality, including for benthic invertebrates as a food source for fish, with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from the changes in hydrology and groundwater on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

**Operation and Maintenance**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.7** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects in fish habitat quantity and quality from changes to hydrology or groundwater during Operation and Maintenance will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting.

A key mitigation and enhancement measure includes regularly inspecting and maintaining culverts and bridges to prevent blockages from forming and causing ponding or backwater effects.

Effects on fish habitat quantity and quality from changes in hydrology or groundwater during Operation and Maintenance that may alter drainage patterns and increase or decrease drainage flows and surface water levels are expected to be indirect, negative in direction, negligible in magnitude, local in geographic extent, long term, infrequent, irreversible, and unlikely to occur.

Effects on fish habitat quantity and quality from changes to hydrology or groundwater from Operation and Maintenance are expected to result in negligible residual effects on fish

habitat quantity and quality, including for benthic invertebrates as a food source for fish, with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat from the changes in hydrology and groundwater on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

#### 7.3.2.8 Residual Effects on Fish Survival and Reproduction from Improved Public Access to Recreational Angling Areas

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.10** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects during Construction from public access to recreational fishing reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Using existing access roads where possible; and
- Using best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species.

Developing a policy for non-Indigenous Project personnel while on shift or at temporary construction camps in regard to any hunting, fishing, or trapping activities.

Potential changes in angler pressure and fish harvest will continue to be managed by the Ministry of Natural Resources, the government agency mandated to manage fisheries resources (e.g., fisheries management zones, fishing seasons, catch limits, closures).

Furthermore, fishing is managed as a public resource through provincial licensing requirements and by establishing rules in terms of season length, catch limits, and catch-and-release rules for waterbodies near the Project. Local communities will be responsible for managing their resources by limiting fish catch to a sustainable level for each species.

Effects on fish survival and reproduction during Construction from changes to public access to recreational fishing areas, including from potential for spread of invasive species, are expected to be direct, negative in direction, regional in geographic extent, long term, frequent, irreversible, and possible. Due to the remoteness of the area and small population of people in northern Ontario (**Section 7.3.1.10**), minor changes to the harvest of fish in individual waterbodies are anticipated. The productivity of fish populations

may decrease from the fish harvest, but it is not likely to disrupt overall population dynamics; therefore, magnitude is considered medium.

Effects on fish survival and reproduction from changes to public access to recreational fishing in Construction are expected to result in minor residual effects on fish populations with effective implementation of mitigation and enhancement measures. There may be a decrease in productivity, but the populations of the Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot) are anticipated to remain functional, self-sustaining, and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

**Operation and Maintenance**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.10** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects during Operation and Maintenance from public access to recreational fishing reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. A key mitigation and enhancement measure includes using best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species. As described for Construction, potential changes in angler pressure and fish harvest will continue to be managed by the Ministry of Natural Resources and local communities will be responsible for managing their resources by limiting fish catch to a sustainable level for each species.

Effects on fish survival and reproduction during Operation and Maintenance from changes to public access to recreational fishing areas, including from potential for spread of invasive species, are expected to be direct, negative in direction, regional in geographic extent, long term, frequent, irreversible, and possible. Due to the remoteness of the area and small population of people in northern Ontario (**Section 7.3.1.10**), minor changes to the harvest of fish in individual waterbodies are anticipated.

The productivity of fish populations may decrease from the fish harvest, but it is not likely to disrupt overall population dynamics; therefore, magnitude is considered medium.

Effects on fish survival and reproduction from changes to public access to recreational fishing in Operation and Maintenance are expected to result in minor residual effects on fish populations with effective implementation of mitigation and enhancement measures. There may be a decrease in productivity, but the populations of the Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot) are anticipated to remain functional, self-sustaining, and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

### 7.3.2.9 Residual Effects on Fish Reproduction and Survival from Spills of Fuel or Other Materials

**Construction**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.11** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects on fish habitat quantity and quality from changes to surface water and sediment quality from spills of fuel or other materials during Construction will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Preparing and implementing a Spill Prevention and Emergency Response Plan; and
- Refuelling, servicing, and maintaining vehicles and equipment in designated areas at temporary construction camps and temporary laydown areas a minimum of 120 m from waterbodies.

Considering the nature of work associated with the Project, the most plausible types of spills have been identified as hydrocarbons (i.e., fuel and / or oil) from machinery or other chemical applications. Releases of cementitious materials have the potential to increase water pH (i.e., render it extremely alkaline or basic), which has the potential to cause fish mortality or longer-term health issues in fish.

Leaks or spills are considered avoidable with good planning, adequate design, and proper emergency response. Further to this, the frequency, spatial extent and severity of accidental spills or leaks during Construction are anticipated to be minimized with the effective implementation of mitigation and enhancement measures identified in the assessment of surface water.

Effects on surface water and sediment quality during Construction from spills of fuel or other materials are expected to be indirect, negative in direction, with negligible magnitude, local in scale, short term (i.e., limited to the period of instream construction activity [weeks]), infrequent, reversible, and unlikely. Due to spill events likely being short term and isolated in nature, it is unlikely there would be a bioaccumulation of contaminants in fish species and their prey. No changes to trophic status (including primary or secondary productivity) would be expected.

Effects on fish survival and reproduction from changes to surface water and sediment quality from spills during Construction are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species

populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

**Operation and Maintenance**

With the effective implementation of mitigation and enhancement measures (detailed in **Section 7.3.1.11** and **Table 7-5**) and the use of best management practices, it is anticipated that residual effects on fish habitat quantity and quality from changes to surface water and sediment quality from spills of fuel or other materials during Operation and Maintenance will be reduced or moderated as well as regulated through Fisheries and Oceans Canada and the Ministry of Natural Resources permitting. Key mitigation and enhancement measures include:

- Preparing and implementing a Spill Prevention and Emergency Response Plan; and
- Refuelling, servicing, and maintaining Operation and Maintenance vehicles and equipment in designated areas a minimum of 120 m from waterbodies.

As discussed for Construction, leaks or spills are considered avoidable with good planning, adequate design, and proper emergency response and the frequency, spatial extent and severity of accidental spills or leaks during Operation and Maintenance are anticipated to be minimized with the effective implementation of mitigation and enhancement measures identified in the assessment of surface water.

Effects on surface water and sediment quality during Operation and Maintenance from spills of fuel or other materials are expected to be indirect, negative in direction, with negligible magnitude, local in scale, short term, infrequent, reversible, and unlikely.

Effects on fish survival and reproduction from changes to surface water and sediment quality from spills during Operation and Maintenance are expected to result in negligible residual effects on fish and fish habitat with effective implementation of mitigation and enhancement measures. There is no anticipated effect on the function or productivity of the habitat on the populations of Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). The Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective. As a result, no changes to aquatic biodiversity would be expected.

## 7.3.3 Assessment of Significance

The assessment of significance of residual effects of the Project is informed by the interaction between the significance factors, with magnitude and geographic extent being the most important factors. Consideration is also given to context, which includes ecological context (i.e., the sensitivity and resilience of the Valued Component fish populations), and social context (i.e., concerns of Indigenous communities, interested agencies, groups and individuals raised during consultation and engagement and through review comments on

the Environmental Assessment reports). Implementation of proven mitigation and enhancement measures is expected to aid in the avoidance or reduction of the magnitude, geographic extent, and / or duration of residual effects on fish and fish habitat.

The magnitude of the predicted residual effects on fish and fish habitat in Construction and Operation and Maintenance Phases of the Project are of negligible to medium magnitude and range from confined to the Construction Disturbance Area to regional in geographic extent.

Residual effects on the fish Valued Component were considered **not significant** as the residual effects were assessed negligible to medium in magnitude and they do not represent a substantial management concern. There is the potential for management concerns through an increased public access leading to changes in angler pressure and fish harvest; however, the resources are expected to continue to be managed through the Ministry of Natural Resources and local communities for recreational and Indigenous harvest, respectively. Residual effects on aquatic biodiversity were also considered not significant.

Overall, the Valued Component fish populations are expected to remain self-sustaining and ecologically effective; therefore, the predicted residual effects on fish and fish habitat are assessed as **not significant.**

### 7.3.4 Prediction Confidence and Uncertainty

Scientific inference is associated with uncertainty, and prediction confidence (i.e., the level of confidence in assessment results) depends on the level of uncertainty and the way this uncertainty is addressed. Primary factors affecting confidence in the predictions made in the fish and fish habitat assessment include:

- Availability and accuracy of baseline data;
- Level of understanding of baseline fish and fish habitat conditions, range of natural variation, and the resilience of fish and fish habitat Valued Components to disturbance;
- Understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space (e.g., exactly how the Project would influence fish and fish habitat Valued Components); and
- Level of certainty associated with the effectiveness of proposed mitigation and enhancement measures, where applicable.

Uncertainty was managed by:

- Reviewing baseline studies and other relevant information related to existing fish and fish habitat conditions in the Local Study Area and Regional Study Area;
- Where appropriate, uncertainty may be addressed by additional mitigations as required, or through monitoring programs designed to verify the effects predictions and / or the effectiveness of mitigation;
- Completing quality assurance and quality control of baseline data;
- Applying conservative assumptions regarding the footprint area and related Project activities that may cause disturbance or direct fish habitat loss to increase confidence that the effects were not underestimated;
- Applying conservative assumptions to increase confidence that the effects were not underestimated; and
- Comparing assessment results to relevant published scientific literature.

Overall, there is a moderate degree of confidence in the predictions related to the changes to fish and fish habitat Valued Components. Mitigation and enhancement measures and best management practices would be implemented to reduce effects on the aquatic ecosystem and fish and fish habitat Valued Components. There is a high level of confidence in the mitigation and enhancement measures and best management practices as these are routinely and effectively implemented across Canada. There is a high degree of confidence associated with the predicted changes in fish habitat quantity and quality associated with the development of water crossing structures, both permanent and temporary.

The estimated physical footprint of these structures is well understood and is based on previous experience with similar types of developments. There is also a good understanding of the existing fish habitat conditions in the immediate vicinity of the affected areas in the Local Study Area, where surveys were completed during the fish and fish habitat environment baseline study (**Attachment B**).

Overall, confidence levels were considered to be moderate because there were baseline data for the majority of the sites available, the Project-related effects are mostly understood, and the level of certainty associated with the effectiveness of proposed mitigations is moderate to high.

### 7.3.5 Summary

**Table 7-6** provides a summary of the characterization of predicted residual effects and determination of significance by residual effect for fish and fish habitat Valued Components.

## Table 7-6: Characterization of Predicted Residual Effects and Determination of Significance for Fish and Fish Habitat Valued Components

| Valued Component | Predicted Residual Effect | Phase | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Probability of Occurrence | Significance (Significant, Not Significant) | Uncertainty | Direct / Indirect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish habitat quantity and quality through physical alteration of waterbodies | Construction | Neutral where proposed work is above the high-water mark | N/A[a] | | | | | | | | |
| | | | Negative where proposed work is below the high-water mark | Low | Construction Disturbance Area | Short to medium term for temporary waterbody crossings<br><br>Long term for permanent waterbody crossings | Infrequent | Reversible for temporary waterbody crossings<br><br>Irreversible for permanent waterbody crossings | Unlikely (work above the high-water mark)<br><br>Certain (work below the high-water mark) | Not significant | Moderate | Direct and indirect[b] |
| | | Operation and Maintenance | Negative | Negligible | Construction Disturbance Area | Short term | Infrequent | Reversible | Possible | Not significant | Moderate | Direct and indirect[b] |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish habitat quantity and quality through changes to riparian vegetation | Construction | Negative | Negligible | Construction Disturbance Area | Medium term for temporary waterbody crossings<br><br>Long term for permanent waterbody crossings | Infrequent | Reversible for temporary waterbody crossings<br><br>Irreversible for permanent waterbody crossings | Possible | Not significant | Moderate | Direct and indirect[b] |
| | | Operation and Maintenance | Negative | Negligible | Construction Disturbance Area | Medium term | Infrequent | Reversible | Possible | Not significant | Moderate | Direct and indirect[b] |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual injury or mortality of fish from instream construction | Construction | Negative | Negligible | Construction Disturbance Area | Short term | Infrequent | Irreversible | Possible | Not significant | Moderate | Direct |

| Valued Component | Predicted Residual Effect | Phase | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Probability of Occurrence | Significance (Significant, Not Significant) | Uncertainty | Direct / Indirect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on habitat quality from release of sediment at waterbody crossings | Construction | Negative | Negligible | Local | Short term | Infrequent | Reversible | Unlikely where proposed work is above the high-water mark<br><br>Possible where proposed work is below the high-water mark | Not significant | Moderate | Direct |
| | | Operation and Maintenance | Negative | Negligible | Local | Short term | Infrequent | Reversible | Unlikely | Not significant | Moderate | Direct |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology | Construction | Neutral where proposed work is above the high-water mark | N/A[(a)] | | | | | | | | |
| | | | Negative where proposed work is below the high-water mark | Negligible | Construction Disturbance Area | Medium term for temporary waterbody crossings<br><br>Long term for permanent waterbody crossings | Continuous | Reversible for temporary waterbody crossings<br><br>Irreversible for permanent waterbody crossings | Possible | Not significant | Moderate | Indirect |
| | | Operation and Maintenance | Neutral where proposed work is above the high-water mark | N/A[(a)] | | | | | | | | |
| | | | Negative where proposed work is below the high-water mark | Negligible | Construction Disturbance Area | Short term | Infrequent | Reversible | Possible | Not significant | Moderate | Indirect |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake** | Residual effects on fish survival, reproduction, and distribution from the placement of waterbody crossing | Construction | Neutral where proposed work is above the high-water mark | N/A[(a)] | | | | | | | | |

| Valued Component | Predicted Residual Effect | Phase | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Probability of Occurrence | Significance (Significant, Not Significant) | Uncertainty | Direct / Indirect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Whitefish, and Burbot** | structures, affecting fish access to habitats | | Negative where proposed work is below the high-water mark | Negligible | Local | Medium term | Infrequent | Reversible | Possible | Not significant | Moderate | Direct |
| | | Operation and Maintenance | Neutral where proposed work is above the high-water mark | N/A[(a)] | | | | | | | | |
| | | | Negative where proposed work is below the high-water mark | Negligible | Local | Medium term | Infrequent | Reversible | Possible | Not significant | Moderate | Direct |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels | Construction | Negative | Negligible | Local | Long term | Infrequent | Irreversible | Unlikely | Not significant | Moderate | Indirect |
| | | Operation and Maintenance | Negative | Negligible | Local | Long term | Infrequent | Irreversible | Unlikely | Not significant | Moderate | Indirect |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish survival and reproduction from improved public access to recreational angling areas | Construction | Negative | Medium | Regional | Long term | Frequent | Irreversible | Possible | Not significant | Moderate | Direct |
| | | Operation and Maintenance | Negative | Medium | Regional | Long term | Frequent | Irreversible | Possible | Not significant | Moderate | Direct |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish survival and reproduction from spills of fuel or other materials | Construction | Negative | Negligible | Local | Short term | Infrequent | Reversible | Unlikely | Not significant | Moderate | Indirect |
| | | Operation and Maintenance | Negative | Negligible | Local | Short term | Infrequent | Reversible | Unlikely | Not significant | Moderate | Indirect |

Notes:
N/A = not applicable.
(a) Criteria were not rated as the direction was neutral.
(b) Please see Section 7.3.2 for discussion on the direct versus indirect characterization for this residual effect pathway.

# 8 Cumulative Effects Assessment

The *Canadian Environmental Assessment Act, 2012* (Government of Canada, 2019) requires that each Environmental Assessment / Impact Statement of a project consider any cumulative environmental effects that are likely to result from the project in combination with the environmental effects of other physical activities that have been or will be carried out, as well as with consideration of climate change.

This section presents the assessment of potential cumulative effects completed as part of the Project. The effects of past and present activities on the study area and Valued Components identified for the Project were assessed, and results are described in the following sections.

The cumulative effects assessment builds on the results of the effects assessment described in **Section 7** and provides the incremental changes that are predicted to have a likely residual adverse effect on a Valued Component.

## 8.1 Cumulative Effects Scoping

### 8.1.1 Valued Components with Residual Effects

Where residual effects identified in **Section 7** were negligible magnitude, unlikely or possible to occur, or positive in direction, the effect was not carried forward into the cumulative effects assessment. The residual effects that have been carried forward for assessment are described in **Table 8-1.**

**Table 8-1: Valued Components and Residual Effects**

| Valued Component | Residual Effect | Phase |
|---|---|---|
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish habitat quantity and quality through physical alteration of waterbodies where work is below the high-water mark | Construction |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Residual effects on fish survival and reproduction from improved public access to recreational angling areas | Construction and Operation and Maintenance |

### 8.1.2 Spatial and Temporal Boundaries

The spatial boundary for the cumulative effects assessment corresponds to the geographic extent that the likely residual adverse effects of the Project are predicted to occur. The study area used in the cumulative effects assessment is the same as the fish and fish habitat effects assessment Regional Study Area used for the residual effects assessment (**Section 4.2.3.2.2**).

Temporal boundaries for the cumulative effects assessment correspond to the duration that the likely residual adverse effects of the Project are predicted to occur. There are currently no plans to decommission the Community Access Road as there is no expected / known end date for its need. Therefore, future suspension, decommissioning, and eventual abandonment was not considered in this Report. It will be considered if and when a decommissioning or abandonment application is made for the Community Access Road.

The Project is planned to occur in two phases:

- **Construction Phase**—The time from start of Construction, including site preparation activities, to the start of Operation and Maintenance of the Community Access Road. Decommissioning of construction works is included in the Construction Phase. The Construction Phase is anticipated to take approximately three to ten years to complete; and
- **Operation and Maintenance Phase**—The Operation and Maintenance Phase starts once construction activities are complete and lasts for the life of the Project. The Operation and Maintenance Phase of the Project is considered to be permanent based on the expected timeline for when major refurbishment of road components (e.g., bridges) is anticipated.

In determining the temporal boundaries for the cumulative effects assessment, in particular the long duration of the Operation and Maintenance Phase, consideration was given to the long-term effects on the well-being of present and future generations.

**Table 8-2:Spatial and Temporal Boundaries**

| Valued Component | Spatial Boundary | Temporal Boundary |
|---|---|---|
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Includes the three tertiary watersheds (4GD Upper Albany – Makokibatan, 4GE Lower Ogoki, and 4GF Upper Albany – Muswabik) that are intersected by the centreline of the Preferred Route. The Regional Study Area was extended to include areas where the Local Study Area falls outside of these tertiary watersheds. Tertiary watersheds are based on the federal “Drainage Area” reporting framework and represent third level subdivisions of Canada into suitably sized areas based on drainage for administrative purposes (Ministry of Natural Resources and Forestry, 2015b). | ■ Construction<br>■ Operation and Maintenance |

### 8.1.3 Physical Activities Inclusion List

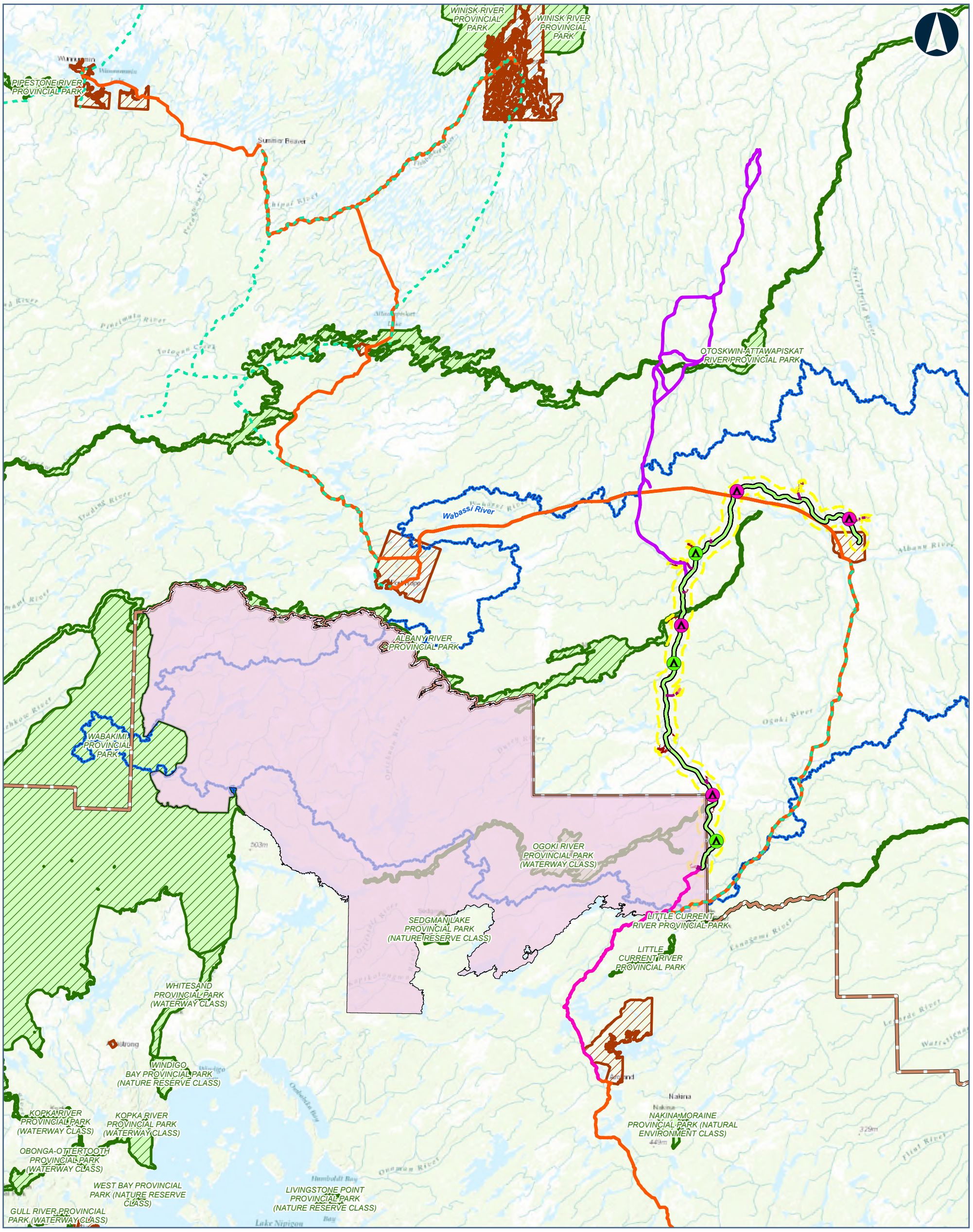
To determine the spatial boundaries of potential cumulative effects, five related projects within the fish and fish habitat effects assessment Regional Study Area were considered for the cumulative effects assessment (**Table 8-3; Figure 8-1**).

## Table 8-3: Project and Physical Activity Inclusion List for Fish and Fish Habitat

| Project | Identified in *Tailored Impact Statement Guidelines* (Yes / No) | Location | Status | Distance (km) and Direction from the Project | Developer / Company | Project Start Date | Project Duration | Project Completion Date | Assumed Temporal Overlap with Community Access Road Activities (Y / N) | Project Description | Fish and Fish Habitat Valued Components Temporal Overlap with Project (Yes / No) | Fish and Fish Habitat Valued Components Spatial Overlap with Project (Yes / No) | Included in Cumulative Effects Assessment (Yes / No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Northern Road Link** | Yes | Between the Community Access Road and Webequie Supply Road, northwestern Ontario | Impact Assessment ongoing | 0 (adjacent or overlapping) | Webequie First Nation<br>Marten Falls First Nation | October 28, 2020 | Unknown | Unknown | Yes – construction and operation will overlap with Community Access Road construction (expected for Northern Road Link to begin construction during construction of northern portion of Community Access Road | ■ Marten Falls First Nation and Webequie First Nation are proposing to build, operate and maintain a multi-use road and associated infrastructure between the Community Access Road that has been proposed by Marten Falls First Nation (the Project) and the supply road that has been proposed by Webequie First Nation.<br>■ Terms of Reference for the preparation of an Environmental Assessment were approved March 3, 2023. | Yes | Local Study Area – Yes<br><br>Regional Study Area – Yes | Yes |
| **Anaconda and Painter Lake Road Upgrades** | Yes | James Bay Lowlands | Unknown | 0 (adjacent or overlapping) | In discussions: Ministry of Transportation, Ontario and Aroland First Nation | Not Started | 2-5 years | Unknown | Yes –operation expected to overlap with Community Access Road construction and operation | ■ Upgrades to existing road will be required for heavy vehicles accessing the Community Access Road route during construction and operation and maintenance.<br>■ Currently discussions on proponency and scope of work are underway.<br>■ Potential scope of work is expected to include roadway widening, culvert and bridge replacements / rehabilitations to accommodate higher weight vehicles, and road base improvements.<br>■ This project will be completed prior to the start of the construction of the Community Access Road and therefore the upgrades to these roads is not expected to overlap with the construction of the Community Access Road. | Yes | Local Study Area – Yes<br><br>Regional Study Area – Yes | Yes |

| Project | Identified in *Tailored Impact Statement Guidelines* (Yes / No) | Location | Status | Distance (km) and Direction from the Project | Developer / Company | Project Start Date | Project Duration | Project Completion Date | Assumed Temporal Overlap with Community Access Road Activities (Y / N) | Project Description | Fish and Fish Habitat Valued Components Temporal Overlap with Project (Yes / No) | Fish and Fish Habitat Valued Components Spatial Overlap with Project (Yes / No) | Included in Cumulative Effects Assessment (Yes / No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rapid Lynx Broadband** | Yes | Matawa First Nation communities | Phase 1: Complete<br>Phase 2: Ongoing | Phase 1 – 0 (adjacent or overlapping)<br><br>Phase 2 – 57.69 | Rapid Lynx | February 2020 | Unknown | Unknown | Yes – operations of Phase 1 and operations and construction of Phase 2 expected to overlap with Community Access Road Construction and Operation and Maintenance Phases | ■ Approximately 810 km of fibre-optic cables, providing reliable high-speed internet service to five Matawa First Nation communities: Eabametoong, Marten Falls, Neskantage, Nibinamik and Webequie with an interconnection at Aroland. | Yes | Local Study Area – Yes<br><br>Regional Study Area – Yes | Yes |
| **Ogoki Forest Management Plans: Ogoki-Armstrong Primary Roads** | Yes | Ogoki Forest, Ontario | Operating | Forest Management Plans: Varies<br><br>Ogoki Primary Roads: 6.24 km | GreenForest Management Inc. and Geraldton Area Natural Resources Advisory Committee | 2020 | 10 years | 2030 | Yes – existing road operations overlap with Community Access Road construction and operations | ■ Forest Management Plans for the Ogoki Forest.<br>■ Includes Ogoki-Armstrong Primary Roads as these roads are being used for forest management. | Yes | Local Study Area – No<br><br>Regional Study Area – Yes | No – these roads are present under existing conditions |
| **Winter Road Realignment Project** | No | Various | Ongoing | 0 | Ministry of Northern Economic Development and Growth | 2025 | Unknown | Unknown | Yes – construction and operations will overlap with Community Access Road construction (expected to occur concurrently) | ■ Funding to remote northern communities for projects involving installation of water crossing infrastructure, such as pre-engineered bridges and culverts, and repairs to existing structures.<br>■ Funding for approximately 3,200 km of winter roads in Northern Ontario. | Yes | Yes | Yes |

Notes: km = kilometre; Y = yes; N = no.



**Legend**

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)
- 50 PERSONS
- 200 PERSONS

PREFERRED ROUTE

APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE

APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTION CAMP

BEDROCK

SAND AND GRAVEL

FAR NORTH BOUNDARY

WATERCOURSE

FIRST NATION COMMUNITY

PROVINCIAL PARK

AQUATICS LSA

AQUATICS RSA

PHYSICAL ACTIVITIY PROJECT INCLUSION
- ANACONDA AND PAINTER LAKE FORESTRY ACCESS ROAD UPGRADES
- NORTHERN ROAD LINK
- RAPID LYNX BROADBAND PROJECT
- OGOKI FOREST MANAGEMENT PLANS
- WINTER ROAD REALIGNMENT PROJECT

**Data Source:**
Base Data: Provided by MNRF 2019; Route Infrastructure - Provided by AECOM 2019. Contains Information licensed under the Open Government Licence Ontario.
Aerial photography provided by:
Service Layer Credits: World Topographic Map: Esri, © OpenStreetMap contributors, HERE, Garmin, FAO, USGS, NGA, EPA, NPS, AAFC, NRCan
World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, AAFC, NRCan

# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Physical Activities Inclusions in the Aquatics Regional Study Area

0 5 10 20 30 40
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Feb, 2026 | 1:1,100,000 * when printed 11"x17" |
| Rev:0 | |

**Figure 8-1**

Contains information provided by Ontario Ministry of the Environment, Conservation and Parks or by Ontario Ministry of Natural Resources and Forestry (Copyright: King's Printer of Ontario 2023), through a Sensitive Data License Agreement. This drawing has been prepared for use of AECOM client and may not be reproduced or relied upon by third parties, except as agreed by AECOM and its client, as required by law or for use by governmental reviewing agencies. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without AECOM express written consent. The use of Sensitive Data in this drawing does not constitute an endorsement by the Ministry for this drawing or by AECOM of the Sensitive Data.

Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0035_Aquatics_ProjectInclusions\21455151-0035-AQ-0000.aprx
Date Saved: 2/10/2026 2:36 PM User Name: INRR172702

### 8.1.4 Summary of Outcome

The predicted residual effects identified in **Table 8-1** are applicable to the six fish and fish habitat Valued Components (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot). Four of the five projects identified within **Table 8-3** have been considered for the cumulative effects assessment within the spatial and temporal boundaries of the six fish and fish habitat Valued Components (**Table 8-2; Section 8.2**). **Table 8-4** summarizes the outcome of the cumulative effects scoping.

**Table 8-4: Summary of Outcome**

| Past, Existing and Future Physical Activities / Projects | Valued Component Carried Forward | Results of Scoping |
|---|---|---|
| **Northern Road Link** | ■ Lake Sturgeon<br>■ Walleye<br>■ Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | Both the Marten Falls First Nation Community Access Road Project and Northern Road Link Project have the potential for residual effects on the habitat quantity and quality of fish and fish habitat Valued Components through physical alteration of waterbodies from work below the high-water mark and residual effects on the survival and reproduction of fish and fish habitat Valued Components from improved public access to recreational angling areas.<br><br>The residual effects from both projects have potential to overlap temporally during the Construction and Operation and Maintenance Phases. Spatially, residual effects from the Northern Road Link Project may overlap with the residual effects from the Marten Falls First Nation Community Access Road Project within the Local and Regional Study Areas. |
| **Anaconda and Painter Lake Road Upgrades** | ■ Lake Sturgeon<br>■ Walleye<br>■ Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | Both the Marten Falls First Nation Community Access Road Project and the Anaconda and Painter Lake Road Upgrades projects have the potential for residual effects on the habitat quantity and quality of fish and fish habitat Valued Components through physical alteration of waterbodies from work below the high-water mark and residual effects on the survival and reproduction of fish and fish habitat Valued Components from improved public access to recreational angling areas.<br><br>The residual effects from both projects may overlap temporally during the Construction and Operation and Maintenance Phases. Spatially, residual effects from the Anaconda and Painter Lake Road Upgrades projects may overlap with the residual effects from the Marten Falls First Nation Community Access Road Project within the Local and Regional Study Areas. |
| **Rapid Lynx Broadband** | ■ Lake Sturgeon<br>■ Walleye<br>■ Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | Both the Marten Falls First Nation Community Access Road Project and Rapid Lynx Broadband Project have the potential for residual effects on the habitat quantity and quality of fish and fish habitat Valued Components through physical alteration of waterbodies from work below the high-water mark and residual effects on the survival and reproduction of fish and fish habitat Valued Components from improved public access to recreational angling areas.<br><br>The residual effects from both projects may overlap temporally during the Construction and Operation and Maintenance Phases. Spatially, residual effects from the Rapid Lynx Broadband Project would overlap with the residual effects from the Marten Falls First Nation Community Access Road Project within the Local and Regional Study Areas. |
| **Ogoki Forest Management Plans: Ogoki-Armstrong Primary Roads** | ■ Not applicable | The Ogoki-Armstrong Primary Roads associated with the Ogoki Forest Management Plans are existing roads and are considered in the existing environment; their effects have been incorporated in the residual effects assessment of the Project. |
| **Winter Road Realignment Project** | ■ Lake Sturgeon<br>■ Walleye<br>■ Brook Trout<br>■ Northern Pike<br>■ Lake Whitefish<br>■ Burbot | Both the Marten Falls First Nation Community Access Road Project and Winter Road Realignment Project have the potential for residual effects on the habitat quantity and quality of fish and fish habitat Valued Components through physical alteration of waterbodies from work below the high-water mark and residual effects on the survival and reproduction of fish and fish habitat Valued Components from improved public access to recreational angling areas.<br><br>The residual effects from both projects may overlap temporally during the Construction and Operation and Maintenance Phases. Spatially, residual effects from the Winter Road Realignment Project would overlap with the residual effects from the Marten Falls First Nation Community Access Road Project within the Local and Regional Study Areas. |

# 8.2 Cumulative Effects Assessment

## 8.2.1 Changes to Fish Habitat Quantity and Quality through Physical Alteration of Waterbodies where Work is Below the High-Water Mark

### 8.2.1.1 Potential Cumulative Effects

As discussed in **Section 8.1**, the construction of the Northern Road Link, Anaconda and Painter Lake Road Upgrades, Rapid Lynx Broadband projects, and Winter Road Realignment along with the Project, have the potential for cumulative effects on fish habitat quantity and quality through physical alteration of waterbodies from the installation of waterbody crossings.

As described in **Section 7.3.1.1**, disturbances that may affect fish habitat directly from Construction of waterbody crossings include in-water construction activities and the installation and placement of structures (e.g., piers and culverts), fill, or other materials in the waterbody. Direct effects from physical alternations during construction can affect fish habitat through the following:

- Changes in the waterbody bed (from disturbance);
- Changes in food supply (i.e., effects on benthic invertebrate communities);
- Changes in flows from the installation of isolation structures during in-water construction;
- Changes in the composition and size of bed material; and / or
- Changes in the bank configuration or materials.

Direct habitat effects can include alteration or loss of specific habitat features, such as pools, aquatic vegetation, and bed materials that ultimately lead to loss or impairment of habitat functions, such as overwintering, spawning, and rearing habitat for fish or lower trophic levels. These direct habitat effects may result in changes in the food supply, which may be reflected in altered fish community structure and productivity.

The potential for cumulative effects on fish habitat quantity and quality from construction will depend on a number of factors including:

- The locations where waterbody crossings are to be installed within specific watersheds and potential for spatial overlap of effects within the geographic range of the Valued Component fish populations;

- The type of crossing structure used, including:
  - Whether in-water work is required for equipment crossings (e.g., culverts versus clear-span bridges) or installation of fibre-optic cable (e.g., trenching versus boring or drilling).
  - Whether equipment crossings are temporary or permanent.
- The habitat present at the crossing site and within the watershed; and
- The timing of construction.

Cumulative effects related to changes to habitat quantity and quality from the construction of waterbody crossings for the Northern Road Link, Anaconda and Painter Lake Road Upgrades, Rapid Lynx Broadband, and Winter Road Realignment projects may begin during the Construction Phase and continue through the Operation and Maintenance Phase of the Project, depending on the timing of the Northern Road Link and Anaconda and Painter Lake Road Upgrades projects.

#### 8.2.1.2 Mitigation and Enhancement Measures

It is anticipated that mitigation and enhancement measures will be, or have been, implemented to limit habitat loss and alteration during the construction of the Northern Road Link, Anaconda and Painter Lake Road Upgrades, Rapid Lynx Broadband, and Winter Road Realignment projects and that these mitigation and enhancement measures will be similar to those implemented for the Project **(Section 7.3.1.1.2)**. Mitigation and enhancement measures and best management practices for in-water work would be expected to be followed including the selection of appropriate waterbody crossing structures for permanent or temporary roads, use of isolations or boring or horizontal directional drilling for installation of fibre-optic cable at waterbody crossings, use of riparian buffers, erosion and sediment control planning, and bank restoration and revegetation following construction activities. Similar to the design for the Community Access Road, it is anticipated that any permanent waterbody crossings will be designed with consideration of climate change, and monitoring and maintenance activities will be adaptable to changing conditions.

These projects will also be required to meet permitting requirements from the Ministry of Natural Resources under the *Lakes and Rivers Improvement Act* and Fisheries and Oceans Canada under the *Fisheries Act* (see **Section 7.3.1.1.2**), including considerations related to restricted activity timing windows and requirements for fish passage where required. Proponents would be expected to follow requirements in the Ministry of Natural Resources permits and Fisheries and Oceans Canada's *Standards and Codes of Practice* (2025b,c) and the Letter of Advice or Authorization for their project. Environmental Monitors and Indigenous Environmental Monitors would also be expected to be on site during construction.

### 8.2.1.3 Characterization of Predicted Cumulative Effects

Changes in fish habitat quantity and quality through physical alteration of waterbodies where work is below the high-water mark will be minimized by effective implementation of the mitigation and enhancement measures; however, cumulative effects from physical alteration have the potential to occur because work may be conducted below the high-water mark for the Northern Road Link and Anaconda , Painter Lake Road Upgrades, and Winter Road Realignment projects or has been conducted for the Rapid Lynx Broadband project. However, cumulative changes to habitat quantity or quality for Valued Component fish species will only occur if the crossings are proposed to be located on the same waterbodies as the Project.

The proposed Northern Road Link would be a new all-season multi-use gravel road to be constructed between Marten Falls First Nation Community Access Road and Webequie Supply Road in northwestern Ontario (**Figure 8-1**). Although route alternatives have been identified, the crossing methods are not finalized. Similarly, the schedule for construction is not finalized. The only potential for spatial overlap with the Project is towards the north of the Project in the Upper Albany - Makokibatan watershed. Two crossings have been identified for the Northern Road Link (**Figure 8-1**) that are on the same waterbodies as the Project: one crossing on Gourlie Creek and one on the Wabassi River (3.8 and 46 km away from the Project, respectively). The Project currently proposes to cross Gourlie Creek and the Wabassi River using a multi-span bridge (**Section 7.1**); due to the size of these waterbodies, it is likely that the crossings for the Northern Road Link would also use bridges (clear span or multi-span). It is expected that both the Northern Road Link and the Project would follow mitigation and enhancement measures and best management practices as outlined in **Section 8.2.1.2**, including following all Fisheries and Oceans Canada and the Ministry of Natural Resources permit conditions. The bridge designs would be expected to consider climate change considerations. As a result, the effects from each project from physical alterations from construction activities would be expected to be localized to the crossing location.

The Anaconda and Painter Lake Road Upgrades will be completed to allow construction of the Project. The potential scope of work is expected to include roadway widening, culvert and bridge replacements / rehabilitations to accommodate higher weight vehicles, and road base improvements. These upgrades would be completed in advance of the Project construction. The road upgrades are in the planning and design study phase. The potential for spatial overlap is south of the Project in the Lower-Ogoki watershed. However, there are no waterbodies that are crossed by both projects. As a result, no cumulative effects related to physical alterations would be expected from the Anaconda and Painter Lake Road Upgrades and the Project.

The Rapid Lynx Broadband project involves laying heavily armored fibre-optic cable approximately 1 m underground and under waterbodies, with some aerial sections. Construction with brush and clear cutting began in February 2020, and installing the fibre-optic cable started in June 2020. The route generally follows the winter road. Sections of Phase 1 construction have already been completed, including the section near the Project. There are five waterbodies identified on the route alignment for the Rapid Lynx Broadband project (**Figure 8-1**) that are on the same waterbodies as the Project: Buffaloskin River (1.5 km away from the Project), two on unnamed waterbodies (2.1 and 13.2 km from the Project), one on the Wabassi River (84 km from the Project), and one on the Albany River (80 km from the Project). It is expected that the Rapid Lynx Broadband project used aerial or horizontal directional drilling methods to cross these waterbodies. However, even if an isolation and open-cut method were conducted to lay the cable, the effects would be short term and localized to the crossing location.

The Winter Road Realignment Project involves the installation of water crossing infrastructure, such as pre-engineered bridges and culverts, and repairs to existing structures. Construction and operations will overlap with Community Access Road construction (expected to occur concurrently). The route aligns with the existing winter road. However, there are no waterbodies that are crossed by both projects. As a result, no cumulative effects related to physical alterations would be expected from Winter Road Realignment Project and the Project.

As a result, the effects from each project on fish habitat quantity and quality from physical alterations would be expected to be localized to the crossing location and have limited potential for cumulative effects on the populations of Valued Component fish species. As a result, the incremental changes related to this interaction from these other projects are within the residual effects predicted for the Project (i.e., low magnitude and long term / irreversible for permanent crossings). Habitat of the Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot) is anticipated to remain stable and functional but there may be a minor decrease in productivity from physical alteration of the waterbodies. However, the Valued Component fish species populations are anticipated to remain self-sustaining and ecologically effective.

The cumulative effects characterization is provided in **Section 8.2.5**.

### 8.2.2 Changes to Fish Survival and Reproduction from Improved Public Access to Recreational Angling Areas

#### 8.2.2.1 Potential Cumulative Effects

If the Northern Road Link and the upgraded Anaconda and Painter Lake roads were to move ahead, they would involve extension of road access to the north and south of the Project. These developments would allow additional access to waterbodies along this road route during both Project Construction and Operation and Maintenance and associated potential effects on the survival and reproduction of harvested Valued Component species

(Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot) along these road routes. Although the Rapid Lynx Broadband project does not involve a permanent access road, there is potential for increased access from a cleared corridor (e.g., all terrain vehicle access). The Winter Road Realignment Project involves upgrades to the existing winter road, and as such, would not change the existing access to the area.

Improved public access to recreational angling areas from construction and operations of these roads can affect fish survival and reproduction by increasing harvest pressure from recreational anglers, small communities close to the Project, and from construction workers while on site and increased introduction or spread of invasive species and pathogens from the increased access and harvest pressure.

Although the area will remain remote, it is expected that there will be some increase in harvest pressure because of the projects and that most of the harvest pressure from access related to the projects will be on larger waterbodies with known productive fisheries. Smaller waterbodies may experience periodic fishing activity and may be vulnerable to overharvesting, but it is likely that locations with higher value fisheries will be targeted (Hunt and Lester, 2009).

#### 8.2.2.2 Mitigation and Enhancement Measures

It is anticipated mitigation and enhancement measures will be implemented to limit increased access and harvest pressure and associated potential for introduction or spread of invasive species or pathogens during the construction and operations of the Northern Road Link, upgraded Anaconda and Painter Lake roads, and Rapid Lynx Broadband projects and that these mitigation and enhancement measures will be similar to those implemented for the Project.

Mitigation and enhancement measures for construction effects may include:

- Using existing access or winter roads where possible for construction; and
- Following best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species.

Mitigation and enhancement measures during operation and maintenance may include:

- Following best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species.

Potential changes in angler pressure and fish harvest will continue to be managed by the Ministry of Natural Resources, the government agency mandated to manage fisheries resources (e.g., fisheries management zones, fishing seasons, catch limits, closures). Furthermore, fishing is managed as a public resource through provincial licensing requirements and by establishing rules in terms of season length, catch limits, slot-sizing, and catch-and-release rules for waterbodies near the Project.

Local communities will be responsible for managing their resources by limiting fish catch to a sustainable level for each species.

#### 8.2.2.3 Characterization of Predicted Cumulative Effects

Increase in harvest pressure on waterbodies during the projects is anticipated where access has been improved or created as a result of the projects, but most is expected to be on larger waterbodies with known productive fisheries. Smaller waterbodies may experience periodic fishing activity and may be vulnerable to overharvesting, but locations with higher value fisheries (e.g., Valued Component species) offer more appeal to recreational fishers (Hunt and Lester, 2009).

The proposed Northern Road Link would allow additional access to waterbodies along this road route and associated potential effects on Valued Component fish species from increased fish harvest. There is a crossing of the Wabassi River proposed for the Northern Road Link that is approximately 46 km upstream of the crossing of the Wabassi River proposed for the Project. Due to the distance separating these locations, these are likely different fish populations, and any effects on Valued Component fish populations related to fish harvest at these two locations would not be expected to overlap cumulatively. The crossing of Gourlie Creek for the Northern Road Link is approximately 3.8 km upstream of the crossing of this waterbody by the Project. Although this would provide another point of access to Gourlie Creek, it is unlikely to considerably increase harvest pressure as the locations remain remote and would be unlikely to draw additional fishers from southern locations. It would likely remain the same local fishers who would access both of these locations.

The Anaconda and Painter Lake roads already exist, and these upgrades are a requirement to the Project going ahead. Although the upgrades to these existing roads would not provide additional access to Regional Study Area waterbodies, the upgrades to the roads may improve the driveability and potentially increase the use of the roads by the general public. Although this project will provide access to the south end of the Community Access Road in the Lower-Ogoki watershed, there are no waterbodies on the Anaconda and Painter Lake roads that are also crossed by the Project. Therefore, this project would not be expected to interact cumulatively with the Project to increase fish harvest beyond what has already been predicted for the Project.

There are five waterbodies identified for the Rapid Lynx Broadband project (**Figure 8-1**) that are on the same waterbodies as the Project: Buffaloskin River (1.5 km away from the Project), two on unnamed waterbodies (2.1 and 13.2 km from the Project), one on the Wabassi River (84 km from the Project), and one on the Albany River (80 km from the Project).

Due to the distance separating the crossings on the Wabassi and Albany rivers, these likely involve different fish populations, and any effects on Valued Component fish populations related to fish harvest at these locations would not be expected to overlap cumulatively. For the Buffaloskin River and the two unnamed waterbodies, although clearing of the right-of-way may allow for all terrain vehicle access to these waterbodies, a substantial increase in harvest pressure would not be expected due to the remoteness of the sites. It is expected that any fishers in the area would preferentially use all-season access roads to access fishing locations. As the locations remain remote, it would likely remain the same local fishers who would access these locations.

The Winter Road Realignment Project involves upgrades to the existing winter road. The upgrades to these existing winter roads would not provide additional access to Regional Study Area waterbodies and would only be available for use during the winter. There are also no waterbodies on the Winter Road Realignment Project that are also crossed by the Project. Therefore, this project would not be expected to interact cumulatively with the Project to increase fish harvest beyond what has already been predicted for the Project.

The construction and operations of the Northern Road Link, upgraded Anaconda and Painter Lake roads, and Rapid Lynx Broadband projects may expand access to a broader range of individuals and groups. However, the region will remain relatively remote, with the nearest urban centre (Thunder Bay with a population of approximately 110,000) being over 430 km from Marten Falls First Nation. A large influx of recreational anglers is not expected, based on the studies described in **Section 7.3.1.10.1** (Hunt and Lester, 2009; deKerckhove et al., 2015; Post et al., 2002, 2008; Ministry of Natural Resources and Forestry, 2010b and references cited within; Hunt et al., 2022).

As described in **Section 8.2.2.2**, potential changes in angler pressure and fish harvest will continue to be managed by the Ministry of Natural Resources, and local communities will be responsible for managing their resources by limiting fish catch to a sustainable level for each species.

As a result, the incremental changes related to effects on fish survival and reproduction from changes to public access to recreational fishing areas, including from potential for spread of invasive species, from the Northern Road Link, upgraded Anaconda and Painter Lake roads, the Rapid Lynx Broadband, and Winter Road Realignment projects are within the residual effects predicted for the Project:

- **Construction**—negative in direction, medium in magnitude, regional in geographic extent, long term, frequent, irreversible, and possible; and
- **Operation and Maintenance**—negative in direction, medium in magnitude, regional in geographic extent, long term, frequent, irreversible, and possible.

Due to the remoteness of the area and small population of people in northern Ontario, minor changes to the harvest of fish in individual waterbodies are anticipated or for the potential spread of invasive species. It is expected that waterbodies that are likely to attract the greatest number of recreational fishers due to these projects have Valued Component species abundances that can support an increase in fishing pressure. There may be a decrease in productivity, but the populations of the Valued Component fish species (Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot) are anticipated to remain functional, self-sustaining, and ecologically effective.

The cumulative effects characterization is provided in **Section 8.2.5**.

### 8.2.3 Prediction Confidence and Uncertainty

Within a cumulative effects assessment, there is inherently a level of uncertainty due to the level of information available regarding other projects, including reasonably foreseeable developments. However, this uncertainty is managed by making conservative assumptions regarding these projects' design or activities. There is a good understanding of the effects on fish and fish habitat related to permanent roads, road upgrades, and fibre-optic cable installation projects. Similarly, the mitigation and enhancement measures and best management practices for these types of projects are standard, routinely, and effectively implemented across Canada, and are required as part of Fisheries and Oceans Canada and the Ministry of Natural Resources permit conditions.

There is also a good understanding of the fish and fish habitat conditions within the Regional Study Area and the resilience and adaptability of the Valued Component fish species.

Overall, confidence levels for the cumulative effects assessment were considered to be moderate, as the Project-related effects are mostly understood, there is a level of certainty associated with the effectiveness of proposed mitigations, and conservative assumptions were applied.

### 8.2.4 Determination of Significance

The cumulative effects of the Northern Road Link, Anaconda and Painter Lake Road Upgrades, Rapid Lynx Broadband, and Winter Road Realignment projects along with the Project to cumulative effects on fish and fish habitat is not expected to change the determination of significance (**Section 7.3.3**). Based on the cumulative effects assessment (**Section 8.2**), the characterization of cumulative effects was considered to be the same as the residual effects characterization for both interactions carried forward; the magnitude of the predicted cumulative effects remained low for changes to fish habitat quantity and quality through physical alteration from work below the high-water mark and medium for changes to fish survival and reproduction from improved public access to recreational angling areas.

Cumulative effects on the fish Valued Component were considered **not significant** as the residual effects were assessed low to medium in magnitude and they do not represent a substantial management concern. Similar to **Section 7.3.3**, there is the potential for management concerns through an increased public access leading to changes in angler pressure and fish harvest; however, the resources are expected to continue to be managed through the Ministry of Natural Resources and local communities for recreational and Indigenous harvest, respectively.

Overall, the Valued Component fish populations are expected to remain to be self-sustaining and ecologically effective, and therefore, the predicted cumulative effects on fish and fish habitat are assessed as **not significant.**

### 8.2.5 Summary

The characterization of predicted cumulative effects for fish and fish habitat Valued Components is provided in **Table 8-5**.

**Table 8-5: Characterization of Predicted Cumulative Effects for Fish and Fish Habitat Valued Components**

| Valued Component | Cumulative Effect | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Probability of Occurrence | Significance (Significant, Not Significant) | Uncertainty |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Changes to fish habitat quantity and quality through physical alteration of waterbodies where work is below the high-water mark | Negative | Low | Construction Disturbance Area | Short to medium term for temporary waterbody crossings<br><br>Long term for permanent waterbody crossings | Infrequent | Reversible for temporary waterbody crossings<br><br>Irreversible for permanent waterbody crossings | Certain (work below the high-water mark) | Not significant | Moderate |
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Changes to fish survival and reproduction from improved public access to recreational angling areas | Negative | Medium | Regional | Long term | Frequent | Irreversible | Possible | Not significant | Moderate |

# 9 Monitoring Programs and Future Commitments

A monitoring program verifies the accuracy of the effects assessment and evaluates the effectiveness of mitigation and enhancement measures. Monitoring programs also include future commitments related to mitigating residual effects. A Project-specific Environmental Monitoring Program will be developed and implemented that includes the monitoring commitments related to fish Valued Components presented in this section.

## 9.1 Pre-construction Monitoring Program

Prior to construction, the following monitoring programs will be required:

- Fish and fish habitat and surface water surveys using methods similar to those outlined in **Section 4.3** will be conducted before construction at any waterbody that has not been assessed and work is proposed below the high-water mark to meet permitting requirements (i.e., for the Fisheries and Oceans Canada Request for Review under the *Fisheries Act* and for permit applications to the Ministry of Natural Resources under the *Lakes and Rivers Improvement Act*); and
- If new waterbodies are identified prior to construction, an Aquatics Specialist will be contracted to assess the waterbody. Depending on the nature of the waterbody, recommendations for construction methods, appropriate mitigation and enhancement measures, and permitting requirements will be made by the Aquatics Specialist and, if necessary, local First Nation communities and appropriate regulatory agencies including Fisheries and Oceans Canada and the Ministry of Natural Resources, will be engaged. This will allow for the appropriate mitigation and enhancement measures to be implemented during construction at each waterbody crossing at a site-specific level, which will reduce or avoid potential effects on habitat quantity and quality.

## 9.2 Construction Monitoring Program

During construction, the following monitoring programs will be required:

- Environmental Monitors and Indigenous Environmental Monitors will be on site during construction to confirm that all waterbodies crossed by the Community Access Road right-of-way and access roads have been identified and documented in the waterbody crossing list. The Environmental Monitors will monitor the installation, use, and removal of waterbody crossing structures. The Environmental Monitors will confirm that the appropriate waterbody crossing structure is being used and that the required Fisheries and Oceans Canada and the Ministry of Natural Resources approvals and permits are in place;

- If new waterbodies are identified during construction, the waterbody will be clearly flagged and activity will be suspended within 30 m of the location until an Aquatic Specialist has assessed the waterbody and determined a suitable course of action, which may include contacting Fisheries and Oceans Canada and the Ministry of Natural Resources;
- Appropriate erosion and sedimentation control measures will be installed, monitored, and managed to minimize or avoid sediment mobilization from the disturbed area to drainages or waterbodies. Adequate and appropriate erosion and sedimentation control materials will be on site and available prior to commencement of construction;
- A *Licence to Collect Fish for Scientific Purposes* from the Ministry of Natural Resources will be obtained and Aquatics Specialists will rescue and relocate fish within the isolated workspace prior to construction in the isolated workspace; and
- Turbidity and total suspended solids will be monitored according to Fisheries and Oceans Canada, and the Ministry of Natural Resources permit requirements and will follow the Canadian Council of Ministers of the Environment's *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Canadian Council of Ministers of the Environment, 1999).

## 9.3 Operation and Maintenance Monitoring Program

During Operation and Maintenance, the following monitoring programs will be required:

- Culverts and bridges will be regularly inspected and maintained to prevent blockages from forming and causing ponding or backwater effects. Where culverts and bridges are installed at fish-bearing waterbodies, Fisheries and Oceans Canada's *Codes of Practice* will be followed for debris removal activities (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and fish stranding can be avoided) (Fisheries and Oceans Canada, 2025b). Inspection frequency will be adjusted where appropriate to take into account changing climate conditions over time; and
- A program will be conducted to verify that erosion and sediment control measures have been successful (e.g., bank restoration and revegetation), and that the stability of each waterbody crossing is maintained (i.e., the channel has not washed out). The post-construction monitoring will occur within one full growing season after the completion of construction, but timing may be extended if needed. The integrity of the permanent crossing structures will be inspected regularly (i.e., annually in spring). Any changes to the morphology of the waterbody channel affecting fish habitat quality or quantity will be identified and addressed, as needed.

## 9.4 Future Commitments

All mitigation and enhancement measures outlined in **Section 7** will be adhered to, including future commitments outlined in **Table 9-1**.

**Table 9-1: Summary of Future Commitments**

| Valued Component | Commitment | Phase or Period | Section Reference |
|---|---|---|---|
| **Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot** | Complete site-specific fish and fish habitat and surface water surveys to support engineering and Fisheries and Oceans Canada and the Ministry of Natural Resources permitting at waterbody crossings where work below the high-water mark is proposed. Submit designs of waterbody crossings as required for permit applications to Fisheries and Oceans Canada and the Ministry of Natural Resources. | Detailed Design | **Section 7.3.1.1.2** |

## 9.5 Future Permits and Approvals

To facilitate the construction of the Community Access Road, including construction activities and temporary infrastructure, permits and approvals from federal, provincial, government, and other jurisdictional agencies will need to be acquired.

The pits and quarries that are proposed through the Community Access Road Project will be subject to permitting requirements outlined within the *Aggregate Resources Act* and its regulations. For a permit to be issued, additional studies, mitigation plans, consultation and monitoring commitments may be required. In addition to permitting requirements under *the Aggregate Resources Act*, permitting and approvals under other pieces of legislation may also be required for pit and quarry development, including:

- Federal *Species at Risk Act.*
- Ontario *Planning Act*;
- Ontario *Water Resources Act*;
- Ontario *Environmental Protection Act*; and
- Ontario *Endangered Species Act*.

A preliminary list of permits and approvals anticipated to be applicable or potentially applicable to the Project for fish and fish habitat are detailed in **Table 9-2**. This list is based on a conceptual level of design, and the final determination of permits and approvals that will be required will occur as the design is advanced.

**Table 9-2: Summary of Potential Permits and Approvals List**

| Permit / Approval | Issuing Authority | Purpose / Scope | Considerations / Next Steps |
|---|---|---|---|
| **Request for Review** | Fisheries and Oceans Canada | Required for projects taking place in or near water where all *Measures to Protect Fish and Fish Habitat* (Fisheries and Oceans Canada, 2025a) cannot be met | Fisheries and Oceans Canada will determine whether to provide a Letter of Advice or if a *Fisheries Act* Authorization is required<br><br>Request for Review |
| ***Lakes and Rivers Improvement Act* Approval** | Ministry of Natural Resources | Required from the Ministry of Natural Resources under the *Lakes and Rivers Improvement Act* under Ontario Regulation 454/96 | Applicable for water crossings (e.g., bridges, culverts)<br><br>*Lakes and Rivers Improvement Act* Approval |

Should Lake Sturgeon be uplifted from *Species of Special Concern* to *Threatened* status, or any other species at risk be found in the Project area prior to the permitting phase of the Project, additional permitting may be required for these species at risk, including Fisheries and Oceans Canada (under the *Species at Risk Act*) and the Ministry of the Environment, Conservation and Parks (under the *Endangered Species Act*).

# 10 Summary and Recommendations

The potential effects summary and recommendations for fish and fish habitat Valued Components is provided in **Table 10-1**. Through the permitting stage of the Project, a Project-specific Environmental Protection Plan and Environmental Monitoring Plan will be developed and implemented that includes an implementation plan for the mitigation and monitoring commitments related to fish Valued Components that are presented in **Table 10-1**.

## Table 10-1: Potential Effects Summary and Recommendations

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| **FFH-01** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish habitat quantity and quality through physical alterations of waterbodies | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Follow best management practices and environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Fisheries and Oceans Canada (a Request for Review will be prepared for Fisheries and Oceans Canada. Fisheries and Oceans Canada will determine whether to provide a Letter of Advice or if a Fisheries Act Authorization is required) and the Ministry of Natural Resources (permits will be required from the Ministry of Natural Resources under the Lakes and Rivers Improvement Act).<br>■ Where feasible, areas of sensitive fish habitat and fishing areas that have been identified through the Indigenous Knowledge program in pre-construction design will be avoided.<br>■ Limit the Project footprint to the extent feasible.<br>■ During detailed design, complete site-specific fish and fish habitat and surface water surveys to support engineering and Fisheries and Oceans Canada and the Ministry of Natural Resources permitting at waterbody crossings where work below the high-water mark is proposed. Submit designs of waterbody crossings as required for permit applications to Fisheries and Oceans Canada and the Ministry of Natural Resources. Surveys may also be required at select sites where work above the high-water mark is proposed based on Fisheries and Oceans Canada and the Ministry of Natural Resources permitting requirements. | ■ Use existing access roads where possible.<br>■ Complete work as quickly as possible to shorten the duration of disturbance.<br>■ Decommission and rehabilitate temporary access roads, staging areas, camps, and debris and / or timber stockpiles following construction, where not needed for Operation and Maintenance activities.<br>■ Have Environmental Monitors and Indigenous Environmental Monitors on site during construction to confirm that all waterbodies crossed by the Preferred Route right-of-way and access roads have been identified and documented in the waterbody crossing list. The Environmental Monitors will monitor the installation, use, and removal of waterbody crossing structures. The Environmental Monitors will confirm that the appropriate waterbody crossing structure is being used and that the required Fisheries and Oceans Canada and the Ministry of Natural Resources approvals and permits are in place.<br>■ If new waterbodies are identified prior to construction, contact an Aquatics Specialist to assess the waterbody. Depending on the nature of the waterbody, recommendations for construction methods, appropriate mitigation and enhancement measures, and permitting requirements will be made by the Aquatics Specialist and, if necessary, local First Nation communities and appropriate regulatory agencies including the Ministry of Natural Resources and Fisheries and Oceans Canada will be engaged. This will allow for the appropriate mitigation and enhancement measures to be implemented during construction at each waterbody crossing at a site-specific level, which will reduce or avoid potential effects on habitat quantity and quality. If new waterbodies are identified during construction, clearly flag the waterbody and suspend activity within 30 m of the location until an Aquatic Specialist has assessed the waterbody and determined a suitable course of action, which may include contacting Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Construct waterbody crossings in a manner that maintains downstream flows and fish passage and follows conditions of permits or authorizations issued for the Project by Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Use existing waterbody crossing structures where possible. Minimize the number of waterbody crossings required for the Project.<br>■ Construct, operate, remove, decommission, and rehabilitate all waterbody crossing structures, if appropriate, following best management practices and environmental approval |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | conditions, including the Ontario Provincial Standard Specification General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks (2021b), Ministry of Natural Resources and Forestry's Environmental Guidelines for Access Roads and Water Crossings (1990) and Fisheries and Oceans Canada's Measures to Protect Fish and Fish Habitat (2025a) and Standards and Codes of Practice (2025b,c).<br>■ Avoid construction during a fish and fish habitat restricted activity timing window, where feasible. Work may not be conducted during the proposed restricted activity timing window unless approval is obtained from the Ministry of Natural Resources and Fisheries and Oceans Canada. Proposed restricted activity timing windows were assigned to avoid work during sensitive life history periods or life stages for all fish that may be present in each waterbody, including movements to spawning areas, spawning and egg incubation, or eggs and newly hatched fry. The restricted activity timing windows for each waterbody crossing will be finalized by the Ministry of Natural Resources during permitting.<br>■ For permanent and temporary waterbody crossing structures, the proposed restricted activity timing window will be applicable if:<br>■ Any work is completed below the high-water mark (e.g., installation or removal of fill or culverts, bridge supports below the high-water mark, one-time ford).<br>■ The waterbody is frozen and an ice bridge / snow fill is constructed.<br>■ Beaver dam removals are required.<br>■ For permanent and temporary waterbody crossing structures, the proposed restricted activity timing window will not be applicable:<br>■ If all work is completed above the high-water mark (e.g., installation or removal of a clear span bridge with no fill or supports below the high-water mark).<br>■ If work is completed below the high-water mark and approval is obtained from Ministry of Natural Resources and Fisheries and Oceans Canada prior to construction.<br>■ When using the existing and installed waterbody crossing structures, where no modifications are required.<br>■ Avoid constructing in sensitive habitats (e.g., spawning areas, groundwater upwellings) where feasible.<br>■ Construct or install waterbody crossing structures in a manner that protects the banks from erosion, maintains downstream flows in the waterbody, and follows permits or authorizations issued for the Project from Fisheries and Oceans Canada and the Ministry of Natural Resources. |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | ■ Fording of a waterbody is not permitted, unless approved by the Ministry of Natural Resources and Fisheries and Oceans Canada. As per Fisheries and Ocean Canada's Code of Practice (2025b), limit fording to a one-time event (over and back) and use only if an existing crossing at another location is not available or practical to use. If repeated crossings of the waterbody are required, a crossing structure will be installed. Permits are expected to be required from Ministry of Natural Resources for any use of a ford.<br>■ Complete instream construction in isolation of flowing water (i.e., use isolation methods for the installation and removal of culverts where surface water exists at the time of construction).<br>■ For isolations / diversions, maintain 100% downstream flow.<br>■ Use erosion resistant fill material below the high-water level within the floodplain of a waterbody.<br>■ Upon removal of the temporary crossing materials, return the waterbody banks to their original profile if needed and stabilize disturbed areas, as necessary, to prevent soil erosion.<br>■ Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles a minimum of 30 m away from the ordinary high-water mark of a waterbody, where possible.<br>■ Maintain buffer zones of 30 m around waterbodies and limit clearing of riparian vegetation to the extent practical and to the requirement of the access road and alignment clearing width only.<br>■ Install, monitor, and manage appropriate erosion and sedimentation control measures to minimize or avoid sediment mobilization from the disturbed area to drainages or waterbodies and in accordance with Ontario Provincial Standard Specifications Construction Specification for Temporary Erosion Control (2021a) and Construction Specification for Temporary Sediment Control (2020). Adequate and appropriate erosion and sedimentation control materials shall be on site and available prior to commencement of construction. |
| | | | Operation and Maintenance | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | N/A | ■ Regularly inspect and maintain culverts and bridges to prevent blockages from forming and causing ponding or backwater effects. Where culverts and bridges are installed at fish-bearing waterbodies, follow Fisheries and Oceans Canada's *Codes of Practice* for debris removal activities (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and fish stranding can be avoided) (Fisheries and Oceans Canada, 2025b). |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | ■ Operate waterbody crossing structures in consideration of best management practices and environmental approval conditions, including the Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a). |
| **FFH-02** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish habitat quantity and quality through changes to riparian vegetation | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | N/A | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Clear and revegetate the riparian zone following Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a), Ontario Provincial Standard Specification *General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks* (2021b), and the Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990), and *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (2010a) and its associated *Background Rationale* document (2010b).<br>■ Maintain a 30 m riparian buffer around waterbodies, where feasible.<br>■ Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion.<br>■ Consider the restricted activity timing windows for waterbodies for the timing of clearing riparian. |
| | | | Operation and Maintenance | | N/A | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Maintain a 30 m riparian buffer around waterbodies, where feasible.<br>■ Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion. |
| **FFH-03** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Injury or mortality of fish from instream construction | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | N/A | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Instream Construction: |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | ○ For isolations / diversions, appropriately screen water intakes or pumps to prevent entrainment or impingement of fish (Fisheries and Oceans Canada, 2025a); follow measures for design and installation of intake end of pipe fish screens to protect fish (Fisheries and Oceans Canada, 2025a).<br>■ Obtain a *Licence to Collect Fish for Scientific Purposes* from the Ministry of Natural Resources and have Aquatics Specialists rescue and relocate fish within the isolated workspace prior to construction in the isolated workspace. |
| **FFH-04** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes in habitat quality from release of sediment at waterbody crossings | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Develop and follow a Sediment and Erosion Control Plan in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020). | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies* and *Changes to fish habitat quantity and quality through changes to riparian vegetation.*<br>■ Implement the relevant mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a).<br>■ Recontour disturbed areas to restore drainage patterns and the approximate preconstruction profile.<br>■ Postpone instream construction if excessive flows or flood conditions are present or anticipated. Resume activities when water levels have subsided or equipment / techniques suitable for conditions are deployed.<br>■ To the extent practical, and while complying with all appropriate mitigation and enhancement measures, complete work below the high-water mark as quickly as possible to shorten the duration of disturbance.<br>■ Construct or install waterbody crossings in a manner that protects the banks from erosion, maintains downstream flows in the waterbody, and follows permits or authorizations issued for the Project from Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Avoid bank grading to accommodate temporary bridges where possible. Restrictions on grading may be required as part of waterbody crossing permits from Fisheries and Oceans Canada and the Ministry of Natural Resources.<br>■ Install, monitor, and manage appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during construction and in accordance with Ontario Provincial Standard Specifications *Construction Specification for Temporary Erosion Control* (2021a) and *Construction Specification for Temporary Sediment Control* (2020).<br>■ Temporary erosion control measures must be:<br>○ Properly installed.<br>○ Installed before or immediately after initial disturbance. |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | ○ Inspected and properly maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established or reclamation is complete. |
| | | | Operation and Maintenance | | Develop and follow a Sediment and Erosion Control Plan. | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Install, monitor, and manage appropriate erosion and sedimentation control measures to prevent sediment from reaching the waterbody prior to and during maintenance activities. |
| **FFH-05** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish habitat quantity and quality from the placement of waterbody crossing structures and changes in channel morphology | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | N/A | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies* and *Changes in habitat quality from release of sediment land disturbance during road construction at waterbody crossings.* |
| | | | Operation and Maintenance | | | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* |
| **FFH-06** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish survival, reproduction, and distribution from the placement of waterbody crossing structures, affecting fish access to habitats | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Waterbody Crossing:<br>○ Where a channel allows for fish passage, design and install culverts in fish-bearing waterbodies to allow for fish passage to Ministry of Natural Resources and Forestry's *Environmental Guidelines for Access Roads and Water Crossings* (1990) and Fisheries and Oceans Canada's *Standards and Code of Practices* (2025b, c) and fish passage guidelines (Katopodis and Gervais, 2016; Di Rocco and Gervais, 2024). | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies* and *Changes in habitat quality from release of sediment land disturbance during road construction at waterbody crossings.* |
| | | | Operation and Maintenance | | N/A | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* |
| **FFH-07** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish habitat quantity and quality due to changes in hydrology or groundwater that may alter drainage patterns and increase or decrease drainage flows and surface water levels | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Develop and maintain surface water management and erosion control infrastructure to minimize potential for changes to infiltration rates. | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Implement the mitigation and enhancement measures as described in the surface water quality assessment (WSP, 2026a). |
| | | | Operation and Maintenance | | N/A | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| **FFH-08** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Blasting-related injuries or mortality to fish | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Prepare and implement a Blasting and Communication Management Plan that is in accordance with Ontario Provincial Standard Specification *General Specifications for the Use of Explosives* (2014) and describes specific measures that would be implemented if blasting is required. | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Use explosives only if alternate methods of excavation to remove materials for foundation systems and roads are not feasible.<br>■ Complete blasting near fish-bearing waterbodies outside the proposed restricted activity timing window for all blasting operations.<br>■ For blasting operations, follow the overpressure and vibration guidelines outlined in in the Fisheries and Oceans Canada's *Measures to Protect Fish and Fish Habitat* (2025a), Ontario Provincial Standard Specification *General Specifications for the Use of Explosives* (2014), and *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky, 1998):<br>○ **Overpressure guideline**—Explosives are not to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous water pressure change (i.e., overpressure) greater than 100 kPa where fish are present. The overpressure guideline applies year-round in any fish-bearing waterbody near the blast.<br>○ **Vibration guideline**—Explosives are not to be detonated that produce, or are likely to produce, a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation. The vibration guideline applies during the restricted activity timing window in the waterbody near the blast. |
| | | | Operation and Maintenance | | ■ Follow the Construction mitigation and enhancement measures outlined in *Blasting-related injuries or mortality to fish.* | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Follow the Construction mitigation and enhancement measures outlined in *Blasting-related injuries or mortality to fish.* |
| **FFH-09** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish habitat quality from the deposition of air contaminants and fugitive dust emissions | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Prepare and implement a Dust / Air Quality Management Plan prior to construction. | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Implement the air quality mitigation measures as described in surface water quality assessment (WSP, 2026a).<br>■ Burn of slash piles subject to agreements with Indigenous communities, landowners, and to permits and approvals by appropriate regulatory agencies. |
| | | | Operation and Maintenance | | ■ Prepare and implement a Dust / Air Quality Management Plan. | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | ■ Implement dust control practices (e.g., wetting with water and implementation of speed limits), as required. |
| **FFH-10** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish survival and reproduction from improved public access to recreational angling areas | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | N/A | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Decommission and reclaim temporary pits and quarries and the temporary infrastructure for construction including access roads, staging areas, camps, and debris and / or timber stockpiles at the end of construction. Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act.*<br>■ Implement best management practices and regulations outlined by the Ministry of Natural Resources to reduce the spread of invasive species. |
| | | | Operation and Maintenance | | N/A | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.* |
| **FFH-11** | Lake Sturgeon, Walleye, Brook Trout, Northern Pike, Lake Whitefish, and Burbot | Changes to fish survival and reproduction from spills of fuel or other materials | Construction | ■ Fisheries and Oceans Canada<br>■ Ministry of Natural Resources | ■ Prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred. | ■ Follow the Construction mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Have equipment for containing spills on site. Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in onsite work areas, and / or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents.<br>■ Refuel, service, and maintain vehicles and equipment in designated areas at temporary construction camps and temporary laydown areas a minimum of 120 m from waterbodies.<br>■ Wash, refuel, and service machinery to prevent any deleterious substances from entering a waterbody (Fisheries and Oceans Canada, 2025a).<br>■ Store fuel and other materials for the machinery to prevent any deleterious substances from entering a waterbody (Fisheries and Oceans Canada, 2025a).<br>■ Register aboveground storage tanks under, and in compliance with, applicable federal and provincial legislation.<br>■ Meet the *Canada's Transportation of Dangerous Goods Act, 1992* (Government of Canada, 1992) and Ontario *Technical Standards and Safety Act, 2000* (Government of Ontario, 2000) for the transportation, storage, and handling of fuels. |

| ID | Valued Component | Environmental Concern and Potential Effect | Project Phase | Concerned Agencies | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Detailed Design | Mitigation, Protection, Monitoring, and Study Commitments to be Carried Forward to Construction / Operation and Maintenance |
|---|---|---|---|---|---|---|
| | | | | | | ■ Have machinery and equipment arrive on site in a clean condition and inspect and maintain routinely to avoid fluid leaks.<br>■ Train individuals working on site and handling hazardous materials about best practices for the transportation of dangerous goods to avoid negatively affecting fish and fish habitat by introducing hazardous materials into the environment. |
| | | | Operation and Maintenance | | N/A | ■ Follow the Operation and Maintenance mitigation and enhancement measures outlined in *Changes to fish habitat quantity and quality through physical alterations of waterbodies.*<br>■ Meet the Ontario *Technical Standards and Safety Act, 2000* (Government of Ontario, 2000) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada, 1992) for the transport, storage, and handling of fuels required for maintenance.<br>■ Have machinery and equipment arrive on site in a clean condition and inspect and maintain routinely to avoid fluid leaks during maintenance.<br>■ Herbicide use is not planned. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth undisturbed to prevent erosion. |

Notes: kPa = kilopascal; m = metre; % = percent; N/A = not applicable; mm/s = millimetre per second.

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# Attachment A - Draft Study Plan, Workplan, and Regulator Comments

MARTEN FALLS FIRST NATION
**ALL SEASON COMMUNITY ACCESS ROAD**

FINAL

# Fish and Fish Habitat Study Plan

***May 2021***

## Distribution List

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## Revision History

| Rev # | Date | Revision Description |
|---|---|---|
| Draft | May 2020 | Submitted Study Plan – Fish and Fish Habitat to the Agency. |
| Final | May 2021 | Revised to address federal and provincial agency comments. |

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## Appendices

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# Acronyms

Agency, the ... Impact Assessment Agency of Canada
CAR ..... Community Access Road
CEMP ..... Construction Environmental Management Plan
EA ..... Environmental Assessment
IA ..... Impact Assessment
IAA ..... *Impact Assessment Act*
IS ..... Impact Statement
km ..... kilometre
LiDAR……..Light Detection and Ranging
LSA ..... Local Study Area
MECP ..... Ontario Ministry of the Environment, Conservation and Parks
MFFN ..... Marten Falls First Nation
MNRF ..... Ministry of Natural Resources and Forestry
PDA ..... Project Development Area
RSA ..... Regional Study Area
SAR ..... Species at Risk
TISG ..... Tailored Impact Statement Guidelines
ToR ..... Terms of Reference
VC ..... Valued Component

# 1. Introduction

The Proponent of the Community Access Road (CAR or the Project) is Marten Falls First Nation (MFFN), a remote First Nation community in northern Ontario located at the junction of the Albany and Ogoki rivers, approximately 430 kilometres (km) from Thunder Bay, Ontario. The MFFN community is proposing an all-season Community Access Road that will connect the MFFN community to the Ontario's provincial highway network (Highway 643) to the south via the existing Painter Lake Road. MFFN, as the Proponent of the Project, has formed a MFFN CAR Project Team that includes MFFN CAR Community Member Advisors and MFFN CAR Project Consultants who act with input, guidance and direction from the MFFN Chief and Council.

This document outlines the study plan for the Fish and Fish Habitat discipline to support a coordinated Impact Assessment (IA) required for Project review by the Impact Assessment Agency of Canada (the Agency) under the federal *Impact Assessment Act* (IAA) and Environmental Assessment (EA) required for Project review by the Ontario Ministry of the Environment, Conservation and Parks (MECP) under the Ontario *Environmental Assessment Act*.

## 1.1 Federal and Provincial Terminology

The study plans have been prepared using federal terminology, however, the respective provincial terminology has been provided in **Table 1-1** for reference. The terms can be used interchangeably.

**Table 1-1: Equivalent Federal and Provincial Terms**

| Provincial Term | Federal Term |
|---|---|
| Criteria | Valued Component |
| Impact Management Measure | Mitigation Measure |
| Net Effects | Residual Effects |
| Record of Consultation | Record of Engagement |

## 1.2 Project Study Plans

This Study Plan is one of a group of study plans created for the Project. **Table 1-2** includes the study plans for each environmental[1] discipline currently planned for the Project and the valued components (VCs) covered by the study plans where applicable.

**Table 1-2: Project Study Plans and Valued Components**

| Environmental Discipline | Study Plan Name | Valued Component(s) |
|---|---|---|
| **Aboriginal and Treaty Rights and Interests** | ■ Aboriginal and Treaty Rights and Interests Study Plan | ■ Indigenous Current Use of Lands and Resources for Traditional Purposes<br>■ Cultural Continuity (ability to practice and transmit cultural traditions) |
| **Atmospheric Environment** | ■ Atmospheric Environment and Greenhouse Gases Study Plan | ■ Air Quality<br>■ Greenhouse Gas Emissions |
| **Climate Change** | ■ Climate Adaptation and Resiliency Study Plan | ■ Climate Change |
| **Acoustic and Vibration Environment** | ■ Acoustic and Vibration Environment Study Plan | ■ Noise<br>■ Vibration |
| **Physiography, Geology, Terrain and Soils** | ■ Physiography, Terrain and Soils Study Plan | ■ Physiography, Terrain and Soils |
| **Surface Water** | ■ Surface Water Study Plan | ■ Surface Water |
| **Groundwater and Geochemistry** | ■ Groundwater and Geochemistry Study Plan | ■ Groundwater |
| **Vegetation** | ■ Vegetation Study Plan | ■ Wetland and Riparian Ecosystems<br>■ Upland Ecosystems<br>■ Designated Areas (Areas of Natural and Scientific Interest, Environmentally Significant Areas, Significant Woodlands, Critical Landform / Vegetation Associations)<br>■ Traditional Use Plants and SAR Plant Populations (including species with special conservation status or rarity in the province) |
| | ■ Peatlands Study Plan | ■ Peatland Ecosystems (bogs and fens) |
| **Wildlife** | ■ Wildlife Study Plan | ■ Bats (including SAR-bats such as: Little Brown Myotis [*Myotis lucifugus*], Northern Myotis [*Myotis septentrionalis*] and Tricolored Bat [*Perimyotis subflavus*]) |

1. *The use of the term environment in this document is inclusive of the components of the environment that are included in the Ontario Environmental Assessment Act definition, which includes a general description of the social, cultural, built and natural environments.*

| Environmental Discipline | Study Plan Name | Valued Component(s) |
|---|---|---|
| | | ■ Fur Bearers (proxy VC[2] American Marten [*Martes americana*], Beaver [*Castor canadensis*] and Wolverine [*Gulo gulo*])<br>■ Amphibians and Reptiles<br>■ Pollinating Insects |
| | ■ Ungulates (Moose and Caribou) Study Plan | ■ Moose (*Alces alces*)<br>■ Caribou, boreal population (*Rangifer tarandus*) |
| | ■ Bird Study Plan | ■ Forest Birds (proxy VC of Red-eyed Vireo [*Vireo olivaceus*] for deciduous forest, Ovenbird [*Seirus aurocapilla*] for mixedwood forest, Dark-eyed Junco [*Junco hyemalis*] for coniferous forest and disturbed forest<br>■ Raptors (proxy VC of Osprey [*Pandion haliaetus*] for diurnal raptors and Boreal Owl [*Aegolius funereus*] for nocturnal raptors<br>■ Shorebirds (proxy VC of Wilson's Snipe [*Gallingo delicata*])<br>■ Waterfowl (proxy VC of Mallard [*Anas platyrhynchos*])<br>■ Bog / Fen Birds and Other Wetland Birds (proxy VC of Palm Warbler [*Setophaga palmarum*] for bogs, Common Yellowthroat [*Geothlypis trichas*] for fens; and Northern Waterthrush [*Parkesia noveboracensis*] for swamps .<br>■ SAR birds: Canada Warbler (*Cardellina canadensis*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Eastern Whip-poor-will (*Antrostomus vociferous*), Eastern Wood-Pewee (*Contopus virens*), Evening Grosbeak (*Coccothraustes vespertinus*), Olive-sided Flycatcher (*Contopus cooperi*), Bald Eagle (*Haliaeetus leucocephalus)*, Peregrine Falcon (*Falco peregrinus*), Short-eared Owl (*Asio flammeus)*, Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Black Tern (*Childonias niger*), Rusty Blackbird (*Euphagus carolinus*), Yellow Rail (*Coturnicops noveboracensis*) |
| **Fish and Fish Habitat** | ■ Fish and Fish Habitat Study Plan | ■ Lake Sturgeon (*Acipenser fulvescens*)<br>■ Walleye (*Sander vitreus*)<br>■ Brook Trout (*Salvelinus fontinalis*)<br>■ Northern Pike (*Esox lucius*)<br>■ Lake Whitefish (*Coregonus clupeaformis*) |

[2] *A proxy VC is used when looking at the effects of one species that represents many others.*

| Environmental Discipline | Study Plan Name | Valued Component(s) |
|---|---|---|
| | | ■ Chain Pickerel (*Esox niger*)<br>■ Yellow Perch (*Perca flavescens*)<br>■ Cisco (*Coregonus artedii*)<br>■ Burbot (*Lota lota*)<br>■ Longnose Sucker (*Catostomus catostomus*)<br>■ White Sucker (*Catostomus commersonii*)<br>■ Forage / Prey Species (including species such as Lake Chub [*Couesius plumbeus*])<br>■ Lower Trophic Organisms (e.g., benthic invertebrates) |
| **Social** | ■ Social Study Plan | ■ Housing and Accommodation<br>■ Community Service and Infrastructure<br>■ Transportation<br>■ Community Well-being<br>■ Populations and Demographics |
| **Economy** | ■ Economic Study Plan | ■ Regional Economy<br>■ Labour Force and Employment<br>■ Government Finances |
| **Land and Resource Use** | ■ Land and Resource Use Study Plan | ■ Land Use Compatibility<br>■ Parks and Protected Areas<br>■ Extractive Industry<br>■ Forestry Industry<br>■ Energy and Linear Infrastructure<br>■ Recreation and Tourism |
| **Human Health and Community Safety** | ■ Human Health and Community Safety Study Plan | ■ Public Safety<br>■ Public Health<br>■ Diet<br>■ Environmental Factors Influencing Health |
| **Visual Aesthetics** | ■ Visual Aesthetics Study Plan | ■ Visual Contrast / Character<br>■ Visibility<br>■ Visual Sensitivity |
| **Archaeological and Cultural Heritage** | ■ Cultural Heritage Study Plan | ■ Archaeological Sites and Resources<br>■ Built Heritage Resources and Cultural Heritage Landscapes |

It should be noted that while there is not a consultation study plan, the Project has developed the *Consultation and Engagement Plan to Support the Environmental Assessment / Impact Statement* (AECOM 2020) (referred to as the Impact Statement [IS] / EA Consultation Plan).

# 2. Purpose and Objectives

The key objectives of conducting an IA / EA are to describe the existing environment, gather sufficient information to predict Project-related effects (positive and negative, direct and indirect) of the Project and alternatives on the environment, determine measures needed to avoid or minimize adverse Project effects, and enhance beneficial Project effects where feasible, and to undertake consultation and engagement throughout. The purpose of this Study Plan is to explain:

- A baseline[3] study methodology that will result in a comprehensive description of the existing environment potentially impacted by the Project;
- How efficient and transparent data management and analysis will be undertaken;
- Effects assessment scoping inputs specific to fish and fish habitat that will allow for potential effects of the Project on the existing environment to be appropriately assessed in the IS / EA Report; and
- How the study plan aligns with federal and provincial requirements and guidance, including the Agency's Tailored Impact Statement Guidelines (TISG), dated February 24, 2020 (the Agency 2020c), for this Project and applicable provincial agency comments on the Draft Terms of Reference (ToR)[4].

As required by the IAA and referenced in TISG Section 7.3, work plans will also be developed for disciplines as required. It is anticipated the work plans will include further details on how to action the study plans; for example, they would contain information such as location of sampling sites, scheduling, and sequencing.

For the purposes of establishing appropriate context, the study plan begins with background and relevant information on:

- Study-plan related discussions with the Agency, MECP and applicable agencies to date (**Section 3**);
- The approach to Project consultation and engagement (**Section 4**);
- How Indigenous Knowledge will be collected and used in the IA / EA (**Section 5**); and
- The spatial and temporal boundaries that will be used for the IA / EA (**Section 6**).

3. *Baseline refers to the current conditions of the environment potentially impacted by the Project. Baseline conditions serve as a reference against which changes due the Project are measured.*
4. *If necessary, the Study Plan will be updated to reflect the approved ToR if approval is obtained.*

# 2.1 Approach to Handling Confidential Information

## 2.1.1 Indigenous Knowledge

Permission from the Indigenous community will be sought before including Indigenous Knowledge in the IS / EA Report, regardless of the source of the Indigenous Knowledge. Sensitive and / or confidential information will be specifically collected through the Indigenous Knowledge Program to inform the IS / EA Report, and its use and publication will be governed by Indigenous community-specific Indigenous Knowledge Sharing Agreements. Sensitive and / or confidential information collected through Indigenous Knowledge Sharing Agreements will be protected from public or third-party disclosure and will be established between the Proponent and Indigenous communities participating in the Indigenous Knowledge Program prior to the sharing and use of any sensitive information. Instances where Indigenous Knowledge sharing has taken place during consultation activities (e.g., meetings) will be recorded in the Record of Consultation Engagement, including where Indigenous Knowledge was incorporated into Project decisions and into the IS / EA Report (i.e., specifics will not be included in the Record of Consultation and Engagement given the potential sensitivity and / or confidentiality of the information shared).

## 2.1.2 Species at Risk

Sensitive information related to Species at Risk[5], such as those provided by the Ontario Ministry of the Environment, Conservation and Parks or by the Ministry of Natural Resources and Forestry, will be presented in materials in accordance with the applicable Sensitive Data Licence Agreements applicable to the Project.

5. *Species at Risk (SAR) include species listed as threatened, endangered or special concern under the Ontario (provincial) Endangered Species Act, 2007 or the Canadian (federal) Species at Risk Act, 2002.*

# 3. Study Plan Technical Discussions

To facilitate the development of satisfactory study plans and eventually a satisfactory IS / EA Report, MFFN previously submitted draft study plans in an effort to hold technical discussions with the Agency, the MECP and applicable agencies. A summary of technical discussions and correspondence held to date on this Study Plan has been provided below in **Table 3-1**.

**Table 3-1: Summary of Study Plan Technical Discussions**

| Attendees/ Responsible Party | Correspondence, Date(s) | Discussion Point | Solution |
|---|---|---|---|
| ■ **MECP** | ■ Comments received following MECP review of draft Study Plan, received 5-August-2020 | ■ Planning of proposed field studies should consider appropriate conditions, timing windows and technical procedures; specifically, appropriate water temperatures for benthic invertebrate collection. | ■ Technical procedures and standard practices for carrying out the proposed studies will be considered for the planning stages that will be detailed in a work plan. Responses to these comments are in **Appendix B**. |
| ■ **The Agency** | ■ Comments received following submission and review of draft Study Plan, received 20-July-2020 | ■ Comments and clarification questions received, including editorial comments, additional information requirements regarding study plan, assessment and desktop analysis. | ■ Additional details and clarification provided within this Study Plan, and responses to these comments are in **Appendix B**. |
| ■ **The Agency**<br>■ **MNRF**<br>■ **MENDM**<br>■ **DFO**<br>■ **MFFN CAR**<br>■ **Project Team** | ■ Technical discussion of comments received following agency review of draft Study Plan, teleconference meeting on 1-October-2020. | ■ Comment and technical discussion pertaining to the collection and use of existing data, previous studies and desktop analysis to inform baseline conditions and study plan. | ■ More details of the previous studies and existing information that were used to steer and inform this Study Plan are included in this Study Plan. |
| ■ **The Agency**<br>■ **MNRF**<br>■ **MENDM**<br>■ **DFO**<br>■ **MFFN CAR**<br>■ **Project Team** | ■ Technical discussion of comments received following agency review of draft Study Plan, teleconference meeting on 1-October-2020. | ■ Comment and technical discussion pertaining to proposed deviations from the TISG requirements. | ■ More details of the anticipated methods for effects assessment are included in this Study Plan. Formal request for amendment of the TISG for technical deviations from the TISG requirements will be submitted in a separate document but are highlighted in **Section 11**, **Table 11-3** of this Study Plan. |

| Attendees/ Responsible Party | Correspondence, Date(s) | Discussion Point | Solution |
|---|---|---|---|
| ■ **DFO**<br>■ **MFFN CAR Project Consultant** | ■ Follow-up technical discussion, emails exchanged between 2-October-2020 and 6-October-2020 | ■ Review of 2019 field studies, proposed 2020 studies and site selection, including additional details regarding site selection rationale (for both 2019 and 2020 studies). | ■ DFO review of the additional details provided and acknowledgement of the information provided satisfying the request for additional information (Comment FH-01, **Appendix B**) |

# 4. IS / EA Report Consultation and Engagement Process

## 4.1 Interested Persons and Government Agencies

The Proponent will provide Project notices and advise of opportunities for consultation and engagement with interested persons[6] which includes, at a minimum, members of the public outlined in the *Public Participation Plan for the Marten Falls Community Access Road Project Impact Assessment* (The Agency 2020) (referred to as the Public Participation Plan). This will include the opportunity to provide input on the existing environment, VCs, effects assessment methods, effects assessment results, and mitigation and follow-up program measures as applicable. A variety of activities will be offered so that members of the public are informed of the IS / EA Report as it progresses and are aware of the opportunities and means to provide their input. The study plans have recognized public and agency input received on the Project to date. Government agencies and interested persons will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process. The Project's approach to handling confidential and sensitive information is outlined in **Section 2.1**.

## 4.2 Indigenous Communities

The Proponent will provide Project notices and opportunities for consultation and engagement with Indigenous communities identified in **Table 4-1**, which is inclusive of all indigenous communities identified in the *Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment* (The Agency 2020a) (referred to as the Indigenous Engagement and Partnership Plan).

Indigenous communities will be provided the opportunity to be involved at critical decision-making points throughout the IS / EA Report so that the Proponent can consider and incorporate, where appropriate Indigenous Knowledge and Indigenous land and resource use information into the Project as it pertains to the existing environment, VCs, effects assessment methods, effects assessment results, and mitigation and follow-up program measures. A variety of activities will be offered so that indigenous communities are informed of the IS / EA Report as it progresses and are aware of the opportunities, means and timelines to

6. *Interested persons, as defined in the IS / EA Consultation Plan, are individuals and groups (e.g., associations, non-governmental organizations, industry and academia) who could have an interest in the Project, including but not limited to communities in the region, those with commercial interests (e.g., forestry, trappers, outfitters, other mineral tenure holders in the area) and recreational users or those with recreational interest (e.g., campers, hunters and environmental groups).*

provide their input. The study plans have recognized Indigenous community input received on the Project to date. Indigenous communities will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process.

### Table 4-1: Identified Neighbouring Indigenous Communities, including their Provincial Territorial Organizations and / or Tribal Council Affiliations

| Tribal Council Affiliation | Indigenous Community or Organization |
|---|---|
| **Matawa First Nations Management** *(Nishnawbe Aski Nation)* | ■ **Marten Falls First Nation** (Proponent and potentially affected Indigenous community)<br>■ Aroland First Nation<br>■ Constance Lake First Nation<br>■ Eabametoong First Nation<br>■ Ginoogaming First Nation<br>■ Neskantaga First Nation<br>■ Nibinamik First Nation<br>■ Webequie First Nation |
| **Matawa First Nations Management and the Union of Ontario Indians / Nishnawbe Aski Nation** | ■ Long Lake #58 First Nation** |
| **Mushkegowuk Council** *(Nishnawbe Aski Nation)* | ■ Attawapiskat First Nation<br>■ Fort Albany First Nation<br>■ Kashechewan First Nation |
| **Shibogama First Nations Council** *(Nishnawbe Aski Nation)* | ■ Kasabonika Lake First Nation<br>■ Kingfisher Lake First Nation<br>■ Wapekeka First Nation<br>■ Wawakapewin First Nation<br>■ Wunnumin Lake First Nation |
| **Independent First Nations Alliance** *(Nishnawbe Aski Nation)* | ■ Kitchenuhmaykoosib Inninuwug First Nation |
| **Independent First Nations** *(Nishnawbe Aski Nation)* | ■ Mishkeegogamang First Nation<br>■ Weenusk First Nation |
| **Nokiiwin Tribal Council** | ■ Animbiigoo Zaagi'igan Anishinaabek First Nation (AZA)* |
| **Métis Nation of Ontario** | ■ Métis Nation of Ontario; Region 2* |
| **Independent Métis Nation** | ■ Red Sky Independent Métis Nation* |

*Notes: * Indigenous communities or organizations identified by MECP who should be consulted on the basis that they may be interested in the Community Access Road.*
*** MECP indicated in a letter to MFFN that Long Lake #58 First Nation was moved from interest-based to rights-based.*

## 4.3 Consideration of Identity and Gender-Based Analysis Plus in Engagement

To fulfill requirements of the IAA, the Consultation and Engagement Program will consider a diverse range of perspectives from interested persons and interested Indigenous communities and their members identified in the Agency's Indigenous Engagement and Partnership Plan and the Public Participation Plan. This will include at a minimum providing ongoing opportunities for engagement to:

- **Neighbouring Indigenous communities, including relevant subpopulations:**
  - Women;
  - Youth; and
  - Elders.
- **Non-Indigenous communities including:**
  - Women;
  - Youth; and
  - Activity-based subgroups (e.g., recreationalists, snowmobilers, tourism establishment operators).

The Proponent will also consult and engage with other subpopulations identified by communities during consultation and engagement. The information from these activities and any additional identity groups identified by communities through consultation and engagement will be considered by applicable environmental disciplines for the purposes of data collection and considering disproportionate effects.

During consultation and engagement, these aforementioned groups will be consulted and engaged with on targeted input**.** Specialized knowledge will be gathered through other disciplines such as Social, Economic, Land and Resource Use and Aboriginal and Treaty Rights and Interests. The Socio-economic Data Collection Program is expected to include targeted interviews, focus groups, questionnaires and other niche tools to gather information from diverse populations to resolve gaps in socio-economic secondary data. These diverse populations include the aforementioned identity groups, which are also referenced in the IS / EA Consultation Plan, and those identified by communities during consultation and engagement. The importance of soliciting inputs and perspectives from diverse subgroups has also been factored into the Indigenous Knowledge Program and associated materials (see **Section 5**).

When feedback is received from interested persons and Indigenous communities, issues, comments and questions will be tracked, which is consistent with the process described in the IS / EA Consultation Plan. Specific to Gender-Based Analysis Plus objectives, this will include efforts to engage with diverse populations. It is expected this will include activities specific to subgroups and tabulation of consultation and engagement participation with respect to identity factors. This will provide summary statistics to demonstrate the diversity achieved in consultation and engagement.

# 5. Consideration of Indigenous Knowledge in the IS / EA Report

The following provides a general description of how Indigenous Knowledge will be considered in the IA / EA process. The extent to which Indigenous Knowledge is considered by each specific VC will vary depending on the nature of the VC, the potential for Project effects on the VC and whether Indigenous knowledge that relates to a VC is provided / obtained. As such, not all aspects of the general approach described below may apply to all VCs / study plans.

There are two concurrent and complementary avenues for Indigenous communities and groups to be engaged with and provide input on the Project: the Indigenous Knowledge Program and the Consultation and Engagement Program. Both programs serve to support the collection of Indigenous perspectives, values, and input on the Project, including Aboriginal and Treaty Rights and how they may be impacted by the Project, to be integrated throughout the IA / EA process. However, the Indigenous Knowledge Program specifically aims to solicit and incorporate information that is considered sensitive and may have confidentiality requirements, including Indigenous Knowledge and information on Indigenous land and resource use. Indigenous Knowledge Sharing Agreements will be established between the Proponent and Indigenous communities participating in the Indigenous Knowledge Program prior to the sharing and use of any sensitive information.

All Indigenous communities and groups identified by the MECP and the Agency through the Indigenous Engagement and Partnership Plan have the opportunity to participate in the Indigenous Knowledge Program. The Indigenous Knowledge Program provides interested Indigenous communities an opportunity to: share existing Indigenous Knowledge and information on Indigenous land and resource use and cultural values that may be relevant to the Project, and / or complete Project-specific studies to collect and share Indigenous Knowledge and information on Indigenous land and resource use and cultural values. The Indigenous Knowledge Program includes opportunities for Indigenous communities and groups to meet with the Proponent to discuss the program, ask questions, and share concerns and interests. In support of this, the Proponent has created an Indigenous Knowledge Program Guidance Document (the Guidance Document) that provides:

- An overview of the Indigenous Knowledge Program and information on how Indigenous Knowledge, Indigenous land and resource use and cultural values and practices can be collected and / or shared;

- Information on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values and practices may be used in the planning and design processes; and
- A suite of guidance materials that were developed based on the information requirements of both the federal and provincial assessment processes, including question guides to support the collection of information on historical and current community context, Indigenous Knowledge that may be relevant to the various technical disciplines, information on Indigenous land and resource use, cultural values and practices and associated spatial data, and perspective on potential Project-related effects and associated mitigation and / or enhancement measures.

The Guidance Document will also support participating Indigenous communities in providing Project-specific information in a manner that facilitates meaningful incorporation into the IS / EA Report.

The IS / EA Consultation Plan outlines the process for obtaining information and feedback about the Project from Indigenous communities (i.e., the Consultation and Engagement Program). All Indigenous communities identified by the MECP and the Agency have the opportunity to participate in the Consultation and Engagement Program through community-specific meetings, Public Information Centres, web conferences, and other formats. All Indigenous communities identified by the MECP and the Agency will be provided information related to the Project and invited to participate at various points throughout the IA / EA process.

There are also opportunities for technical teams to engage with Indigenous communities to solicit perspectives and information relevant to the Project, including information related to collection of existing information and the development of the IS / EA Report. The Proponent also invites feedback and inputs throughout the Project via the Project website and ongoing communications with the Proponent.

The Indigenous Knowledge and Consultation and Engagement programs are designed to be complementary and provide multiple opportunities for communities to offer feedback and information, including perspectives on Aboriginal and Treaty Rights and interests and how these may be impacted by the proposed Project. Relevant information collected through both the Indigenous Knowledge and Consultation and Engagement programs, including potential effect pathways on Aboriginal and Treaty Rights and interests, will be shared with each of the relevant disciplines throughout the IA / EA to: guide and inform VCs; support characterization of the existing environment; identify the potential effects of the Project on VCs; help identify mitigation measures and potential monitoring programs; and ultimately guide Project planning. The nature of how the Indigenous Knowledge becomes integrated into the IS / EA Report will be dictated by the specific information provided by each Indigenous community and the parameters set out in

the Indigenous Knowledge Sharing Agreements. A description of how Indigenous Knowledge was considered in the IA / EA and in each of the technical discipline areas will be included in the IS / EA Report.

It is also important to note that information collected through the various activities (e.g., field studies and programs, effects assessments) of each discipline area (e.g., wildlife, vegetation, cultural heritage) will be shared with the Indigenous Knowledge Program leads. This will support the establishment of the existing environment and the effects assessment for the Aboriginal and Treaty Rights and Interests environmental discipline, as well as the identification of potential mitigation measures and monitoring programs, given the interrelated nature of Indigenous peoples and other environmental disciplines.

The Proponent will strive to respectfully collaborate with Indigenous communities on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values will become part of the IS / EA Report, and how potential effects to Aboriginal and Treaty Rights and interests will be assessed. It is expected that measures to support this may include but are not limited to: engaging Indigenous communities to solicit information on Indigenous Knowledge and Indigenous land and resource use and cultural values to inform baseline conditions, providing Indigenous communities with draft sections of the IS / EA Report to illustrate how Indigenous Knowledge and information on Indigenous land and resource use and cultural values has been integrated and to confirm it has been presented appropriately, and completing collaborative working sessions with Indigenous communities for the effects assessment on Aboriginal and Treaty Rights and Interests. Further information on how potential effects on Indigenous rights will be assessed is provided in the Aboriginal and Treaty Rights and Interests Study Plan.

# 6. Assessment Boundaries

## 6.1 Temporal Boundaries: Project Phases

Project phases, which are temporal boundaries, are developed to establish the timeframes within which potential effects of the Project will be considered in the IS / EA Report. The Project is planned to occur in two phases, which are briefly described below and shown in **Figure 6-1**.

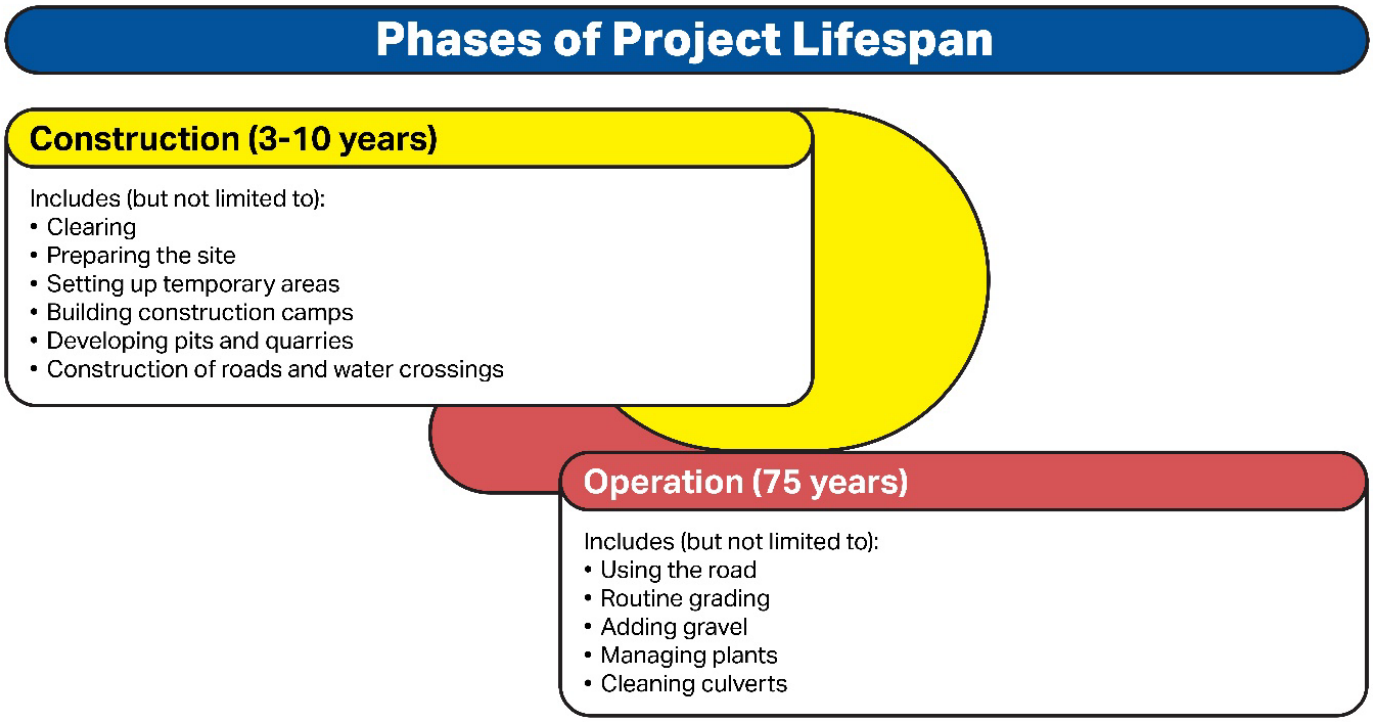
- **Construction Phase:**
  The time from start of construction, including site preparation activities, to the start of operations and maintenance of the CAR. Decommissioning of construction works is included in the construction phase. The construction phase is anticipated to take approximately 3 to 10 years to complete.
- **Operations and Maintenance Phase:**
  The operations and maintenance phase starts once construction activities are complete and lasts for the life of the Project. The operations and maintenance phase of the Project is considered to be 75 years based on the expected timeline for when major refurbishment of road components (e.g., bridges), is anticipated.

There are currently no plans to decommission the CAR as there is no expected / known end date for its need. Therefore, future suspension, decommissioning and eventual abandonment of the CAR will not be considered in the IS / EA Report. It will be considered if and when a decommissioning or abandonment application is made for the road.

In determining the temporal boundaries, in particular the long operations and maintenance phase, consideration was given to the long-term effects on the well-being of present and future generations (Sustainability Principle #2 [7]). The final temporal boundaries to be used in the IS / EA Report will be based on regulatory agency guidance, professional judgement and input received through the Project consultation process.

7. *Sustainability Principles #2 is one of four sustainability principles included in Section 25 of the Project's TISG as further elaborated on Section 9.7.*

**Figure 6-1: Project Schedule**




# 6.2 Spatial Boundaries: Study Areas

## 6.2.1 General Information

Study areas identify the geographic extents within which potential effects of the Project are likely to occur and will be considered in the IS / EA Report. The existing conditions and potential effects are documented for three study areas selected for the Project:

- **Project Development Area (PDA):** area of direct disturbance:
- **Local Study Area (LSA):** the area where most of the direct effects of the Project are likely to occur; and
- **Regional Study Area (RSA):** the area where indirect effects of the Project are likely to occur.

The PDA encompasses the 100 metre-wide CAR right-of-way (ROW), temporary construction access roads, work areas, worker camps, and pits, quarries and associated access roads. The preliminary LSA

currently being considered within the scope of the ongoing provincial regulatory review process generally includes the area within 2.5 km of the centreline of Alternative 1 and Alternative 4. The preliminary study area generally allows for the documentation of existing conditions and prediction of potential environmental effects for the Project. A 5 km wide study area also allows for route refinements during development of Project design (e.g., adjustment of the alignment to avoid sensitive features).

The specific location of Project components, including the roadway, quarries, pits and temporary infrastructure, are not yet known and will be included in the IS / EA Report. While most of the Project components are expected to be located within the preliminary 5 km wide study area, benefits (e.g., reduced environmental disturbance, avoidance of sensitive features, technical considerations, concerns received through consultation) for locating Project components on lands outside of the 5 km wide study area may become known during the IA / EA process. If the need to locate Project components outside the 5 km wide study area is determined to be required or of benefit to the Project, the study area would be adjusted.

The study area for each environmental discipline may vary from the above-described general study area based on the potential for the Project to directly or indirectly affect each environmental discipline; therefore, discipline-specific LSAs and RSAs have been defined for the Project. In defining the final LSAs and RSAs, each environmental discipline will consider:

- Location and other characteristics of the environmental discipline relative to the Project;
- The anticipated extent of the potential Project effects;
- Federal, provincial, regional, and local government administrative boundaries;
- Indigenous groups listed in **Table 4-1**;
- Community knowledge and Indigenous Knowledge;
- Current or traditional land and resource use by Indigenous communities;
- Exercise of Aboriginal and Treaty Rights of Indigenous peoples, including cultural and spiritual practices; and
- Physical, ecological, technical, social, health, economic and cultural considerations.

The study areas included in this document are preliminary, covering the extent to which readily available information suggests the Project may have noticeable effects on the environment. The size, nature and location of past, present and reasonably foreseeable projects will be taken into consideration in the development of the cumulative effects assessment study area(s). The appropriate study area(s) to assess

cumulative effects are dependent on the VCs predicted to have direct residual adverse effects as a result of the Project, and therefore cannot be defined until the IS / EA Report has sufficiently advanced.

As further detailed in **Section 4**, the Proponent will continue to provide opportunities for neighbouring Indigenous communities and interested persons to provide input and inform the effects assessment, including the LSAs and RSAs.

### 6.2.2 Fish and Fish Habitat Study Areas

The LSA and RSA boundaries for Fish and Fish Habitat are detailed in **Table 6-1** and shown on **Figure 6-2**.

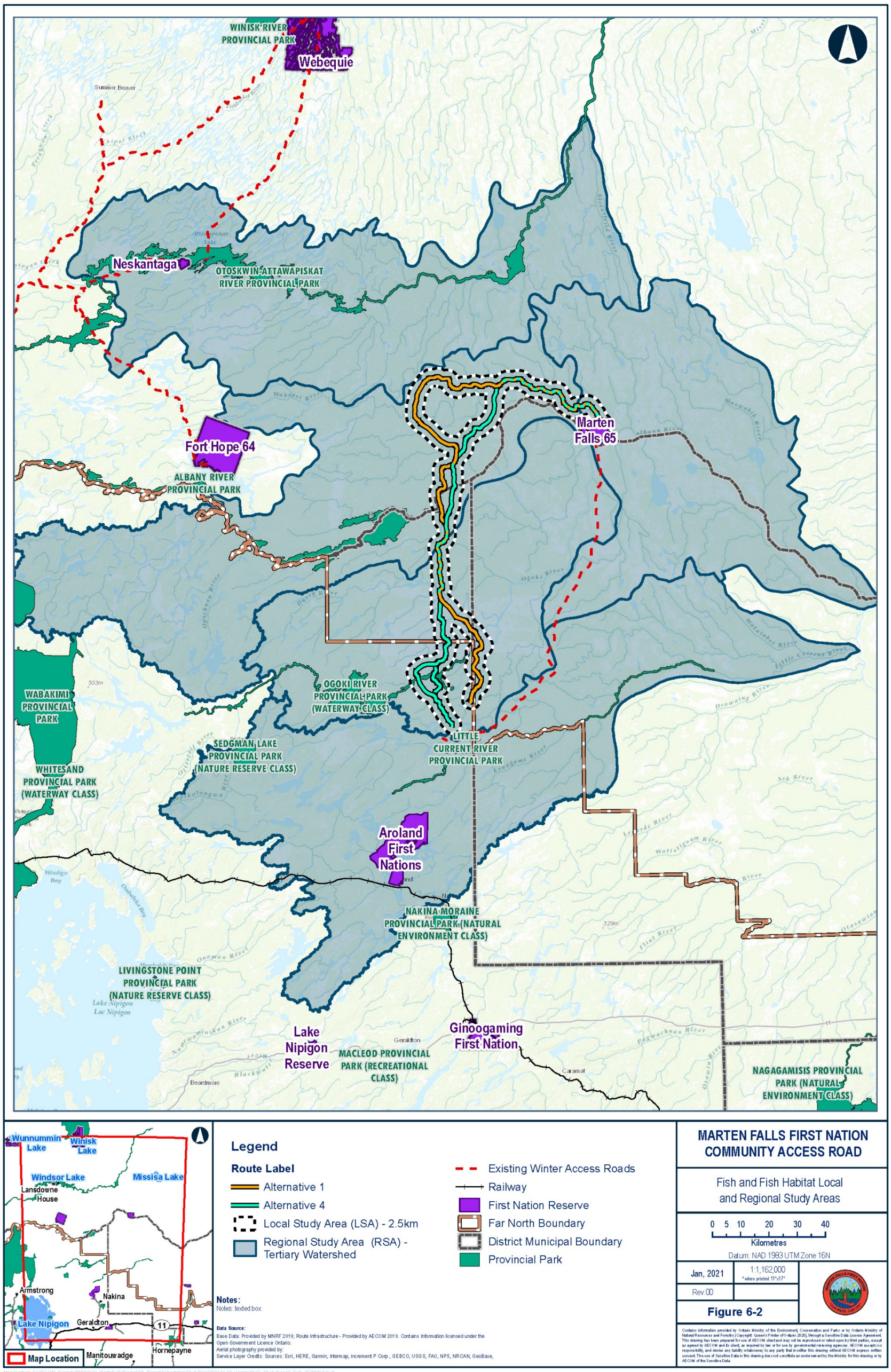
**Table 6-1: Fish and Fish Habitat Study Areas**

| Study Area | Geographic Extent | Rationale |
|---|---|---|
| **Local Study Area** | ■ 2.5 km buffer on both sides of the centreline of Alternative 1 and Alternative 4 | ■ Will describe the baseline conditions of the aquatic environment outside of the PDA with no direct interaction with Project infrastructure, but that has the potential to be subjected to direct or indirect effects (e.g., sedimentation, spills) |
| **Regional Study Area** | ■ Tertiary sub-watersheds traversed by Project components of Alternative 1 and Alternative 4 | ■ Baseline characterization of fish and fish habitat where direct effects outside of the PDA and LSA are not likely, however the potential for broad, indirect effects persist |

The **LSA** for the Fish and Fish Habitat discipline is proposed to include the area included within a 2.5 km buffer around the centreline of Alternative 1 and Alternative 4. The waterbodies within the 2.5 km buffer will therefore account for waterbodies where direct interaction with Project components are not proposed, but where there lies the potential for off-site direct or indirect effects.

The **RSA** for the Fish and Fish Habitat discipline of the Project will encompass the waterbodies of the sub-watersheds through which the route alternatives travel. A characterization of the sub-watersheds will provide a broad description of the baseline conditions which have the potential to be affected by indirect effects of the Project.

## Figure 6-2: Fish and Fish Habitat Local and Regional Study Area



# 7. Baseline Study Design

## 7.1 Desktop Assessment

A desktop review of existing information sources and previous studies will be completed to supplement the field investigations for characterizing the aquatic environment. The desktop review will consist of the development of a waterbody crossing list and a review of historical information, including aerial imagery. Fish and fish habitat baseline conditions will be compiled at the local scale for each waterbody potentially affected by the Project (i.e., within the Project Development Area). A list of relevant information sources found to date has been included in **Appendix A** and reflects federal and provincial guidance received to date. This Study Plan focuses on the additional studies required to gather information beyond what is currently available through existing information sources and previous field studies, including those as described in **Appendix A** and those conducted for this Project.

Available existing information will be reviewed to characterize the context of the fish and fish habitat and characterize the baseline aquatic environment within the study areas of the Project as defined in **Section 6**. Some of the information may include (but is not limited to) waterbodies, thermal regimes, fish species, significant fish habitat features (e.g., spawning habitat, nursery habitat, migration barriers), aquatic Species at Risk (SAR), Species of Conservation Concern[8], and SAR habitat. In addition to the desktop assessment, information gathering will also rely on public consultation and Indigenous Knowledge. Community and Indigenous Knowledge will be collected through the Indigenous Knowledge Program as described in **Section 5**. Through consultation with the public and Indigenous community members, the MFFN CAR Project Team intends to collect specific fishery information and traditional uses of waterbodies in the study areas, such as traditional and current fishing grounds, spawning habitat and migration corridors.

A waterbody crossing list will be developed for the PDA (**Section 6**) by using GIS to overlay the Project footprint with the Ontario Hydro Network (MNRF 2011) data layer to identify potential hydrology features crossed by the Project. Additional potential waterbodies not mapped in the Ontario Hydro Network will be identified through manual review of the routes overlaid on aerial imagery. These “unmapped”, potential waterbody crossings will then be added to the waterbody crossing list. Waterbody crossings will then be assigned a unique site identification.

8. *Species of Conservation Concern includes Species with Provincial (Ontario) S-rank assigned by NHIC as S1 (critically imperiled), S2 (imperiled) or S3 (vulnerable);Species listed as Special Concern under the ESA; and Species identified as nationally Endangered or Threatened by the COSEWIC, which are not protected under the ESA.*

Light Detection and Ranging (LiDAR) will be used to re-examine the unmapped crossings to determine if the digital elevation model (DEM) from LiDAR shows evidence of a defined channel. Water features without defined bed or banks (a criterion for the definition of a waterbody in Ontario [*Conservation Authorities Act*; Government of Ontario 2003; Stanfield 2017; Government of Ontario 1990]) will not be considered waterbodies, and thus not included in the crossing list.

Each waterbody crossing location will be classified into general waterbody type (**Table 7-1**) and will be further characterized using available desktop data. This categorization will serve to inform habitat suitability for VCs as well as facilitate field sampling and assessment planning, given assessment and sampling methods will vary depending on site conditions.

**Table 7-1: Desktop Habitat Classification**

| Habitat Classification | Definition | Common Examples of Habitat |
|---|---|---|
| **Lentic (lake / pond)** | ■ Aquatic ecosystems characterized by little to no flow through the system. | ■ Beaver impoundments, lakes, ponds. |
| **Lotic (watercourses)** | ■ Aquatic ecosystems characterized by unidirectional flow through the system. | ■ Brooks, creeks, ditches, rivers, streams. |

A preliminary review of background information was conducted to inform this Study Plan and selection of VCs of the Fish and Fish Habitat discipline. A list of background information sources retrieved to-date is provided in **Appendix A**. This does not include Indigenous information obtained through Indigenous Knowledge and Consultation and engagement programs as this process is still underway.

# 7.2 Field Investigations

In addition to the collection and review of existing information relevant to the Project, field studies are being conducted to substantiate existing data and previous assessments related to the Project to adequately characterize the baseline conditions of the VC and assess the potential effects. The field investigations will collect more detailed information and fill gaps in the desktop assessment.

## 7.2.1 Methodology

### 7.2.1.1 Site Selection

Desktop analysis and aerial reconnaissance was conducted in fall of 2019 to identify the potential waterbodies crossed by both Alternative 1 and Alternative 4. The initial desktop exercise identified 164

crossings considered potential waterbodies, 70 of which were determined to have no defined bed or banks (based on the review of the LiDAR and the aerial reconnaissance). Those undefined drainages were generally swales overgrown with terrestrial vegetation or areas with unconnected ponded water in low-lying areas. As such, these drainages were considered to have no fish habitat and were not considered further in the baseline characterization of fish and fish habitat.

The site selection process for the subset of waterbody crossing locations for detailed assessment was based on several factors, including: representative sites per tertiary watershed, logistics, health and safety, cultural importance (which, to date has been provided by only MFFN), available background information and previous studies (e.g., waterbody crossing locations surveyed previously in support of the Cliffs Chromite Project Environmental Assessment [Golder 2013] where sections of the preferred route alternatives overlap with the alignment of the Cliffs route), waterbody type and abundance within the tertiary watershed. The selected waterbody crossing locations were evenly distributed along the length of Alternative 1 and Alternative 4 and among the relevant tertiary watersheds to the extent feasible.

The distribution of subset sites:

- A habitat assessment at a 50% subset of locations where the PDA intersects with waterbodies with potential fish habitat.
- Fish community sampling at a 50% subset of locations where the PDA intersects with waterbodies with potential fish habitat (typically where habitat assessment has been completed).
- Benthic invertebrate sampling at a 25% subset of sites selected for habitat assessment.

Site selection was described in further detail in **Section 7.1**.

It is understood that, for permitting purposes, site-specific ground-based surveys will be required at all waterbody crossings where work is anticipated to occur below the highwater mark during construction. Ultimately, the approach to the field data collection program for fish and fish habitat has been tailored to the objectives of each stage of the Project. Ground-based field information will be initially obtained at a subset of waterbody crossings to advance the alternatives assessment and the EA, recognizing that data obtained from this subset of crossing locations over multiple seasons and years is expected to be more that sufficient to characterize baseline conditions and complete the effects assessment. Upon selection of a preferred alternative, supplemental surveys will be conducted at waterbody crossing locations that were not surveyed as part of the EA to support the preparation and submission of permit applications, where required. To this end, every waterbody crossing location where work is to occur below the highwater mark, will have site-specific ground-based surveys completed, either as part of initial investigations in support of the EA or during the supplemental surveys.

#### 7.2.1.2 Aerial Reconnaissance

Aerial reconnaissance was completed along the full extent of Alternative 1 and Alternative 4 in fall 2019 to verify the location of mapped and unmapped waterbody crossings, as well as to further augment the baseline characterization results from the desktop review. One or two georeferenced photographs were taken from the air at each waterbody crossing and habitat variables will be documented where possible at each of the identified waterbody crossing locations, including: waterbody type (e.g., watercourse, lake / pond, bog or fen terrain, drainage feature); habitat and bed substrate types; presence of fish passage barrier and type (if applicable); and fish habitat potential (i.e., potential for the waterbody to support fish).

#### 7.2.1.3 Fish Habitat Assessment

Fish habitat was assessed at each field assessment site selected (50% subset). The data collected for assessment sites have the potential to vary across waterbody types; the methods for each of these are described below.

##### 7.2.1.3.1 Lentic Habitat (lakes, ponds)

Detailed habitat assessments will be completed at each assessment site where lake / pond habitat is encountered or there is other evidence to suggest that the location may have some fish habitat potential in a lentic capacity. These waterbodies and riparian areas will be assessed throughout their extent within the PDA by positioning assessment transects at the centreline of the route alignment and at regular intervals on either side of the centreline, where the following data will be collected:

- Location of transect
- Physical dimensions (width, depth)
- Substrate composition
- Dominant and subdominant riparian vegetation and aquatic macrophytes
- Composition and percent coverage of dominant and subdominant cover types

Where Project components other than the road alignment are proposed in close proximity to a waterbody (if any), the footprint of the proposed component plus a 100 m buffer (within the waterbody) will be assessed in the same manner.

In addition to collection of the data noted above per transect, *in situ* water parameter data and observations will be collected, including temperature, pH, dissolved oxygen concentration, and conductivity. Site photographs, location of field assessment site boundaries (coordinates) and location of suitable (i.e.,

appropriate conditions for a species to carry out that life function) sensitive habitat features will be collected. Suitable sensitive habitat features and / or potential to support important habitat function such as spawning, migration, overwintering, nursery, productive feeding areas and fish passage barriers will be delineated or mapped, photographed and described. Data collected as part of the Fish and Fish Habitat Discipline will be supplemented with water quality and hydrological data collected as part of the surface water program where applicable (refer to the Surface Water Study Plan).

#### 7.2.1.3.2 Lotic Habitat (streams, rivers)

Lotic habitat assessments will be conducted where there is evidence of unidirectional flow at the time of assessment with the potential to support fish. Habitat assessments will involve the establishment of a transect at the centreline of the proposed route alignment, and at regular intervals up to 120 m upstream and 120 m downstream of the route alignment. This distance helps ensure that the entire width of the 100 m wide CAR ROW is included in assessment.

The following data will be collected at each transect:

- Photographs upstream, downstream, of the left downstream bank, of the right downstream bank, and of the substrate;
- Location of transect;
- Geomorphic measurements (wetted width, wetted depth, bankfull depth, bankfull width);
- Depth in thalweg[9] and / or mean pool depth;
- Substrate composition;
- Dominant and subdominant bank materials;
- Dominant and subdominant riparian vegetation and aquatic macrophytes;
- Bank stability; and,
- Dominant and subdominant cover types.

In addition to collection of these data, *in situ* water parameter data will be collected from the watercourse at centreline, including temperature, pH, dissolved oxygen, conductivity and velocity. Site photographs, location of assessment site boundaries and location of suitable sensitive habitat features will be collected. Suitable sensitive habitat features or potential important habitat function such as spawning, migration, overwintering, nursery, productive feeding areas and fish passage barriers. will be delineated or mapped, photographed and described. This supplemental information is consistent with that which will be collected

*9. Thalweg is the line of lowest elevation within a watercourse*

for lentic habitat. Water and sediment sampling and analysis to describe baseline conditions as they pertain to water quality, hydrology and contaminants are included in the surface water program (see **Section 7.2.1.3** and **7.2.2** of the **Surface Water Study Plan**).

### 7.2.1.4 Biological Sampling

#### 7.2.1.4.1 Fish Communities

Fish communities will be characterized by exerting fishing effort where conditions are suitable to support fish and are logistically and safely feasible to execute. Fish sampling will be completed in compliance with applicable License to Collect Fish for Scientific Purposes issued by the MNRF for the Project. The methods employed at each assessment site will be site-specific and dictated by site conditions and waterbody category identified in the desktop assessment. Characteristics such as geomorphic conditions, season / temperature, access and safety considerations, existing fish community, VCs and trophic levels, and water depth will be taken into consideration when determining appropriate sampling techniques to employ to avoid or minimize species capture biases. Where necessary to minimize species collection biases and to target varying trophic levels (where the potential for such variety is present), a combination of fish collection methods may be used. **Table 7-2** provides an overview of typical fish sampling methods which will be performed, where appropriate per assessment site in the PDA. Wherever possible, backpack electrofishing will be the preferred method of collection.

**Table 7-2: Proposed Fish Community Sampling Methods**

| Method | Targeted Species | Suitable Habitats | Description |
|---|---|---|---|
| **Angling** | Sport Species | ■ Water deeper than 1 m, minimal obstructions. Lakes, ponds, rivers. | ■ Rod and reel used to drag artificial lures through water to elicit a strike from predatory fish. |
| **Backpack Electrofishing** | All | ■ Wadable with water depths typically no greater than 70 cm, effectiveness is subject to various water quality parameters. Streams and small rivers, shorelines of lentic waterbodies. | ■ The application of an electrical current to water that results in an uncontrolled muscular convulsion in fish that causes them to swim toward the anode of an electrofishing unit mounted on the back of a crew member. |
| **Boat Electrofishing** | All | ■ Water deeper than 1 m and less than approximately 3 m depending on water conditions (e.g. water clarity). Boat access to water required or air transport of more portable units (e.g., inflatable boat). Effectiveness is subject to various water quality parameters. Rivers, lakes, ponds. | ■ The application of an electrical current to water that results in an uncontrolled muscular convulsion in fish that causes them to swim toward the anode of an electrofishing unit mounted on a boat. |

| Method | Targeted Species | Suitable Habitats | Description |
|---|---|---|---|
| **Hoop Netting** | All | ■ Wadable with water deeper than 50 cm, or unwadeable with boat access. Streams, rivers, lakes, ponds. | ■ A collection of nets that guide passing fish into a holding area. |
| **Trap Netting** | All | ■ Water deeper than 1 m, boat access to water required. Rivers, lakes, ponds. | ■ A collection of nets that guide passing fish into a holding area. |
| **Minnow Trapping** | Small-bodied fishes | ■ Water deeper than 30 cm. Streams, rivers, lakes, ponds. | ■ A baited, wire mesh trap that passively captures small bodied fish. |
| **Seine Netting** | Small-bodied fishes | ■ Wadable with water deeper than 50 cm. River, lake and pond shorelines with minimal obstruction. | ■ A mesh net with a weighted bottom that is dragged through shallow water. |

In addition to general survey data (i.e., date and time, weather, specific transect boundaries and / or trap location) sampling effort will be documented to determine the Catch per Unit Effort (CPUE). Each individual fish will be identified in the field and enumerated, age class (e.g., young-of-year, juvenile, adult) and observations of evident disease (e.g., tumors, lesions, parasitic) will be noted. The length and weight of VCs will be documented. Lethal sampling is not intended for this Study Plan and every attempt will be made to release fish alive.

#### 7.2.1.4.2 Benthic Invertebrates

Benthic invertebrates are a food source for many fish species and therefore support fish communities. The benthic invertebrate community will be sampled at a subset of 25% the total number of assessment sites. All benthic invertebrate assessments will be completed in accordance with Ontario Benthic Biomonitoring Network (OBBN) guidelines.

Sampling sites will be selected to target representative waterbody types and habitat to a provide a baseline of diversity and abundance. Site selection will consider factors such as flow and thermal regime, watershed representation and waterbody type, health and safety and logistical constraints. Benthic invertebrate samples will be collected from within the Fish and Fish Habitat study area, ideally, within 10 m of the centreline.

Benthic invertebrate community samples will be collected using one of two pieces of equipment:

- In lotic / erosional environments (i.e., watercourses with predominantly coarse substrates) will be collected using a Surber sampler (i.e., sample area = 0.093 $m^2$) where there were suitable coarse substrates (i.e., cobble / boulder).
- In lentic / depositional environments (i.e., waterbodies with sediments that are predominantly silt / sand), samples were collected using a grab sampler (0.0232 $m^2$) (i.e., Ekman or petite Ponar).

Three replicate samples will be collected at each location and combined to prepare one composite sample. Replicate sampling locations will be selected according to the presence of similar aquatic habitat (i.e., flowing water, similar substrate, water depth, presence of aquatic vegetation) in the lentic or lotic environment within each waterbody. The selection of similar habitat will be maintained to the extent possible between sub-sampling locations at each site, to reduce habitat-related variability in the benthic invertebrate community data.

Composite samples will be sieved through a 500 µm mesh Nitex screen. Material retained in the mesh will be placed in a 1-litre (L) plastic bottle and preserved in 10% buffered formalin. Samples will be couriered to a qualified taxonomist for taxonomic identification and enumeration at the end of the program. The resulting sample will be set in preservative for identification and enumeration per assessment site through laboratory analysis.

## 7.2.2 Previous Field Investigations

Existing information was reviewed (**Section 7.1**) and recent field studies were carried out (preceding this Study Plan) as described in **Section 7.2.1**. Although the field studies carried out in 2019 and 2020 were conducted in advance of finalization of this Study Plan, data collected through these surveys remain relevant and are considered to be studies completed under this Study Plan.

### 7.2.2.1 Historic Field Studies Undertaken (2011 / 2012)

Fish sampling and habitat assessment was carried out at 19 watercourse crossings in 2011 / 2012 by Golder in support of the Cliffs Chromite Project (Project EA since terminated) and results are available that are pertinent for this Project because the study areas for both projects have some overlap. Therefore, previous information collected for the Cliffs Chromite Project will be used to supplement the data collected for this Project to understand significant long-term changes in fish habitat where there is overlap in sampling locations.

The existing information from this prior study is relevant where the route alignment for the Cliffs all-season access road overlaps with the PDA for the CAR. Additional data for waterbody crossing locations of the route alignment for the Cliffs Project throughout the MFFN CAR Project's LSA and RSA will also inform the characterization of fish and fish habitat in the Project study areas.

The studies conducted in 2011 / 2012 and described in detail in the Cliffs Chromite Project Environmental Assessment – Aquatic Ecology Technical Supporting Document (Golder, 2013) will serve to further inform the IA / EA, considering the data are less than 10 years old. Furthermore, the observed fish habitat

conditions at sites revisited for detailed habitat assessment conducted for this Project, as well as observations from aerial surveys, were shown to be consistent (Golder, 2020b), which supports the assumption that without major interference, the detectable physical changes to the habitat conditions at the sites assessed in support of the Cliffs Chromite Project are likely to be negligible to none in the span of the past several years. Therefore, the existing fish habitat and fish community data for the 19 assessment sites completed in support of the Cliffs Chromite Project will be considered when identifying sites for detailed habitat assessment and fish community assessment for this Project.

#### 7.2.2.2 Recent Studies Undertaken (2019-2020)

Field studies have been undertaken for the purpose of informing baseline conditions of fish and fish habitat in support of the Project have included the following studies conducted in 2019 and 2020:

- Aerial and ground-based fish habitat assessments at 12 waterbody crossing locations from September 5 to 10, 2019.
- Fish sampling was carried out at 9 waterbody crossing locations from September 5 to 10, 2019.
- Aerial habitat assessment carried out at 16 waterbody crossing locations from October 14 to 26, 2020.
- Ground-based fish habitat assessment carried out at 19 waterbody crossing locations from October 14 to 26, 2020.
- Benthic invertebrate sampling carried out at 16 waterbody crossing locations from October 14 to 16, 2020.

In both 2019 (September) and 2020 (October), aerial reconnaissance surveys were conducted to confirm desktop information, obtain aerial photographs and to gain an understanding of the regional context of each waterbody crossing locations. The aerial reconnaissance was completed along the full extent of both route Alternative 1 and Alternative 4.

Detailed assessments of the habitat up to 120 m upstream and 120 m downstream of the route alignment were conducted. The data collected is consistent with the study methods for fish habitat described in **Section 7.2.1**, and included documentation of the following: waterbody type and flow conditions, channel dimensions (wetted width, wetted depth, bankfull width, bankfull depth), bank shape and stability, habitat features (e.g., in-water cover, substrate and vegetation), fish passage barriers, photographs, and suitable habitat important for fish life functions (e.g., spawning).

Sampling carried out in 2019 provides the first year of multi-year field study data in addition to data gathered through desktop analysis, previous studies (**Section 7.1.1**) and Indigenous Knowledge (from MFFN). No

fishing was conducted in 2020 because the timing of fall habitat assessment overlapped with the timing window for fall spawning fish (e.g., Brook Trout, Lake Whitefish). Habitat assessments were completed in the fall of 2019 and 2020 at 30 unique sites. A smaller subset of sites were repeated between at least two years of 2011 / 2012, 2019 and 2020.

Fish sampling was conducted where site conditions allowed for sampling to take place (e.g., health and safety and logistical constraints caused by rough terrain, un-wadeable waterbodies). Within the area of detailed assessment as noted above, baited minnow traps and backpack electrofishing were employed to document the resident fish community at the assessment sites (in 2019).

Benthic sampling was not conducted as part of the field surveys of 2019. In 2020, erosional sampling using a Surber sampler and depositional sampling using a petite Ponar grab sampler were conducted at select sites. During the 2020 surveys, benthic invertebrate sampling coincided with fish habitat surveys.

The locations of the detailed site assessments (in 2019 and 2020) is attached in **Appendix C**. Detailed results of the field programs in 2019 and 2020 will be provided at a later date.

### 7.2.3 Future Field Studies

Field studies will be completed under appropriate seasonal and weather conditions to facilitate safe access for field crews and appropriate conditions for visual inspection, such as minimal snow cover, open water, and avoidance of flood conditions.

Sites proposed for future assessment  will be selected pending further desktop review, review of recent field studies (2019-2020), health and safety considerations and logistical constraints such as access and gear-type. To achieve the target % subsets (**Section 7.2.1.1**), the balance of the sites remaining after previous field investigations (2011 / 2012, 2019 and 2020) will be assessed. Based on information available at this time, this translates to approximately 40 additional sites to be completed for habitat assessment and fish community sampling, and approximately 7 sites for benthic invertebrate collection. The detailed field schedule for future fish and fish habitat assessment is yet to be finalized.

# 8. Data Management and Analysis

Data management including quality assurance / quality control (QA / QC) will be employed to minimize potential for data entry and analysis errors, prepare data sets for analysis and limit sensitive data distribution in accordance to established agreements. Data provided to agencies will meet ISO 19115 standards.

## 8.1 Data Management

### 8.1.1 Desktop Analysis

Relevant data collected from the desktop assessment described in **Section 7.1** will be compiled into a map and data layer per route alternative using ArcGIS for reader reference to inform and supplement the field investigations for the PDA.

### 8.1.2 Field Investigations

A quality assurance / quality control (QA / QC) program was used for the Project to minimize the probability of error during data collection, data entry, and data interpretation, including aerial imagery review and the creation of the fish species list for each waterbody crossing. Standardized datasheets and methods were used as a means of consistency and to control the quality of data collected. Specific work instructions were written for the purpose of field data collection. Datasheet QA / QC was completed in the field for all datasheets completed for that day. The QA / QC check included an exchange of datasheets between field crews or team members so that all fields were legible and properly entered. Field photos and GPS coordinates were backed up to laptops daily. Data entry was evaluated for errors or omissions by reviewing each datasheet to verify that the electronic database accurately reflected field observations. QA / QC for the waterbody crossing lists involved the following tasks:

- Review by more than one person, including a senior fish biologist to help ensure accuracy
- Review by a fish biologist and a water resources engineer to help ensure all waterbodies were included and to QA / QC the data

The data collected during field investigations using this method will include data pertaining to habitat assessment of the PDA and biological sampling (excluding results of laboratory analysis) of the PDA. Analysis of benthic invertebrate samples will be conducted by an accredited laboratory and QA / QC standards will be reviewed and modified as required.

# 8.2 Data Analysis

## 8.2.1 Habitat Assessment

As described in **Section 7.2**, habitat assessment will be conducted within the PDA. The waterbodies previously categorized by lentic or lotic habitat will take into further account the conditions documented during habitat assessment to describe habitat types observed in the PDA that can be applied to the LSA and RSA to characterize the habitat throughout. To extrapolate and describe the habitat in the LSA and RSA, these habitat features will be categorized by their habitat type, stream order, stream type, gradient, and size. Once categorized they can be compared to similar waterbodies that were assessed in detailed within the PDA and thereby contextualize the habitat found throughout the LSA and RSA.

Lotic habitat will be further described by stream order (Strahler 1952) and stream type, and ranges of habitat conditions or habitat types typical of the PDA will be developed using the data collected in the habitat assessment. Metrics used to describe these typical habitat types of the PDA may include (but may not be limited to) mean geomorphic conditions observed in the PDA (i.e., bankfull width, bankfull depth, gradient) and fish passage barriers.

Desktop assessment using ArcGIS incorporating LDAR data and the habitat categorization as described above will be used to describe and categorize waterbodies in the LSA and RSA. A comparative analysis will be conducted between the categorized waterbodies of the LSA and RSA and the ranges of habitat preferences of VCs to provide evaluation of suitable habitat of VCs throughout the LSA and RSA. These data will be used to determine habitat suitability descriptions of VCs to apply to the LSA and RSA, based on a literature review of habitat preferences of these fish species. Waterbodies visited during field investigations that do not have the propensity to act as fish habitat will not be included in this analysis.

VCs have been identified based on background information review and consultation as described in **Section 7**. **Table 8-1** below provides resources for habitat suitability of VCs collected to-date. Habitat suitability examines species life history and habitat preferences for important life functions to identify these features. This list provides examples of resources to be referenced; the list will be revised as needed should additional relevant information be acquired (for example, information gathered through the Indigenous Knowledge Program being conducted for the Project).

**Table 8-1: Examples of Literature Reviewing VCs Habitat Suitability Patterns**

| VCs | Examples of Existing Habitat Suitability Resources |
|---|---|
| **Lake Sturgeon** | Daugherty et al. (2008) |
| **Walleye** | McMahon et al. (1984); Lowie et al. (2001) |
| **Brook Trout** | Raleigh (1982); Schmitt et al. (1993) |
| **Northern Pike** | Inskip (1982); Harvey (2009) |
| **Lake Whitefish** | Bégout Anras et al. (1999); DeJong (2017) |
| **Burbot** | Golder (2008) |

It is recognized that species occupancy and use of habitat could occur in any waterbody where access and habitat are suitable, and the analysis is not meant to provide a definitive presence / absence. This assessment will be used to describe the baseline conditions and occupancy potential of VCs of the LSA and RSA, in addition to the desktop assessment and detailed habitat assessment of the PDA. The habitat assessment of the PDA for Route Alternatives 1 and 4 will characterize the habitat and established baseline conditions of waterbodies within the sub-watersheds of the RSA and LSA. The habitat will be characterized as having “Fish Habitat”, “Potential Fish Habitat”, or “No Fish Habitat”. These designations were determined based on the water quality variables that were assessed (**Section 7.2.1**). Furthermore, the information collected in the habitat assessment of the PDA will inform submissions for regulatory review for water crossing structures, as well as the structure design team.

Mapping of these features in relation to Project components will be used to inform mitigation, protection and avoidance measures including alignment shifts to avoid sensitive features, to predict future conditions and minimize adverse potential effects of the Project to the extent feasible (**Section 9**).

## 8.2.2 Biological Sampling

The fish sampling conducted within the PDA will provide fish community data for the habitat types observed. The scope of the fish sampling program and data collected as described in **Section 7.2.1** will include quantitative and qualitative data that will describe:

- A baseline of species abundance;
- Documentation of fish age classes (i.e., young of year, juvenile, and adult) will serve to inform age distribution and may confirm observations of suitable spawning and nursery habitat;
- Implement appropriate sampling techniques pending site conditions to include different trophic levels and food base for predatory fishes; and
- Baseline of benthic invertebrate species composition, richness and abundance.

Trends in VC presence and abundance will be identified as they relate to habitat type and condition categories as identified above and a basis for similar habitat conditions across that sub-watershed. Comparative analysis of species diversity by habitat type will serve to inform baseline conditions of LSA and RSA in addition to occupancy potential as described in **Section 7.2.1.3**. The characterization of the existing environment serves as the baseline condition for which the environmental effects of the Project will be predicted and assessed against in the IA / EA process. Regulatory and permitting requirements, subsequent to the IA / EA process, will be identified in the IS / EA Report.

Fish species data will be used in the context of each waterbody crossing's tertiary watershed (or LSA and RSA), so that the potential presence of a species in the waterbody crossings is based on the fish known to occur in the watershed. If insufficient habitat data are available (e.g., watercourse obscured by trees during aerial reconnaissance or no LiDAR or historical information available), the waterbody will be rated as "Potential Fish Habitat". This approach will be used in the assessment to minimize the effect of pseudo-absences (presuming a species is absent from a site when it in fact occurs there) in data collection.

Benthic invertebrates within samples will be identified to family (species wherever possible) and enumerated. From the resulting data, the results for each sample will be summarized by calculating the species richness, Shannon's diversity index, and Simpson Index. Species richness is the total number of species found within a sample. Shannon's diversity index and Simpson's index are measures of species diversity that include the proportion of each species in a sample. Communities that have an equal number of all species are indexed as having a greater diversity than those which are heavily skewed towards a single species. This approach will allow the assessment to identify benthic invertebrate community patterns throughout the study areas.

# 9. Effects Assessment

The following sections provide discipline-specific input and considerations as they pertain to the methodology for effects assessment. The Project is in the early stage of the IS / EA Report preparation and it is expected that the effects assessment methodology will be refined iteratively based on regulatory agency guidance, professional judgment and input received through the Project consultation and engagement process.

## 9.1 Project-Environment Interactions

The Project activities that may result in changes to the environment are described within the identified temporal and spatial boundaries (**Section 6**). This includes identification of both direct and indirect changes by comparing the existing setting to the conditions anticipated to occur as a result of the Project. For each environmental discipline, the likely Project-environment interactions will be identified based on professional judgment, activities listed in TISG Section 3.2 as well as projects of similar magnitude and/or location.

A preliminary analysis of Project-environment interactions for Fish and Fish Habitat is provided in **Table 9-1** and will be confirmed during the IA / EA process to identify the Project-environment interactions that are likely to have a potential effect, and to identify measures to avoid or minimize potential negative effects and enhance benefits.

**Table 9-1: Project – Environment Interactions**

| Project Phases | Project Activities | Fish and Fish Habitat |
|---|---|---|
| **Construction Phase** | *Mobilization of Equipment and Supplies* | **X** |
| | *Temporary Construction Staging Areas*[1] | **X** |
| | *Temporary Access Roads and Trails*[1] | **X** |
| | *Temporary Construction Camps*[1] | **X** |
| | *ROW Clearing and Grubbing* | **X** |
| | *Brush and Timber Disposal* | **-** |
| | *Pits and Quarries*[1] | **X** |
| | *Drilling / Blasting / Aggregate Production* | **X** |
| | *Road Construction (stripping, subgrade excavation, embankment fill placement, grading, ditching)* | **X** |
| | *Bridge and Culvert Installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls)* | **X** |
| | *Construction Site Restoration* | **X** |
| **Construction Phase: Decommissioning** | *Pits and Quarries* | **X** |
| | *Temporary Camps, Roads / Trails and Staging Areas* | **X** |

| Project Phases | Project Activities | Fish and Fish Habitat |
|---|---|---|
| **Operations Phase** | *Road Usage* | **X** |
| | *Maintenance*[2] | **X** |

*Notes: 1. Includes construction and use of*
*2. Includes General Maintenance (e.g., grading, erosion control, quarrying, borrow pits), Seasonal Maintenance (e.g., snow clearing, bridge and culvert maintenance), and Special Maintenance (e.g., slope failures, road settlement / break-up.).*

# 9.2 Valued Components and Indicators

VCs are the environmental, health, social, economic or additional elements or conditions of the natural and human environment that may be impacted by a proposed project and are of concern or value to the public, Indigenous peoples, federal authorities and interested parties (the Agency 2020b). Indicators represent the resource, feature, or issue related to the VC that, if changed, may demonstrate an effect on the environment. The indicators and rationale for selection and measurement of potential effects, to be used to assess and evaluate the alternative routes in the IS / EA Report are provided in **Table 9-2**. The table includes both quantitative and qualitative indicators. The final list of VCs and indicators to be used in the IS / EA Report will be based on regulatory agency guidance, professional judgement and input received through the Project consultation and engagement process.

**Table 9-2: Fish and Fish Habitat Indicators**

| Valued Component | Indicators | Rationale for Selection |
|---|---|---|
| **Lake Sturgeon (*Acipenser fulvescens*)** | ■ Habitat Quantity and Quality<br>■ Distribution and connectivity to habitat and migration.<br>■ Survival and reproduction | ■ Species of conservation concern (designated as Special Concern under *Species at Risk Act* and *Endangered Species Act*)<br>■ Cultural importance and sustenance |
| **Walleye (*Sander vitreus*)**<br>**Brook Trout (*Salvelinus fontinalis*)**<br>**Northern Pike (*Esox lucius*)**<br>**Lake Whitefish (*Coregonus clupeaformis*)**<br>**Burbot (*Lota lota*)** | ■ Habitat Quantity and Quality<br>■ Distribution and connectivity to habitat and migration.<br>■ Survival and reproduction | ■ Cultural importance and local recreational/economic value and sustenance |

The VCs for Fish and Fish Habitat have been determined through consideration of the following factors listed in the TISG[10]:

- VC presence in the study area;

*10. The TISG also states that information from ongoing and completed regional assessments in the proposed area of the Project should be used to inform VCs for the Project. In February 2020 a regional assessment of the Ring of Fire region commenced; however, it is not sufficiently advanced at this time to inform the Project VCs. The VCs will be consulted and engaged on early in the IA/ EA process and finalized taking into consideration the input received. Therefore, only information relevant to the Project that arises from the regional assessment of the Ring of Fire within an appropriate timeline will inform the VCs for the Project.*

- the extent to which the VC is linked to the interests or exercise of Aboriginal and Treaty rights of Indigenous peoples, and whether an Indigenous group has requested the VC;
- the extent to which the effects (real or perceived) of the Project and related activities have the potential to interact with the VC;
- the extent to which the VC may be under cumulative stress from other past, existing or future undertakings in combination with other human activities and natural processes;
- the extent to which the VC is linked to federal, provincial, territorial or municipal government priorities (e.g., legislation, programs, policies);
- the possibility that adverse or positive effects on the VC would be of particular concern to Indigenous groups, the public, or federal, provincial, territorial, municipal or Indigenous governments; and
- whether the potential effects of the Project on the VC can be measured and / or monitored or would be better ascertained through the analysis of a proxy VC.

Inputs received to date from Indigenous communities, agencies and interested persons through the Consultation and Engagement Program, including inputs received on the Draft ToR, have also been used to inform the selection of the VCs and indicators for the Fish and Fish Habitat discipline.

## 9.3 Potential Effects

A direct effect occurs through the direct interaction of an activity with an environmental discipline. The Project-environment interactions currently anticipated, based upon preliminary analysis, to result in direct effects to the Fish and Fish Habitat discipline have been identified in **Table 9-1**. The potential direct effects resulting from the Project-environment interactions will be confirmed during the IA / EA process and will be based on input received through the Indigenous Knowledge Program and Consultation and Engagement Program, regulatory agency guidance, and professional judgement.

An indirect effect occurs when a change to one environmental discipline resulting from a Project activity causes a change to another environmental discipline (e.g., changes in vegetation could indirectly affect wildlife). **Table 9-3** provides a preliminary identification of how changes to fish and fish habitat may result in indirect effects to other environmental disciplines.

The degree of risk for indirect effect to fish and fish habitat as a result to changes to another discipline varies depending on activity. Certain potential indirect effects are unlikely to result in a detectable effect at all or can typically be mitigated or avoided.

## Table 9-3: Potential Discipline Interactions

| Discipline and Associated Valued Components | Aboriginal Treaty Rights and Interests | Atmospheric Environment | Acoustic and Vibration | Physiography, Terrain and Soils | Surface Water | Groundwater and Geochemistry | Vegetation | Wildlife | Fish and Fish Habitat | Social | Economy | Land and Resource Use | Human Health and Community Safety | Visual Aesthetics | Archaeological and Cultural Heritage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish and Fish Habitat**<br>■ **Lake Sturgeon**<br>■ **Walleye**<br>■ **Brook Trout**<br>■ **Northern Pike**<br>■ **Lake Whitefish**<br>■ **Burbot** | X | - | - | X | X | - | X | X | | X | X | X | X | X | X |

*Notes: X = Potential pathway for indirect effect as a result of the Project.*
*- = No pathway for indirect effect is anticipated as a result of the Project.*

## 9.4 Methods for Predicting Future Conditions

With respect to quantitative models and prediction, the IS / EA Report must detail the model assumptions, parameters, the quality of the data and the degree of certainty of the predictions obtained.

The prediction of potential future conditions or amount of change from baseline conditions for both route alternatives will include:

- The number of road crossings and therefore water crossing structures required;
- Qualitative considerations of water crossing locations, structure types and habitat features (for example, where low impact structures including clear-span bridges are practical versus structures requiring infill);
- An estimated area of fish habitat within the PDA using data from habitat assessment and therefore area of potential disturbance, including temporary disturbance (e.g., in-water work areas and dewatering) during construction phase (i.e., water crossing structure installation) and operations/maintenance phase (i.e., water crossing repairs, replacements);
- Qualitative discussion of the existing activities and infrastructure which may currently or previously have had an effect on fish and fish habitat. Existing activities will be identified using desktop analysis, consultation with local Indigenous communities, and field observations;
- An estimated area of fish habitat with the potential for permanent alteration or destruction during both construction and operations phase, within the immediate footprint of Project components in water; and
- The area of habitat important for fish life functions within the PDA such as VCs' important habitat features (e.g., spawning, nursery, overwintering habitat) and therefore the potential to be changed or disturbed. Habitat suitability for these functions will be identified and quantified in the PDA for VCs, and in turn the area of direct effect and/or footprint from Project component (e.g., water crossing structures) to such features can be quantified.

Qualitative review of the potential future conditions and potential changes to sensitive features within the PDA will also be described. The predictions of changes as a result of the Project and future conditions will be used to inform the effects assessment and identify mitigation, avoidance and protection measures.

# 9.5 Mitigation and Enhancement Measures

Once potential effects have been identified, the effects assessment will explore technically and economically feasible mitigation measures to avoid or minimize the identified negative effects and enhancement measures to increase positive effects beyond those that are already inherent to the design. These measures will consist of industry-standard practices, federal and provincial standard specifications, regulator-mandated measures, best management practices, Indigenous and community recommendations and recommendations from industry and environmental professionals based on expertise, scientific publications, experience and judgement.

It is important that mitigation and enhancement measures are achievable, measurable and verifiable and monitored for compliance and effectiveness during all temporal phases as part of the Project follow-up monitoring plan. Required environmental monitoring will verify the potential environmental effects predicted in the IS / EA Report, evaluate the effectiveness of mitigation and enhancement measures, and identify the process the Proponent will follow if mitigation and enhancement measures are not effective.

## 9.5.1 TISG Section 20 Requirements

There are a number of generic requirements related to mitigation and enhancement measures listed in the TISG that are applicable to Fish and Fish Habitat discipline. The IA / EA will consider the applicability of these generic measures and those that are specific to Fish and Fish Habitat discipline including:

- “identify measures to prevent and mitigate the risk of engaging in activities that cause harmful alteration, disruption or destruction in key sensitive periods and locations (e.g., spawning) for fish”;
- “identify measures to avoid the deposit of substances harmful to fish or migratory birds in water or areas frequented by fish and/or migratory birds”; and,
- “identify measures to prevent water crossings (i.e., culverts) from negatively impacting freshwater fish movement (e.g., due to flow, debris, or “perching”)”.

Conventional mitigation and avoidance measures to reduce the risk of harm to fish and fish habitat are available through industry standard practices and agency guidance. Additional site and/or project-specific mitigation measures may be identified through Indigenous and community consultation, regulatory processes and Agency guidance. Applicable mitigation practices will be discussed in the IS / EA Report and will be included in construction environmental management plan(s) (CEMP) and contract documents.

There are certain activities associated with the Project where, left unmitigated, are likely to result in significant harm. Therefore, it is important to include mitigation measures in the IS / EA Report to identify the residual effects of an activity following implementation of such measures. Proper implementation of mitigation measures can minimise or completely negate the risk of harm from occurring as a result of the Project.

The IS / EA Report will provide the framework for a future CEMP (to be developed prior to construction), related to its implementation and the standard measures and practices included therein that will be implemented into the Project, such as:

- In-water work timing windows;
- Blasting measures in accordance with the *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright, Hopky, 1998);
- DFO's Measures to Protect Fish and Fish Habitat;
- DFO's Interim Codes of Practice (temporary cofferdams, stream crossings, fish screens, culvert maintenance [for operations]);
- Measures such as avoiding unnecessary idling to minimise emissions and greenhouse gasses;
- Development of a Spill Management Plan and Sediment and Erosion Control Plan; and
- Proper water crossing structure design and installation to accommodate flow and drainage as well as fish passage in fish habitat.
- Measures to limit the spread and / or introduction of invasive species.

Typically, the Contractor is responsible for implementation of the CEMP. The responsible party will be identified in the discussion pertaining to the CEMP. Rationale will be provided in the IS / EA Report in the event that any applicable standard measures are omitted from the environmental construction management plan, if any. Where it is determined that negative residual effects will not be avoided or mitigated and are likely to result in the death of fish or the harmful alteration, disruption or destruction of fish habitat, these negative residual effects will be described in relation to the baseline condition, and quantified by anticipated number and species of fish, and / or area of habitat impacted by the residual effect where applicable (depending on the effect). This information would be used for inclusion in a Request for Project Review for submission to DFO Fish and Fish Habitat Protection Program for DFO to assess for compliance with the *Fisheries Act* and determine whether an Authorization under this Act is required. If the risk of residual negative effects to fish or fish habitat cannot be mitigated or avoided and an Authorization is required, plans will be developed to obtain habitat credits or to offset the negative residual effect. The offsetting plan would be developed in consideration of the policies, guidance and Indigenous consultation referenced within this Study Plan (as applicable), including the *Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the Fisheries Act* (DFO, 2019), the Operational Framework for Use of Conservation Allowances (ECCC, 2012), and any applicable recovery strategies or species management objectives. A plan to monitor the effectiveness of the offsetting measures will also be described.

Typical mitigation and avoidance measures such as standard practices for construction, road and water crossing construction and maintenance. will be applied to both construction and operation phases of the project.

# 9.6 Residual Effects

Residual effects are the effects remaining after the application of mitigation measures. The IS / EA Report will describe in detail the potential adverse and positive residual effects in relation to each temporal phase of the Project (e.g., construction, operation). The residual effects predicted following implementation of avoidance and mitigation measures will be described using criteria to quantify or qualify adverse and positive effects, taking into account any important contextual factors. The residual effects will therefore be described in terms of the direction, magnitude, geographic extent, duration, frequency, likelihood, and whether effects are reversible or irreversible[11]. Ecological and socio-economic context may also be relevant when describing a residual effect. Context relates to the existing setting, its level of disturbance and resilience to adverse effects. Context can also relate to timing as it applies to assessing the worst-case scenario (e.g., effect during fish spawning periods), potential accidents and malfunctions. Where appropriate, information regarding residual effects will be disaggregated by sex, gender, age and other relevant community identifying factors to identify disproportionate residual effects for diverse subgroups.

## 9.6.1 Magnitude

For magnitude, environmental discipline-specific definitions are required and are proposed below in **Table 9-4**.

**Table 9-4: Fish and Fish Habitat Magnitude Definition**

| Magnitude Level | Definition | Rationale |
|---|---|---|
| **Negligible** | ■ None or negligible change to baseline habitat conditions or fish behaviour. | ■ No change in function or productivity of VC habitat<br>■ No change in behaviour or survival of VC<br>■ Minor change in VC habitat, to a degree that does not reduce productivity or function<br>■ Minor disturbance to VC behaviour that does not impede them from carrying out their life processes. For example, temporary impediments to fish movement or access to habitat during dewatering, outside of important timing windows such as spawning. |

*11. TISG Section 13.1 identifies additional effects characteristics for certain disciplines (e.g., wetlands, birds, terrestrial wildlife, species at risk). These additional effects characteristics are described in the respective discipline-specific study plans.*

| Magnitude Level | Definition | Rationale |
|---|---|---|
| **Low** | ■ Minor change to baseline habitat and conditions, without loss of function or individuals. | ■ Habitat of VCs remain suitable and functional, but decrease in productivity<br>■ Minor or temporary disturbance to fish that may interrupt a life process but not decrease productivity or prevent fish from carrying out the activity<br>■ For example, alteration or infill of a minor portion of productive littoral area used by VC for feeding<br>■ Does not result in the death of fish |
| **Medium** | ■ Change to baseline habitat and conditions that results in decrease in function and productivity, and/or potential harm to fish. | ■ Habitat quality and function is reduced but not eliminated<br>■ Decrease in productivity<br>■ Impediment to fish from carrying out life processes<br>■ Potential incidental death of fish, to a degree that is not likely to disrupt overall population dynamics |
| **High** | ■ Change to baseline habitat and conditions that renders them unusable to fish, and/or the likelihood of harm to fish. | ■ Destruction, complete displacement or alteration of habitat, rendering it no longer suitable for the function at baseline conditions<br>■ Loss of productivity as a result of loss of habitat function<br>■ Restricting fish from carrying out life processes, such as complete barrier to fish migration to spawning habitat<br>■ The death of fish to a degree that result in changes to population dynamics. |

## 9.7 Consideration of Sustainability Principles

The following provides a generic description of how sustainability principles will be considered in the effects assessment. The extent to which sustainability principles apply to a specific VC will vary depending on the nature of the VC and the potential for Project effects on the VC.

The effects assessment approach for the Project has included the consideration of the sustainability principles outlined in the Project TISG and the Agency's guidance on sustainability. The sustainability principles that have been considered include:

1. Consider the interconnectedness and interdependence of human-ecological systems;
2. Consider the well-being of present and future generations;
3. Consider positive effects and reduce adverse effects of the Project; and
4. Apply the precautionary principle by considering uncertainty and risk of irreversible harm.

The interconnectedness and interdependence of human-ecological systems will be considered through the assessment of potential indirect effects of each alternative. An indirect effect occurs when a change to one environmental discipline resulting from a Project activity causes a change to another environmental discipline (e.g., changes in vegetation could indirectly affect wildlife). A preliminary assessment of indirect effects has been included in **Section 9.3**.

The well-being of present and future generations will be considered in the effects assessment through the application of the long-term operations phase temporal boundary of 75 years (**Section 6.1**) and through the effects characteristics description of duration and reversibility for each residual effect predicted.

The consideration of positive effects and reducing adverse effects of the Project is fundamental to the effects assessment methodology through the identification of mitigation measures to reduce potential adverse effects and the identification of the preferred alternative through the evaluation of advantages (e.g., positive effects) and disadvantages (e.g., adverse effects).

The effects assessment will apply the precautionary principle by clearly describing and documenting all uncertainties and assumptions underpinning the analysis and identifying information sources. The effects assessment will consider risk of irreversible harm through the effects characteristics description of reversibility for each residual effect predicted and will describe any uncertainty associated with the assessment of residual effects.

The scope of the sustainability assessment will be defined by issues of importance identified by Indigenous communities and interested persons through consultation and engagement activities, while also ensuring to be inclusive of the diversity of views expressed. The selection of VCs that will be the focus of the sustainability assessment will be aligned with the issues of importance identified by Indigenous communities and interested persons, as well as residual effects identified through the effects assessment process. The sustainability assessment will describe how the planning and design of the Project, in all phases including follow-up monitoring, considered the sustainability principles.

## 9.8 Consideration of Identity and Gender-Based Analysis Plus in Effects Assessment

The Proponent recognizes that communities and sub-populations within those communities may be impacted differently by the Project with respect to VCs and indicators. As such, the Project aims to collect baseline information for the purpose of assessing differential effects and establishing relevant mitigation measures, as further elaborated on in **Section 4.3**. Gender-Based Analysis Plus will not be limited to

community feedback, when offered or discussed in secondary texts, additional sub-population information as is applicable to the relevant assessment will be incorporated.

## 9.9 Follow-up Programs

A follow-up program verifies the accuracy of the effects assessment and evaluates the effectiveness of mitigation measures. Identification of follow-up programs for the Project are not described in this Study Plan as the information needed to determine environmental monitoring requirements is dependent on the outcome of the effects assessment and consultation with Indigenous communities, agencies and interested persons. Therefore, the Proponent will include information on follow-up programs that address the requirements outlined in Section 26 of the TISG and in the IS / EA Report, and will identify the compliance and effects monitoring activities to be undertaken during all phases of the Project, as required.

Compliance and effects monitoring is a typical component of a CEMP in order to monitor the implementation and effectiveness of mitigation and avoidance measures of the CEMP. Monitoring requirements are typically included in contract documents and applicable permits to document the residual effects (if any) and to make recommendations of corrective action if required. As noted above, the need for and / or details of a follow-up program specific to fish and fish habitat will be determined following completion of the IA / EA and design details. Where such a program is required, development of the program will take into consideration the predicted residual effect, monitoring, reporting, implementation and intervention responsibilities, input and participation of Indigenous communities, regulatory requirements, and monitoring frequency and duration.

### 9.9.1 TISG Section 26 Requirements

Offsetting of the harmful alteration, disruption or destruction of fish habitat (if required) often requires a follow-up monitoring program as a requirement of Authorization under the *Fisheries Act*. However, determination of the potential for and extent of the harmful alteration, disruption or destruction will not be known until the effects assessment and water crossing structure preliminary design is complete.

Applicable requirements in Section 26 of the TISG will be considered in the design of follow-up programs related to Fish and Fish Habitat discipline, where required.

# 10. Assumptions

Implementation of avoidance, protection and mitigation measures are standard industry practice for road and water crossing construction and are a requirement for regulatory approvals. Contingencies are included in this Study Plan for the IA / EA development for unlikely effects through the implementation of standard industry practices, such as encroachment of project components and facilities other than a waterbody crossing structure below the high water mark of a waterbody (e.g., structures, aggregate, sources), where it is standard practice to avoid encroachment and maintain a setback from waterbodies for such components. However, it is assumed that applicable standard industry practices and requirements to mitigate or avoid effects to fish and fish habitat will be implemented into the Project construction and operation phases.

Assumption used in the IA / EA, for example the assumed average daily traffic on the CAR, will be clearly identified and a rationale provided. These include typical mitigation and avoidance measures following industry standards and guidance as summarized in **Section 9.5**.

# 11. Concordance with Federal and Provincial Guidance

This Section provides the best information currently available on how federal and provincial requirements identified for the Project to date will be addressed. The final concordance with federal and provincial requirements will be included in the IS / EA Report, and will be based on regulatory agency guidance, professional judgement and input received through the Project consultation and engagement process.

## Table 11-1: Study Plan Federal Concordance – Conformance with Requirements

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **1** | TISG Section 1.1, page 4 | ▪ The Guidelines correspond to factors to be considered in the impact assessment. These factors are listed in subsection 22(1) of IAAC and prescribe that the impact assessment of a designated project must take into account any change to the designated project that may be caused by the environment; | ▪ The potential effects of the project on Fish and Fish Habitat and the potential effects of the environment on the project will be assessed in accordance with applicable standards and guidance. | ▪ Section 9 |
| **2** | TISG Section 2.3, pages 6-7 | ▪ The description should focus on aspects of the Project and its setting that are important in order to understand the potential environmental, health, social and economic effects and impacts of the Project. The following information must be included and, where appropriate, located on map(s):<br>– geographic coordinates (i.e., longitude/latitude using international standard representation in degrees, minutes, seconds) for the beginning and end points of the proposed road;<br>– current land and/or aquatic uses within the study areas;<br>– distance of the project components to any federal lands and the location of any federal lands within the study areas;<br>– all waterbodies and their location on a map;<br>– navigable waterways;<br>– the environmental significance and value of the geographical setting in which the Project will take place and the study areas;<br>– environmentally sensitive areas, such as national, provincial, territorial and regional parks, UNESCO World Heritage Sites, geological heritage sites, ecological reserves, ecologically and biologically sensitive areas, wetlands, and habitats of federally or provincially listed species at risk and other sensitive areas;<br>– Dedicated Protected Areas3 and any other areas of ecological and social significance identified by the community during the community-based land use planning processes with the Province of Ontario (e.g., Enhanced Management Areas; see Section 6.1 for requirements related to confidentiality);<br>– lands subject to conservation agreements;<br>– current mineral development proposals, and areas of early and advanced mineral exploration in the study areas;<br>– current areas of aggregate extraction;<br>– description and locations of all potable drinking water sources (i.e., municipal or private), including spring water sources;<br>– description of local communities and Indigenous groups that is culturally relevant and gender sensitive;<br>– if the information is not confidential, provide a description and location of Indigenous traditional territories and/or consultation areas, Treaty and/or Title lands, Indian Reserve lands, Indigenous harvesting regions (with permission of Indigenous groups), Métis settlements; and<br>– culturally important features of the landscape. | ▪ The information related to landscape features, sensitive or protected areas and other items listed in the TISG will be illustrated on detailed maps and / or described within the IS / EA Report, where appropriate. This information will be gathered through the desktop analysis, consultation and community engagement and field studies as described in the Study Plan. | ▪ Section 7<br>▪ Section 8 |
| **3** | TISG Section 3.1, page 11 | ▪ The Impact Statement must describe all project components including but not limited to:<br>– borrow pits, gravel or aggregate pits and quarries (footprint, geographic location, ownership, and development plans including pit phases and lifespan), including their location in relation to upland habitats and the presence of rare, limited and/or significant habitat (e.g., federal, provincial, or Indigenous protected and conserved areas, ANSIs (Areas of Natural and Scientific Interest), Ramsar sites, critical habitat identified under the Species at Risk Act, etc.; | ▪ Study Plan Section 6.2 indicates that the Project Development Area (PDA) encompasses the 100 metre wide CAR right-of-way (ROW), temporary construction access roads, work areas, worker camps, pits and quarries, and associated access roads. The specific location of Project components, including the roadway, quarries and pits, and temporary infrastructure, are not yet known and will be included in the IS / EA Report. | ▪ Section 6.2 |
| **4** | TISG Section 5.1, page 22 | ▪ Any proposed mitigation measures are to be clearly linked, to the extent possible, to valued components in the Impact Statement as well as to specific project components or activities, as well as comments raised during engagement activities | ▪ Once potential effects have been identified, the effects assessment will explore technically and economically feasible mitigation measures to avoid or minimize the identified negative effects and enhancement measures to increase positive effects. | ▪ Section 9.5 |

*12. Federal TISG Reference should be the Section or subsection, page etc. that clearly identifies where comment/issue we are addressing can be found (ex. Section 8.1 of TISG)*

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **5** | TISG Section 7.1, page 29 | ▪ In describing the biophysical environment, the Impact Statement must take an ecosystem approach that considers how the Project may affect the structure and functioning of biotic and abiotic components with the ecosystem using scientific, community and Indigenous knowledge regarding ecosystem health and integrity, as applicable. The Impact Statement must provide a description of the indicators and measures used to determine ecosystem health and integrity, identified during early planning and reflected in the TISG. The presence of habitat (e.g., federal, provincial, or Indigenous protected areas, ANSIs, RAMSAR sites, critical habitat identified under the Species at Risk Act, etc.), such as but not limited to spawning shoals, aquatic vegetation or overwintering pools, potentially affected by the Project should be included in the description of the biophysical baseline conditions. | ▪ We will take an ecosystem approach that considers how the project may affect structure and functioning of biotic and abiotic ecosystem components and the potential residual effects as a result of these changes. This includes areas of indigenous cultural importance, descriptions of ecosystem health and integrity, the presence of protected areas and critical habitat for SAR species. | ▪ Section 9 |
| **6** | TISG Section 7.1, page 30 | ▪ The Impact Statement must establish appropriate study area boundaries to describe the baseline conditions. The study area boundaries need to encompass the spatial boundaries of the Project, including any associated project components or activities, and the anticipated boundaries of the Project effects, including all potentially impacted local communities, municipalities and Indigenous groups. Considerations in assigning appropriate study areas or boundaries would include, but not be limited to:<br>– areas potentially affected by changes to water quality and quantity or changes in flow in the watershed and hydrologically connected waters;<br>– areas potentially effected by airborne emissions or odours;<br>– areas determined by dispersion and deposition modelling;<br>– areas within the range of vision, light and sound and the locations and characteristics of the most sensitive receptors;<br>– species habitat areas, usage timing and migratory patterns;<br>– emergency planning and emergency response zones;<br>– the geographic extent of local and regional services;<br>– any impacted local communities, including municipalities;<br>– all potentially impacted Indigenous groups;<br>– areas of known Indigenous land, cultural, spiritual and resource use; and<br>– existing effected infrastructure. | ▪ The Study Areas are defined and described in the Study Plan. | ▪ Section 6 |
| **7** | TISG Section 7.1, page 30 | ▪ The Impact Statement must consider the resilience of relevant species populations, communities and associated habitats to the effects of the Project. Ecological processes should be evaluated for potential susceptibility to adverse effects from the Project. Considerations include patterns and connectivity of habitat patches; continuation of key natural disturbance regimes; structural complexity; hydrogeological or oceanographic patterns; nutrient cycling; abiotic-biotic and biotic interactions; population dynamics, genetic diversity, Indigenous knowledge relevant for the conservation and sustainable use of relevant species populations, communities and associated habitats. | ▪ The IA / EA will consider the resilience of relevant populations, communities and associated habitat to the effects of the Project. Ecological processes will be evaluated for potential susceptibility to adverse effects from the Project such as considerations for: patterns and connectivity of habitat patches, continuation of key natural disturbance regimes. | ▪ Section 8<br>▪ Section 9 |
| **8** | TISG Section 7.1, page 30 | ▪ If the baseline data have been extrapolated or otherwise manipulated to depict environmental, health, social and/or economic conditions within the study area, modelling methods must be described and must include assumptions, calculations of margins of error and other relevant statistical information. Models that are developed should be validated using field data from the appropriate local and regional study areas. Ensure baseline data is representative of project site conditions. If surrogate data from reference sites are used rather than site-specific surveys, the proponent should demonstrate that the data are representative of project site conditions. | ▪ We will include details on modeling methods and discuss confidence in using desktop and / or field studies when describing baseline conditions. | ▪ Section 7<br>▪ Section 8 |
| **9** | TISG Section 7.1, page 31 | ▪ Where baseline data are available in geographic information system (GIS) format, this information is to be provided to the Agency as electronic geospatial data file(s) compliant with the ISO 19115 standard. This would support the Government of Canada's commitment to Open Science and Data and would facilitate the sharing of information with the public through the Canadian Impact Assessment Registry Internet Site and the Government's Open Science and Data Platform. The Agency intends to make the geospatial data files available to the public under the terms of the Open Government License – Canada. | ▪ Data provided will meet ISO 19115 standards. | ▪ Section 8 |

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **10** | TISG Section 7.2, pages 31-33 | ▪ Information sources and data collection methods used for describing the baseline environmental, health, social and economic setting may consist of the following sources of information. For specific sources of baseline information, see Appendix 1.<br>– Federal government (e.g., Environment and Climate Change Canada, Health Canada, Indigenous Services Canada, Statistics Canada, Women and Gender Equality Canada);<br>– Ontario provincial government (e.g., Ministry of Environment, Conservation, and Parks, Ministry of Natural Resources and Forestry;<br>– Bird Conservation Region plans;<br>– academic institutions;<br>– field studies, including site-specific survey methods;<br>– database searches, including:<br>– federal, provincial, territorial, municipal and local data banks;<br>– Breeding Bird Atlas - Ontario (2001-2005)<br>– monitoring program databases protected areas, watershed or coastal management plans;<br>– natural resource management plans;<br>– species recovery and restoration plans;<br>– field measurements to gather data on ambient or background levels for air, water, soil and sediment quality, light levels or acoustic environment (soundscape);<br>– land cover data, including:<br>• terrestrial ecosystem mapping products;<br>• forest cover maps;<br>• remote sensing resources;<br>• important habitats and features to include:<br>▪ water bodies, wetlands, watercourses;<br>▪ riparian habitat;<br>▪ river banks or other eroded habitats;<br>▪ artificial water sources;<br>▪ forest, tree patches, solitary trees (especially old decaying trees);<br>▪ forest edges and tree rows;<br>▪ ridges, including eskers;<br>▪ caves and mines;<br>▪ cliffs, rock outcrops, exposed bedrock, talus, and other karst topography;<br>▪ buildings, bridges, and other anthropogenic features, including linear features;<br>▪ sources of artificial lighting attracting insects;<br>▪ critical habitat; and<br>▪ and any other habitat features known to be important in the area.<br>– Published literature, such as peer reviewed journals, reports by think tanks, non-government organizations and government reports;<br>– environmental assessment documentation, including monitoring reports, from prior projects in the area and similar projects outside the area;<br>– regional studies, project assessments and strategic assessments;<br>– renewable harvest data;<br>– Indigenous knowledge, including oral histories and knowledge gathered by spending time on the land with knowledge holders;<br>– community based monitoring and studies conducted by Indigenous communities;<br>– expert, community, public and Indigenous engagement and consultation activities, including workshops, meetings, open houses, surveys; | ▪ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report. | ▪ Section 7<br>▪ Appendix A |

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| | | – qualitative information gathered from interviews, focus groups or observation;<br>– census data;<br>– baseline human health risk assessments;<br>– community and regional economic profiles;<br>– community well-being studies; and<br>– statistical surveys, as applicable. | | |
| **11** | TISG Section 7.2, page 32 | ▪ The Impact Statement must provide detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental, health, social and economic condition that is described, in order to corroborate the validity and accuracy of the baseline information collected. | ▪ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ▪ Section 7 |
| **12** | TISG Section 7.2, page 33 | ▪ If using existing data sources, the Impact Statement must provide justification to show that the data sources are relevant in spatial and temporal coverage to the Project. Some data sources may have good coverage in Southern Ontario or existing road networks but be unsuitable as a baseline for these northern areas where there are not roads. | ▪ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report. | ▪ Section 7<br>▪ Appendix A |
| **13** | TISG Section 7.2, page 33 | ▪ Consult the Species at Risk Public Registry for information on the list of species at risk and available recovery documents and reference the documents and dates consulted. Ensure the most up to date documents are used and species statuses are up to date. | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 9 |
| **14** | TISG Section 7.2, page 33 | ▪ Baseline data must be collected in a manner that enables reliable analysis, extrapolations and predictions. Resulting data should be suitable for analyses to estimate pre-project baseline conditions, derive predictions of impacts, and evaluate and compare post-project conditions and at scales of within and across the Project, Local and Regional Assessment areas. Modelling methods, error estimates and assumptions should be reported (as per section 7.1). Modelling and simulations should be used early in the planning phase to estimate the necessary sampling intensity and to quantitatively evaluate the effectiveness of design options. Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to. | ▪ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ▪ Section 7 |
| **15** | TISG Section 7.2, page 33 | ▪ Data directly relevant to the area surrounding the Project are limited. With the exception of existing count data that have been collected within the regional study area, the use of existing information sources should be limited to the goals of estimating the species likely to occur in the study areas, and to identifying the potential timing of migration passage (for species that migrate through) or the general dates of breeding (for species that breed in the area). | ▪ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report. | ▪ Section 7 |
| **16** | TISG Section 7.3, page 34 | ▪ The list of valued components must be informed, validated and finalized through engagement with the public, Indigenous groups, lifecycle regulators, jurisdictions, federal authorities, and other interested parties. The Impact Statement must describe valued components, processes, and interactions that are identified to be of concern or that the Agency considers likely to be impacted by the Project and are included in the Guidelines. | ▪ A summary of the consultation plan for Indigenous communities, government agencies, and interested persons has been provided in Section 4 of the Study Plan; further details can be found in the IS / EA Consultation Plan included as Appendix B of the Proposed ToR. Specific consultation and engagement activities and schedules are currently in development and will be shared with MECP and The Agency once available. | ▪ Section 4 |
| **17** | TISG Section 7.3, pages 34-35 | ▪ In selecting a valued component to be included, the following factors should be considered:<br>– valued component presence in the study area; "<br>– "the extent to which the valued component is linked to the interests or exercise of Aboriginal and Treaty rights of Indigenous peoples, and whether an Indigenous group has requested the valued component;<br>– "the extent to which the effects (real or perceived) of the Project and related activities have the potential to interact with the valued component;<br>– "the extent to which the valued component may be under cumulative stress from other past, existing or future undertakings in combination with other human activities and natural processes;<br>– "the extent to which the valued component is linked to federal, provincial, territorial or municipal government priorities (e.g., legislation, programs, policies); | ▪ The IS / EA Report will include detailed descriptions of the VCs and the rationale for their inclusion to describe their importance and the predicted residual effects (adverse and positive) as a result of the project. | ▪ Section 9 |

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| | | – "the extent to which the valued component is being addressed through any ongoing or completed regional assessment processes;<br>– "the possibility that adverse or positive effects on the valued component would be of particular concern to Indigenous groups, the public, or federal, provincial, territorial, municipal or Indigenous governments; and<br>– whether the potential effects of the Project on the valued component can be measured and/or monitored or would be better ascertained through the analysis of a proxy valued component. | | |
| **18** | TISG Section 7.3, page 35 | ▪ The valued components must be described in sufficient detail to allow the reviewer to understand their importance and to assess the potential adverse and positive environmental, health, social and economic effects and impacts arising from the Project activities. | ▪ The IS / EA Report will include detailed descriptions of the VCs and the rationale for their inclusion to describe their importance and the predicted residual effects (adverse and positive) as a result of the project. | ▪ Section 9 |
| **19** | TISG Section 7.3, page 35 | ▪ For each of the valued components that will be assessed in the Impact Statement, the proponent must create a study plan and a work plan to be validated by the Agency. Upon receipt of a study plan, the Agency may request that the proponent present and discuss the study plan at technical meetings, which will be scheduled during the impact statement phase. | ▪ The Study Plan meets this requirement. A summary of the technical discussions with agencies have been summarized in Section 3 of the Study Plan. | ▪ Section 3 |
| **20** | TISG Section 7.4.1, pages 35-36 | ▪ The Impact Statement must describe the spatial boundaries, including project, local and regional study areas, for each valued component included in assessing the potential adverse and positive environmental, health, social and economic effects of the Project and provide a rationale for each boundary. Spatial boundaries are defined taking into account the appropriate scale and spatial extent of potential effects and impacts of the Project; community knowledge and Indigenous knowledge; current or traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; and physical, ecological, technical, social, health, economic and cultural considerations. The size, nature and location of past, present and foreseeable future projects and activities are factors that should be included in the definition of spatial boundaries. It should be noted that in some cases, spatial boundaries might extend to areas outside of Canada. These transboundary spatial boundaries should be identified where transboundary effects are expected. | ▪ The Study Areas are defined and described in the Study Plan. | ▪ Section 6 |
| **21** | TISG Section 7.4.1, page 36 | ▪ For valued components establish three study area spatial boundaries to assess impacts to each valued component:<br>1) Project Study Area: defined as the project footprint for each alternative route; "<br>2) Local Study Area: defined for each valued component – see below;<br>3) Regional Study Area: defined for each valued component – see below<br>▪ Provide a rationale for boundaries of the project study area, local study area, and regional study area for each valued component and indicate how the above objectives were met in establishing the boundaries. | ▪ The Study Areas are defined and described in the Study Plan. | ▪ Section 6 |
| **22** | TISG Section 7.4.1, page 36 | ▪ For biophysical valued components, spatial boundaries should be defined using an ecosystem-centered approach for the project study area, local study area, and regional study area, as wetlands and eskers are features that are likely to be most affected. Ecoregion boundaries or their derivatives should not be used since the Project occurs on, near and across ecoregion boundaries. See Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012 for more guidance on determining spatial boundaries. Delineate spatial boundaries (i.e., regional study area, local study area, and project study area) to meet the following objectives:<br>a. range of land cover types should be representative of the defined spatial extent;<br>b. the spatial pattern of the land cover types should be well distributed across the defined spatial extent (e.g., revise if one or more land cover types is concentrated in one sub-area and uncommon in other parts of the area); and<br>c. low to moderate rate of change in the prevalence of one or more land cover types with increasing distance from the (i.e., to use land cover patterns to constrain the distances within which comparisons should be made). | ▪ The Study Areas are defined and described in the Study Plan. | ▪ Section 6 |
| **23** | TISG Section 7.4.2, page 37 | ▪ The temporal boundaries of the impact assessment span all phases of the Project determined to be within the impact assessment. If potential effects are predicted after project decommissioning or abandonment, this should be taken into consideration in defining specific boundaries. In order to assess a project's contribution to sustainability, consideration should be given to the long-term effects on the well-being of present and future generations. When defining temporal boundaries, the proponent should consider how elements of environmental, health, social and economic well-being that local communities, including municipalities, and Indigenous groups identify as being valuable could change over time. | ▪ The Study Areas are defined and described in the Study Plan. | ▪ Section 6 |

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **24** | TISG Section 8.8, page 48 | ▪ The Impact Statement must identify the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline biodiversity for fish and marine animals, including the rationale for their selection | ▪ Indicators have been identified based on background information, consultation with regulatory agencies, public and indigenous consultation. | ▪ Section 9 |
| **25** | TISG Section 8.8, page 48 | ▪ The Impact Statement must provide information on the surveys carried out and the source of data available (e.g., location of sampling stations, catch methods, date of catches, species, catch-per-unit effort); | ▪ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ▪ Section 7 |
| **26** | TISG Section 8.8, page 48 | ▪ The Impact Statement must describe primary and secondary productivity in affected waterbodies with a characterization of biotic interaction, season variability ranges and sensitive periods | ▪ Data collection includes both fish (large and small-bodied) and benthic invertebrates. Seasonal variability will be assessed (as described in the Study Plan). | ▪ Section 7<br>▪ Section 8 |
| **27** | TISG Section 8.8, page 48 | ▪ The Impact Statement must list any aquatic species at risk, including critical habitat, that are known to be present within the study area; | ▪ Desktop analysis (including IK information) will identify SAR with the potential to occur in the study areas. | ▪ Section 7 |
| **28** | TISG Section 8.8, page 48 | ▪ The Impact Statement must describe habitat by mesohabitat (e.g., pool, riffle, run), including the length of the section, width of the channel from the high-water mark (bankfull width), water depths, type of substrate (sediments), aquatic and riparian vegetation. Provide maps and photos; | ▪ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ▪ Section 7<br>▪ Section 8 |
| **29** | TISG Section 8.8, page 48 | ▪ The Impact Statement must identify natural obstacles (e.g., falls, beaver dams) or existing structures (e.g., water crossings) that hinder the free passage of fish; | ▪ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ▪ Section 7<br>▪ Section 8 |
| **30** | TISG Section 8.8, page 48 | ▪ The Impact Statement must provide a characterization of fish habitat features that may demonstrate the presence of fish species in terms of appropriate habitats—water quality and quantity characteristics, sediment type characteristics, benthic features, prey, shelter, refuge, feeding, spawning habitats, nursery habitats, rearing habitats, overwintering, migration routes and the sensitive times for these activities; | ▪ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ▪ Section 7<br>▪ Section 8 |
| **31** | TISG Section 8.8, page 48 | ▪ The Impact Statement must provide written description and maps of primary, secondary and tertiary watersheds and major and minor rivers and lakes; | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **32** | TISG Section 8.8, page 48 | ▪ The Impact Statement must provide a description and location of critical habitats for aquatic species at risk that are known to be present within the study area; | ▪ The information requested will be provided in the IS/ EA Report. | ▪ Section 7<br>▪ Section 8 |
| **33** | TISG Section 8.8, page 49 | ▪ The Impact Statement must describe any existing effects associated with previous or current activities (e.g., angling pressures, commercial fisheries); and | ▪ The IS / EA Report will include a discussion of these activities and the identified or and potential effects of these activities to fish and fish habitat, where available and relevant to understanding Project-related effects. Consequential effects on Land and Resource Use and Aboriginal and Treaty Rights and Interests will also be considered in the IS / EA Report. Data on resource use activities will be gathered as described in those referenced Study Plans. | ▪ Section 9<br>▪ Land and Resource Use Study Plan Aboriginal and Treaty Rights and Interests Study Plan |
| **34** | TISG Section 8.8, page 49 | ▪ The Impact Statement must identify sensitive habitat areas (e.g., Ecologically and Biologically Sensitive Areas) within the study area. | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **35** | TISG Section 8.8, page 49 | ▪ Certain intermittent and ephemeral watercourses or waterbodies may constitute fish habitat or contribute indirectly to fish habitat during a certain period. The absence of fish or water at the time of the survey does not irrefutably indicate an absence of fish and/or fish habitat (e.g., migratory corridor). | ▪ All watercourse features will be examined as described in the Study Plan. Justification for considering features as waterbodies and/or fish habitat will be provided in the IS / EA Report. | ▪ Section 7 |

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| **36** | TISG Section 8.11, page 60 | ▪ The Impact Statement must provide a list of all species at risk listed under Schedule 1 of the federal Species at Risk Act that may be directly or indirectly effected by the Project. Use existing data and literature as well as surveys to provide current field data that reflects the natural inter-annual and seasonal variability of each species. Species at risk which may inhabit the project area include:<br>– Lake sturgeon (*Acipenser fulvescens*);<br>– Northern Myotis (*Myotis septentrionali*);<br>– Little Brown Myotis (*Myotis lucifugus*);<br>– Caribou (*Rangifer tarandus*; Provincial: Missisa, Nipigon, and Pagwachuan ranges; Federal: Far North range);<br>– Rusty Blackbird (*Euphagus carolinus)*;<br>– Bank Swallow (*Riparia riparia*);<br>– Barn Swallow (*Hirundo rustica*);<br>– Canada Warbler (*Cardellina canadensi*);<br>– Chimney Swift (*Chaetura pelagica*);<br>– Common Nighthawk (*Chordeiles mino*);<br>– Eastern Whip-poor-will (*Antrostomus vociferu*);<br>– Evening Grosbeak (*Coccothraustes vespertinus*);<br>– Olive-sided fly-catcher (*Contopus cooperi*);<br>– Peregrine Falcon (*Falco peregrinus*);<br>– Short-eared Owl (*Asio flammeus*);<br>– Yellow Rail (*Coturnicops noveboracensis*); and<br>– Wolverine (*Gulo gulo*); | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **37** | TISG Section 8.11, page 60 | ▪ Collect species at risk data to represent the following temporal sources of variation:<br>– among years;<br>– within and among seasons (e.g., spring dispersal, breeding, late summer/fall migration and swarming, hibernation); and<br>– within the 24 hour daily cycle. | ▪ Data (desktop and field-based) will be collected to represent temporal sources of species variation (i.e. among years, among seasons and within 24 periods). | ▪ Section 7 |
| **38** | TISG Section 8.11, page 60 | ▪ The Impact Statement must [identify] key habitat associated with species at risk should be considered valued components, including eskers and similar geologic features, wetlands and peatlands; | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **39** | TISG Section 8.11, page 61 | ▪ Contain complete data sets from all survey sites. These should be in the form of complete and quality assured relational databases, with precisely georeferenced site information, precise observation/visit information and with observations and measurements in un-summarized form. Databases and GIS files should be accompanied by detailed metadata that meets ISO 19115 standards; | ▪ Data provided will meet ISO 19115 standards. | ▪ Section 8 |
| **40** | TISG Section 8.11, page 61 | ▪ Account for the fact that rare species will require more survey effort to detect, which should be reflected in survey design by increasing the number and duration of surveys:<br>– collect field data over at least two years. The goal of collecting data over multiple years is to improve the understanding of natural variability in populations. Two years of sampling is being suggested as a minimum. As the number of sampling years increases so does the understanding of natural variability;<br>– Sample size must be planned to support a robust evaluation of the project study area within the context of the local study area and regional study area;<br>– Design of surveys will need to consider multiple number of survey locations in order to represent the habitat heterogeneity of the regional study area, and to plan the number of survey locations per land cover or habitat class so that aggregation of habitat classes post-hoc is not required; | ▪ Studies to characterize the baseline conditions are described in this Study Plan and took into account Lake Sturgeon, selected as an indicator species. Field studies specifically targeting Lake Sturgeon are not proposed. Field assessments are conducted at a subset of crossings, and a subset of these are repeated between years and/or seasons to understand seasonal and annual variability. Sites were selected to characterize habitat types on a scaled approach and at representative waterbodies, taking into account the scope of work of the project and likely extent of project components and footprint. | ▪ Section 7 |

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| | | – In terms of sampling effort per unit area, field survey effort should be most intensive within the project study area. The level of effort per unit area may be similar or somewhat less within the remainder of the local study area but should be scaled to the likelihood that project effects will impact species at risk within that zone. Efforts outside the project study area should be carefully designed to ensure that estimates comparing and across the project study area, local study area and regional study area are unbiased and precise;<br>– A habitat-stratified random sampling approach should be used. Sample sites should be selected with a randomization procedure such as a GIS grid overlay; and<br>– Where Critical Habitat has not been defined or has been partially identified, a Schedule of Studies may have been created to identify gaps in information for these species. The Schedule of Studies information should be referred to when implementing or assessing survey protocols, in order to provide necessary information for these species. | | |
| **41** | TISG Section 8.11, page 61 | ▪ Ensure that, at minimum, the combined information from existing data and field surveys must be able to describe the distribution and abundance of species at risk in relation to the study areas; | ▪ Field surveys, desktop analysis and delineation of potential suitable habitat within the PDA, will be used to identify the potential occupancy of Lake Sturgeon. | ▪ Section 7 |
| **42** | TISG Section 8.11, page 61 | ▪ Provide documentation and digital files for all results of analyses that allow for a clear understanding of the methods and a replication of the results (raw scripts or workflows are preferred in place of descriptive documentation); | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **43** | TISG Section 8.11, page 64 | ▪ For the species identified:<br>– provide any published studies that describe the regional importance, abundance and distribution of species at risk, including recovery strategies or plans; "<br>– consult relevant published studies that describe suitable survey methodologies for caribou and wolverine based on winter track observations including but not limited to:<br>• caribou resource selection probability functions describing the probability of resource use at the range scale (see Hornseth & Rempel 2016);<br>caribou, moose, and wolf occupancy models describing their distribution in the far north (see Poley et al. 2014); and<br>wolverine occupancy models describing the distribution of wolverine in the far north (see Ray et al. 2018).<br>– provide data and summary lists for each species at risk ranked according to:<br>• abundance; "<br>• distribution across survey sites (i.e., percentage of survey stations at which they were recorded);<br>• abundance in each habitat type; and<br>• map showing areas of highest concentrations or areas of use by species.<br>– data must be supplemented by surveys, as required;<br>– survey protocols should optimize detectability and survey effort should provide for comprehensive coverage at the appropriate time of year (e.g., survey breeding habitat during breeding season, stopover habitat during migration);<br>– survey protocols should provide a rationale for the scope of and the methodology used for surveys including design, sampling protocols and data manipulation; and<br>– where using recognized standards, provide details of any modifications to the recommended methods and rationale for these modifications and indicate who was consulted in the development of the baseline surveys (e.g., federal/provincial wildlife experts, specialists and local Indigenous groups). | ▪ Existing information pertaining to the James Bay / Hudson Bay population of Lake Sturgeon (Special Concern) such as COSEWIC and COSSARO status reports will inform the known distribution and abundance of Lake Sturgeon in the area. | ▪ Section 7<br>▪ Section 8 |
| **44** | TISG Section 8.11, page 65 | ▪ Identify and map all species at risk, critical habitat, and residences on federal land within the project study area and local study area (provincial and/or local government authorities should be contacted to determine any additional data sources and survey methodologies) | ▪ Existing information pertaining to the James Bay/Hudson Bay population of Lake Sturgeon (Special Concern) such as COSEWIC and COSSARO status reports will inform the known distribution and abundance of Lake Sturgeon in the area. | ▪ Section 7<br>▪ Section 8 |
| **45** | TISG Section 8.11, page 65 | ▪ The project study area and local study area, as defined above for each valued component, constitutes the appropriate scale. | ▪ The Study Areas are defined and described in the Study Plan. | ▪ Section 6 |

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| **46** | TISG Section 8.11, page 65 | ▪ The Impact Statement must provide a list of all provincially listed protected species at risk and species assessed by the COSEWIC that have the status of extirpated, endangered, threatened or of special concern and that may be directly or indirectly effected by the Project. Use existing data and literature as well as surveys to provide current field data that reflects the natural inter-annual and seasonal variability; | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **47** | TISG Section 8.11, page 65 | ▪ Provide information and/or mapping at an appropriate scale (The project study area and local study area, as defined above for each valued component, constitute the appropriate scale) for residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, identified or proposed Critical Habitat and/or recovery habitat (where applicable). Describe the general life history of species at risk (e.g., breeding, foraging) that may occur in the project area, or be affected by the Project; | ▪ The information requested will be provided in the IS / EA Report. | ▪ Section 7<br>▪ Section 8 |
| **48** | TISG Section 13, pages 80-83 | ▪ This section of the TISG describes the methodology for the effects assessment, including definitions of scope, severity, and irreversibility. | ▪ This information will be included in the IS / EA Report and is summarized in the Study Plan. | ▪ Section 9 |
| **49** | TISG Section 14.3, page 88 | ▪ The Impact statement must describe how hydrological or drainage changes may disturb soils, wetlands, peatlands or muskeg and result in the release of mercury or methylmercury from disturbed soils, which may affect water and groundwater quality, fish, wildlife and human health; | ▪ The project will be designed to minimize or avoid changes in water flow and/or drainage - further information is available in the Surface Water Study Plan. Fish tissue contamination surveys have not been completed, nor are they proposed. Details regarding potential bioaccumulation of contaminants and consumption by Indigenous groups will be discussed in the Human Health and Community Safety Study Plan. | ▪ Human Health and Community Safety Study Plan<br>▪ Surface Water Study Plan |
| **50** | TISG Section 15.1, Page 90 | ▪ The Impact Statement must describe any direct, incidental or cumulative predicted positive and/or adverse effects to fish (all developmental stages) and fish habitat as defined in subsection 2(1) of the Fisheries Act, including the calculations of any potential habitat loss (temporary or permanent) including spawning grounds, nursery, rearing, food supply, and migration areas, or death of fish. | ▪ The effects assessment will consider area of habitat alteration, disturbance and/or destruction. | ▪ Section 9.4, Section 9.5 |
| **51** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of the geomorphological changes and their effects to hydrodynamic conditions and fish habitats (e.g., modification of substrates, dynamic imbalance, silting of spawning beds); | ▪ The project will be designed to minimize or avoid changes in water flow and/or drainage - further information is available in the Surface Water Study Plan. The effects assessment will consider area of habitat alteration, disturbance and/or destruction. | ▪ Section 9.4<br>▪ Section 9.5 |
| **52** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of the modifications of hydrological, and hydrometric conditions on fish habitat, critical habitat for aquatic species at risk, and on the fish species' life cycle activities (e.g., reproduction, fry-rearing, migration); | ▪ The project will be designed to minimize or avoid changes in water flow and/or drainage (including potential changes in water quality) - further information is available in the Surface Water Study Plan. The effects assessment will consider area of habitat alteration, disturbance and/or destruction. | ▪ Section 9.4<br>▪ Section 9.5 |
| **53** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of potential effects to riparian areas that could affect aquatic biological resources and productivity taking into account any anticipated modifications to fish habitat (e.g., structure, cover); | ▪ Changes in fish habitat as a result of direct and indirect effects will be assessed as part of the IA / EA, including calculation of the loss of riparian habitat as a result of water crossing structure footprint. The potential effects to fish and fish habitat as a result of the Project will be included in the assessment. | ▪ Section 9 |
| **54** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of describe effects to fish biodiversity considering identified biodiversity metrics | ▪ Biodiversity metrics for the Fish and Fish Habitat VC will consider:<br>– Distribution in space;<br>– Frequency of occurrence;<br>– Patterns of occurrence and abundance in time;<br>– Abundance and, if possible, density; and<br>– Associate habitat types and strength of associations. | ▪ Section 9 |
| **55** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of any potential imbalances in the food web and trophic levels in relation to baseline conditions; | ▪ Potential changes in food webs will be considered qualitatively through examination of changes in biodiversity. | ▪ Section 9 |

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| **56** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of effects to the primary and secondary productivity of water bodies and how project-related effects may affect fish food sources; | ▪ Potential changes in food webs will be considered qualitatively through examination of changes in biodiversity. | ▪ Section 9 |
| **57** | TISG Section 15.1, page 90 | ▪ The assessment must include a consideration of potential for direct effects of contamination downstream of the Project on fish and bioaccumulation of contaminants (e.g., selenium, mercury, chromium, arsenic) in fish that may be consumed by Indigenous groups; | ▪ Fish tissue contamination surveys have not been completed, nor are they proposed. Details regarding potential bioaccumulation of contaminants and consumption by Indigenous groups will be discussed in the Human Health and Community Safety VC Study Plan. | ▪ Human Health and Community Safety Study Plan |
| **58** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of potential direct and incidental effects on fish behaviour, distribution, abundance, migration patterns; and " | ▪ Potential direct or indirect effects, if any, as a result of changes to fish habitat will be considered in the IA / EA. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 9 |
| **59** | TISG Section 15.1, Page 90 | ▪ The assessment must include a consideration of potential losses of individuals and relationship to population density and the resiliency of a population. | ▪ Potential direct or indirect effects, if any, that result in changes in population density and/or productivity will be considered in the IA / EA. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 9 |
| **60** | TISG Section 15.1, Page 91 | ▪ The Impact Statement must describe the effects of changes to the aquatic environment on fish and fish habitat, including the anticipated changes in the composition and characteristics of the populations of various fish species, especially those of cultural significance to Indigenous communities with traditional land use practices in the area and provincially or federally listed aquatic species at risk; | ▪ Changes in fish habitat as a result of direct and indirect effects will be assessed as part of the IA / EA, including calculation of the loss of riparian habitat as a result of water crossing structure footprint. For the purpose of the IA / EA, indicator species were selected based on several factors such as local/cultural significance, economic and social significance, rarity and ecological significance. | ▪ Section 9 |
| **61** | TISG Section 15.1, Page 91 | ▪ identify any reduction in fish populations as a result of potential overfishing due to increased access to the project area; " | ▪ Effects on fish populations, outside of direct project activities (such as increased fishing pressure) will be considered in the IA / EA. Further information can be found in the Land and Resource Use Study Plan. | ▪ Section 9<br>▪ Land and Resource Use Study Plan |
| **62** | TISG Section 15.1, Page 91 | ▪ contaminant levels in harvested species and their prey; and | ▪ Fish tissue contamination surveys have not been completed, nor are they proposed. Details regarding potential bioaccumulation of contaminants and consumption by Indigenous groups will be discussed in the Human Health and Community Safety VC Study Plan. | ▪ Human Health and Community Safety Study Plan |
| **63** | TISG Section 15.1, Page 91 | ▪ describe any modifications and use of habitats, including the ability to access the habitat. " | ▪ The effects assessment will consider area of habitat alteration, disturbance and/or destruction. The project will be designed to minimize or avoid changes in water flow and / or drainage (including consequential effects to fish movement) - further information is available in the Surface Water Study Plan. | ▪ Section 9<br>▪ Surface Water Study Plan |
| **64** | TISG Section 15.1, Page 91 | ▪ include a discussion of how project construction timing correlates to key fisheries timing windows for freshwater and anadromous/catadromous species, and any potential effects resulting from overlapping periods; | ▪ The potential residual effects, if any following implementation of avoidance and mitigation measures such as timing windows and as a result of construction activities including the potential effects from overlap of in-water work during sensitive periods will be described in the effects assessment. | ▪ Section 8<br>▪ Section 9 |
| **65** | TISG Section 15.1, Page 91 | ▪ a discussion of how vibration caused by project activities (e.g., blasting) may affect fish habitat and behaviour, such as spawning or migrations; | ▪ The potential residual effects, if any following implementation of avoidance and mitigation measures (such as DFO Guidelines for Blasting In or Near Canadian Fisheries Waters) and as a result of construction activities including vibration and blasting will be described in the effects assessment. This includes temporary disturbance potential effects on fish behaviour such as from blasting activities if this potential disturbance cannot be avoided. | ▪ Section 8<br>▪ Section 9 |

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| **66** | TISG Section 15.1, Page 91 | ▪ describe potential effects from impingement and entrainment of fish and other aquatic biota through water withdrawal; | ▪ The potential residual effects as a result of dewatering activities, if any following avoidance and mitigation measures, will be discussed. The project will be designed to avoid or minimize such effects. | ▪ Section 8<br>▪ Section 9 |
| **67** | TISG Section 15.1, Page 91 | ▪ describe any need for an Fisheries Act authorization and/or a Species at Risk Act permit and describe any consideration of Department of Fisheries and Oceans guidance documents; " | ▪ The information requested will be provided in the IS / EA Report. | ▪ No reference |
| **68** | TISG Section 15.1, Page 91 | ▪ for linear projects, describe and justify watercourse-crossing techniques to be used and the criteria for determining the techniques proposed for each watercourse-crossing; | ▪ The information requested will be provided in the IS / EA Report. | ▪ No reference |
| **69** | TISG Section 15.1, Page 91 | ▪ include a risk assessment of the potential introduction and intrusion of aquatic invasive species; " | ▪ Mitigation measures to limit the spread and / or introduction of invasive species will be considered in the IA / EA. | ▪ Section 9.5 |
| **70** | TISG Section 15.1, Page 91 | ▪ describe effects from changes in light level; | ▪ Potential direct or indirect effects, if any, as a result of changes to fish habitat will be considered in the IA / EA. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 8<br>▪ Section 9 |
| **71** | TISG Section 15.1, Page 91 | ▪ The Impact Statement must describe any positive changes, such as habitat creation; | ▪ The IA / EA will assess the potential negative, neutral and positive residual effects of the project. | ▪ Section 8<br>▪ Section 9 |
| **72** | TISG Section 15.1, Page 91 | ▪ describe the anticipated changes in the composition and characteristics of the populations of fish, following modifications to the aquatic environment, including but not limited to:<br>– disruption of life stages or habitat with regard to their productivity, life cycles,<br>– migration, or local movements, including a consideration of spawning, rearing,<br>– feeding, and overwintering;<br>– disruption of feeding activities of fish;<br>– distribution and abundance of fish;<br>– contaminant levels in harvested species and their prey;<br>– a consideration of a change in: behavior, displacement, access to habitat, habitat<br>– structure, species composition, ecosystem structure and function and habitat quality; and<br>– freshwater animal health and condition. " | ▪ Potential direct or indirect effects, if any, that result in changes in population density and/or productivity, behaviour, community composition and ecological integrity, will be considered in the IA / EA. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 7<br>▪ Section 8<br>▪ Section 9 |
| **73** | TISG Section 15.1, Page 91 | ▪ describe any effects to other aquatic organisms; and | ▪ Data collection includes both fish (large and small-bodied) and benthic invertebrates. Potential direct or indirect effects to aquatic organisms beyond fish and benthic invertebrates, if any, will be qualitatively discussed in the IS / EA Report. | ▪ Section 7<br>Section 8<br>▪ Section 9 |
| **74** | TISG Section 15.1, Page 91 | ▪ describe any changes to aquatic plants, including all benthic and detached algae and phytoplankton | ▪ Aquatic plant and algal surveys have not been completed, nor are they proposed. Potential direct or indirect effects to aquatic plants and algae, if any, will be qualitatively discussed in the IS / EA Report. | ▪ Section 7<br>▪ Section 8<br>▪ Section 9 |
| **75** | TISG Section 15.1, page 91 | ▪ describe any modifications in migration, local movements (e.g., upstream and downstream migration, and lateral movements) or stranding of fish, following the construction, operation or closure of works (e.g., physical, chemical and hydraulic barriers to fish passage); | ▪ The project will be designed to minimize or avoid changes in water flow and/or drainage (including consequential effects to fish movement) - further information is available in the Surface Water Study Plan. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 9<br>▪ Surface Water Study Plan |
| **76** | TISG Section 15.4, page 100 | ▪ provide an account of how the project and mitigation measures are consistent with the recovery strategy, action plan, or management plan for the species. | ▪ Mitigation measures will be informed by best management practices, applicable resource management and/or recovery plan, Indigenous input, and industry standards. | ▪ Section 9.5 |

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| **77** | TISG Section 15.4, page 95 | ▪ The Impact Statement must:<br>– describe the potential direct, incidental and cumulative adverse effects of the project on species at risk listed under Schedule 1 of the Species at Risk Act and, where applicable, its critical habitat (including its extent, availability and presence of biophysical attributes);<br>– analyses predicted effects for each species at risk. To fully understand the effects and/or benefits of one alternative versus another, all relevant metrics and evaluators for species at risk should be considered;<br>– include separate analyses for each project activity, component, and phase;<br>– consider potential effects to species at risk from bioaccumulation and biomagnification of contaminants of dust and other pollutants resulting from the project; and conduct post-construction surveys to verify predicted effects.<br>– conduct post-construction surveys to verify predicted effects. | ▪ Effects to SAR will consider potential direct, incidental and cumulative adverse effects of the Project on SAR and, where applicable, its critical habitat. A thorough list of impact management measures including offsetting and compensation as necessary that will be employed by the Project will be included in the IS / EA Report. | ▪ Section 9 |
| **78** | TISG Section 15.4, page 99 | ▪ clearly identify the locations of federal lands/non-federal lands within the study area and differentiate between these land tenures in the presentation of information regarding all species at risk. For example, total habitat disturbance for boreal caribou should be presented at the range scale, but it should also be presented in a way that clearly indicates habitat disturbance specifically within federal lands; | ▪ The information requested will be provided in the IS / EA Report. | ▪ No reference |
| **79** | TISG Section 15.4, page 99 | ▪ identify critical timing windows (e.g., denning, rutting, spawning, calving, breeding, roosting), setback distances, or other restrictions related to these species; | ▪ Critical timing windows (e.g., spawning and in-water work, denning, breeding, roosting), setback distances, or other restrictions that will be imposed or followed will be considered in assessing predicted effects. | ▪ Section 9 |
| **80** | TISG Section 15.4, page 99 | ▪ identify provincial, territorial or federal permits or authorizations that may be required in relation to the species at risk; | ▪ The information requested will be provided in the IS / EA Report. | ▪ No reference |
| **81** | TISG Section 15.4, page 99 | ▪ describe the potential adverse effects of the Project on species protected by provincial statutes and assessed by the COSEWIC as extirpated, endangered, threatened or of special concern (flora and fauna) and their habitat that are not currently listed under the Species at Risk Act; | ▪ The information requested will be provided in the IS / EA Report. | ▪ No reference |
| **82** | TISG Section 15.4, page 99 | ▪ provide survey results and detailed mapping of each species at risk and their habitat, including important habitat features, for all federal lands; | ▪ The information requested will be provided in the IS / EA Report, if applicable. | ▪ No reference |
| **83** | TISG Section 15.4, page 99 | ▪ describe the residual effects that are likely to result from the project after avoidance and minimization measures have been applied, including the extent, duration and magnitude of the effects on:<br>– the number of individuals killed, harmed, harassed; and<br>– the number of residences damaged or destroyed. | ▪ Potential direct or indirect effects, if any, that result in changes in population density and habitat, will be considered in the IA / EA. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 9 |
| **84** | TISG Section 15.4, page 99 | ▪ describe all feasible measures that will be taken to avoid or lessen the impact of the Project on the species and its critical habitat; | ▪ Mitigation measures will be informed by best management practices, applicable resource management and/or recovery plan, Indigenous input, and industry standards. | ▪ Section 9.5 |
| **85** | TISG Section 15.4, page 99 | ▪ describe all reasonable alternatives to the Project that would avoid the potential effects on species and their habitat, with particular attention to critical habitat, and important habitats such as upland habitat which is used as movement corridors by caribou, breeding areas for birds, and which contains roosting habitat for bats; | ▪ The reasonable alternatives that were or are considered to the project will be described, rationalized and evaluated by several criteria, which may include species at risk. | ▪ No reference |
| **86** | TISG Section 15.4, page 99 | ▪ Describe the area, biophysical attributes and location of habitat including critical habitat affected (e.g., destroyed, permanently altered, disrupted); describe all feasible measures that would be taken to eliminate the effects of the work or activity on species and their habitats, including critical habitat; and | ▪ The IS / EA Report will describe the biophysical attributes and locations of habitat and outline measures that will be used to avoid or limit effects on habitat. | ▪ Section 7<br>▪ Section 8<br>▪ Section 9 |
| **87** | TISG Section 15.4, page 99 | ▪ demonstrate that avoidance and minimization measures will be applied for species at risk. Recovery Strategies will provide information such as Population and Distribution Objectives, and Strategic Direction for recovery; | ▪ Mitigation measures will be informed by best management practices, applicable resource management and/or recovery plan, Indigenous input, and industry standards. | ▪ Section 9.5 |

| ID # | Federal TISG Reference[12] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **88** | TISG Section 16.1, Page 103 | ▪ With respect to biophysical determinants of health, the Impact Statement must provide an assessment of adverse and positive effects on human health in current and future availability (including contamination/quality) of country foods (i.e., food that is trapped, fished, hunted, harvested or grown for subsistence, cultural or medicinal purposes) | ▪ Fish tissue contamination surveys have not been completed, nor are they proposed. Details regarding potential bioaccumulation of contaminants and consumption by Indigenous groups will be discussed in the Human Health and Community Safety VC Study Plan. | ▪ Human Health and Community Safety VC Study Plan |
| **89** | TISG Section 17.3, page 108 | ▪ The Impact Statement must:<br>– describe effects to navigable waterways, including to physical characteristics (e.g., width, depth, etc.), bank/bottom features, biological components, flow/tides, etc.; "<br>– describe ancillary project components that will be constructed in, on, under, over, through or across navigable waterways to support the Project; "<br>– describe potentially affected waterway users and describe consultation with waterway users and Indigenous groups regarding navigational use, issues raised and how issues were addressed; and "<br>– describe project effects to navigation and navigation safety, including potential obstructions to navigation (natural/man-made, other works, navigation aids, etc.). | ▪ The project will be designed to minimize or avoid changes in water flow and/or drainage (including consequential effects to navigation) - further information is available in the Surface Water Study Plan. If this potential for residual effect is identified, a qualitative discussion will be included. | ▪ Section 9<br>▪ Surface Water Study Plan |
| **90** | TISG Section 20, page 119-128 | ▪ Section 20 of the TISG describes the requirements around mitigation and enhancement measures that must be considered in the Impact Statement. | ▪ Mitigation measures will be informed by best management practices, applicable resource management and/or recovery plans, Indigenous input, and industry standards. | ▪ Section 9.5 |
| **91** | TISG Section 21, pages 129-130 | ▪ Section 21 of the TISG describes the requirements and guidance associated with determining residual effects. | ▪ Residual effects will be assessed in the IA / EA. | ▪ Section 9 |
| **92** | TISG Section 26, Page 141 | ▪ Section 26 of the TISG includes a description of the considerations for developing a follow-up program for environmental, health, social or economic effects, as applicable. | ▪ The IS / EA Report will include descriptions of follow up programs, as required by VC. | ▪ Section 9 |

## Table 11-2: Study Plan Provincial Concordance – Conformance with Requirements

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|---|
| 1 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ Study areas are missing and lack clarity – maps show study area for 4 routes even though only 2 (or 1?) routes are proposed to be assessed; no indication of local and regional study areas for each environmental component (e.g. ground water, surface water, caribou, etc.). | ■ The Study Areas are defined and described in the Study Plan. | ■ Section 6 |
| 2 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ In the identification of alternative methods, the Environmental Assessment should document consideration of methods including an assessment of potential impacts to species at risk and their respective habitats and identify methods that can avoid or minimize potential impacts to individuals of the species and all categories or protected habitat to the extent possible. | ■ Potential effects to SAR and their habitats will be included in the IS / EA Report. | ■ Section 9 |
| 3 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ For each potential impact to species at risk or their habitat, measures will have to be identified to first avoid any adverse effects and in cases where there are no practical or feasible alternatives, identify measures that minimize or mitigate the adverse effects. Such measures may be general, site-specific, or activity-specific in nature. For caribou, the province has developed Best Management Practices (BMPs) for some sectors to provide guidance to avoid, minimize or mitigate adverse effects to the species and their habitat. Where possible, it is always preferential to avoid, given that if any adverse impacts exist, the associated activities would require authorization under the ESA. | ■ The IS / EA Report will identify suitable impact management measures to avoid, eliminate or minimize potential effects of the Project, including potential effects SAR. | ■ Section 9 |
| 4 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ MECP recommends that the EA contain commitments to monitoring to verify the expected effects of the proposed undertaking on species at risk and their habitat and to determine if additional impact mitigation measures or adjustments to any measures are required. Monitoring methodology for these species and their habitat should be included in the monitoring plan developed as part of the EA. If impact management measures are proposed, monitoring of the effectiveness of these measures should be included in the monitoring plan. The monitoring plan should include steps the proponent will take if impact management measures are not effective (e.g. application of additional impact management measures, changing how and where the activity will be performed, etc.). | ■ The IS / EA Report will include a monitoring framework to verify the prediction of effects and the effectiveness of the impact management measures implemented, including those related to SAR and their habitat. | ■ Section 9 |
| 5 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ In addition to land use policy, any resource management direction for the study area including forest management plans and fisheries management plans/objectives should be reviewed and considered. | ■ Applicable resource management plans will be reviewed and considered in the IA / EA. | ■ Section 7 |
| 6 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ The proposed all-season road will enable access to areas that previously have been essentially inaccessible to mechanized travel except during the winter. The creation of new access can result in impacts on fish and wildlife populations (e.g., due to new or increased hunting pressure), “remoteness” and remote or “wilderness” recreation / tourism experiences, among other effects. The MNRF will consider the effects of creating new access when making decisions to issue authorizations under legislation administered by MNRF. | ■ Effects to wildlife and fish populations from the creation of new access and recreational opportunities will be considered in the IA / EA. Additional information can be found in the Land and Resource Use VC Study Plan. | ■ Section 9; Resource Use VC Study Plan |
| 7 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ There are numerous water crossings associated with the new road proposal which will require authorization under the PLA by the MNRF. To facilitate MNRF decisions regarding water crossings, the project proposal should include the location and details of all water crossings (drainage areas, width, depth, fish species present, habitat, substrate, approach slopes, shoreline vegetation), and details regarding watercrossing structures (culverts, bridges [bridges must be approved by an engineer]). The proposal should also clearly identify potential impact to fish and aquatic ecosystems that may result from the construction and installation of crossings (impacts to beds, shoreline, water quality, etc.), oil leaks into waterways, et. and how these impacts will be avoided or mitigated. Decommissioning and/or rehabilitation of water crossings associated with the existing winter road should also be addressed. | ■ The IS / EA Report will characterize baseline conditions and assess potential effects of the Project on fish and fish habitat, including construction of watercourse crossings and accidental leaks or spills. Potential interactions between the project and the environment will be considered for all phases of the Project. Impact management measures will be recommended to avoid, eliminate or minimize potential effects of the Project. It is anticipated that mitigation will include measures to decommission and rehabilitate watercourse crossings. | ■ Section 7 and Section 9 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| **8** | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ When considering the effects of a proposal on fish, fish habitat and aquatic environment, MNRF requires information describing the fish and aquatic communities (e.g., species composition, description of habitats), physical habitat parameters (e.g., thermal regime, flow regimes, substrate), existing human use of the resource (e.g., commercial, recreational or Aboriginal fisheries), and sufficient details describing the proposal to understand the potential impacts that it will have on fisheries and aquatic resources (e.g., structure type and location, construction dates). This assessment should also include consideration of the potential impacts that may result from improved access to currently remote fisheries. | ■ The effects assessment will be based on existing information, field data collected during previous studies, and the results of field studies undertaken in support of the Project. Further information is provided in the Study Plan. | ■ Section 7 and Section 9 |
| **9** | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ There are likely a number of species that are considered provincially rare which occur within and adjacent to the proposed road corridor. The MNRF encourages using the best conservation measures available to protect these species. | ■ Potential effects to SAR and their habitats will be included in the IS / EA Report. | ■ Section 9 |
| **10** | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ Project planning should consider the potential introduction and establishment of invasive species via construction and use of the road, impacts that could result, and measures that will be taken to avoid or minimize their spread and resultant negative environmental effects. | ■ Mitigation measures to limit the spread and / or introduction of invasive species will be considered in the IA / EA. | ■ Section 9.5 |
| **11** | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ 2.2 Fisheries<br>– Potential impacts to fisheries within the numerous waterbodies and their tributaries that the road will cross is a major environmental concern within the context of MNRF's mandate, as well as a significant social and cultural concern for the communities who traditionally fish in the area of the proposed road. Information on fisheries present along the corridor options is general (i.e., not crossing-specific) and prepared using desktop information. Fisheries field work should be conducted to confirm desktop assumptions about fish communities and provide species-specific information on sensitive areas such as spawning sites. From a social perspective, MNRF is aware that some Marten Falls First Nation members may have concerns regarding the creation of new access for recreational anglers and harvesters from other communities and resultant increased harvest of fish on which Marten Falls First Nation relies for major component of its diet. An analysis of the potential impacts to food security as related to fisheries (and wildlife from potentially increased hunting pressure) and how anticipated negative effects may be mitigated should be presented. | ■ The effects assessment will be based on existing information, field data collected during previous studies, and the results of field studies undertaken in support of the Project. Further information is provided in the Study Plan.<br>■ We will also solicit and consider input from Indigenous communities. Please review the Land and Resource Use VC Study Plan for further information on resource use effects assessment. | ■ Section 7 and Section 9<br><br>Land and Resource Use Study Plan |
| **12** | MNRF | ■ Email from Kevin Green, Species at Risk Recovery Biologist; Michelle Karam, Management Biologist; Nikki Boucher, A/Species at Risk Specialist - Species at Risk Branch – Permissions & Compliance, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR, MNRF #442 | ■ Preliminary consideration of potential effects to SAR needs to be included, above and beyond those applicable to vegetation (s.7.2.6), wildlife (s.7.27) and fish and fish habitat (s.7.2.8).Both Table 7-4 and s.7.2.9 are lacking any information specific to SAR (e.g., increased mortality risk to caribou resulting from predator efficiencies related to additional linear features, increase in predator/prey populations, etc.).This should include a preliminary list of potential effects, in a table format, including, but not limited to, the following:<br>– Project Component or Activity<br>– Field surveys, staking, layout<br>– Vegetation clearing and grubbing<br>– Construction of supportive infrastructure (e.g. storage and laydown yards, temporary access roads, construction camps, aggregate extraction areas)<br>– Construction of the road<br>– Aggregate extraction and production<br>– Emissions, discharge and waste<br>– Operations and maintenance<br>– Potential Effects<br>– Mitigation Measures | ■ Lake Sturgeon is considered as an indicator species for this IA / EA. | ■ Section 9 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| **13** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Appendix A Fish and Fish Habitat<br>– In addition to the use of large-bodied fish species as environmental indicators, we recommend that you include representative small-bodied forage species. The Fisheries Act considers fish and fish habitat for all fish species. | ■ For the purpose of the IA / EA, indicator species were selected based on several factors including local/cultural significance, economic and social significance, rarity, ecological significance. Studies to characterize the baseline conditions also take into account the different trophic levels in the aquatic environment. | ■ Section 9 |
| **14** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental, MECP Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #15 Section 7.2, Pages 48-49 Assessment Methods<br>– For the most part, section 7.2 provides a description of potential environmental effects for each discipline. However this section also includes assessment methodologies for some subsections (7.2.1 and 7.2.2 AERMOD modelling, quantitative noise assessment) while the majority do not (7.2.3 – 12). The level of detail in the ToR about assessment methods should be consistent for all environmental components.<br>– It is strongly recommended to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review by agencies and others. The work plans should include assessment methodology appropriate for each environmental component. The ToR could include a high level summary table for each environmental discipline listing data collection and assessment methods, with a commitment to develop the work plans at the outset of the EA phase to provide more details. Consider where the information about air and noise modelling is best placed. | ■ The Study Plan meets this requirement. | ■ Section 7, Section 8 |
| **15** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental, MECP Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #16 Section 8 Page 54<br>– Work Plans - Section 8 describes the approach that will be taken to evaluate alternative methods during the EA, including proposed criteria and indicators (presented in Appendix A). The information presented is high level and does not provide an opportunity for technical review of the methodologies that will be applied to evaluate those specific criteria and indicators.<br>– It is strongly recommended to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review by agencies and others. | ■ The Study Plan meets this requirement. | ■ Section 9 |
| **16** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #17 Section 8 Page 54<br>– Consultation on Assessment Methodology - MFFN acknowledges that the proposed methodology will be open to input during the draft ToR review, but also says a more detailed method will be presented in the EA. Page 47 indicates the effects assessment criteria will be developed during the EA. While it is appropriate to defer some detailed work planning to the EA phase, the ToR should include commitments for how technical reviewers, and other interested persons, will be consulted during the development of specific evaluation methodologies or technical work plans. It is strongly recommended that those opportunities for review occur prior to the completion of studies (e.g. prior to the submission of a draft or final EA document).It is not clear whether MFFN plans to consult on the more detailed methodology and criteria during the EA phase or if the ToR phase is the main opportunity to provide input. Please indicate how consultation on the ToR has informed the preliminary criteria and indicators. Please clarify when MFFN will consult and provide opportunity for input on the detailed assessment method, including criteria and indicators (and work plans as MECP has proposed), with agencies, communities and stakeholders during the EA phase in order to finalize the methodologies before EA studies get advanced. | ■ The Study Plan meets this requirement.<br>■ As identified in Section 4.2 of the Study Plan, the Proponent will provide opportunities for consultation and engagement with Indigenous communities identified in Table 4-1, which is inclusive of all Indigenous communities identified in the Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment (IAAC 2020a).<br>■ Further information on how Indigenous Knowledge will be considered in the IS / EA Report has been included in Section 5 of the Study Plan. Section 5 of the Study Plan provides further details on the two concurrent and complementary avenues for Indigenous communities and groups to be engaged with and provide input on the Project: the Indigenous Knowledge Program and the Consultation and Engagement Program. | ■ Section 4, Section 5 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| **17** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #21 Section 10.2.4 Page 73<br>– Technical Work Plans - Page 73 states that MECP has indicated it will not be commenting on work plans associated with field work until the ToR is finalized. This statement does not reflect MECP's guidance to the project team. MECP's guidance, which is documented on page 69 of the RoC, is that the ToR is the mechanism to seek technical review of work plans and that discipline- specific work plans should be included with the ToR. As well, discussions that MECP has had with the project team to date are considered pre-consultation, since it is the ToR that sets out what work is to be done during the EA phase.<br>– Please revise the statement on page 73 to state: "MFFN provided MECP and MNRF work plans associated with field work planned during 2019 for review, however MECP advised this is considered-consultation and that discipline-specific work plans should be appended to the ToR to allow full technical review. "As the draft ToR did not include detailed discipline-specific work plans, the other option the ministry strongly recommends is to include commitments to develop workplans at the outset of the EA phase, including opportunities for technical review. | ■ The Study Plan meets this requirement. | ■ No reference |
| **18** | MECP | ■ Email from Jacinth Gilliam-Price, Surface Water Specialist – Northern Region Surface Water Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #5 Subsection 7.2.4 - Surface Water, p. 49 -Subsection 7.2.4<br>– Appropriately captures potential environmental effects respecting surface water; however, no mitigation measures have been proposed. Although mitigation measures and compliance and effects monitoring may not yet be known at this stage of the project, general measures to be taken to prevent/limit known potential impacts to the environment should be proposed. Mitigation measures are offered in the "Proposed Action/Solution" column. Mitigation measures need to be based on proven and recognized best management practices, standard protocols for stream crossings, land clearing and/or working near water with machinery that are well understood and have been applied to road construction projects throughout northern Ontario. Proposed Best Management Practices (BMPs), standard protocols and good practices are listed in the "Proposed Action/Solution" column. Subsection 7.2.4 revised to include proposed mitigation measures to the identified environmental effect. Water takings for dewatering laydown yards, construction camps, aggregate extraction areas will be carried out in compliance with the conditions for registration on the Environmental Activity and Sector Registry (EASR) or a Permit to Take Water (PTTW) as applicable. Treatment and discharge of wastewater may be guided by an ECA. Excavated materials will not be stored or stockpiled in areas near the surface water feature to minimize the potential for sediment laden runoff. Similarly, the stockpiling of required aggregates (sand, gravel, rock, crushed rock) for the construction of the road bed, temporary access roads and ancillary work areas, and construction and the installation of water body crossings must not be near surface water features for the same reason. Implement BMPs during the construction phase of the Project, ensuring the maintenance of appropriate riparian vegetation buffer strips along streams that intersect the road to attenuate runoff from the road, reduce sedimentation and erosion and provide shade cover thereby reducing stream temperature. Adhere to BMPs for road construction and operation and constructed in accordance with the following:<br>• Ministry of Natural Resources and Forestry's (MNRF's) Environmental Guidelines for Access Roads and Water Crossings (1995), Crown Land Bridge Management Guidelines (MNR 2008),<br>• Northern Land Use Guidelines – Access: Roads and Trails (INAC 2010), and Fish-Stream Crossing Guidebook (B.C. Ministry of Forests, Lands and Natural Resource Operations, B.C. Ministry of Environment and Fisheries and Oceans Canada 2012). | ■ Mitigation, protection and avoidance measures will be included and discussed in the IS / EA Report. | ■ Section 9 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| **19** | MECP | ■ Email from Kevin Leveque, Manager – Northwest Zone Ontario Parks, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #3 Section 7.1.4.9 Page 32.<br>– Lake Sturgeon (Southern Hudson Bay-James Bay population) has been recorded to occur within Ogoki River Provincial Park waterways, captured within projected project area (Alternative 4).The population within Ogoki River is valuable to note for information purposes as well as considered under PPCRA requirements as it pertains to the protection of ecological integrity in protected areas. | ■ Lake Sturgeon is considered as an indicator species for this IA / EA. | ■ Section 7 |
| **20** | MECP | ■ Email from Nikki Boucher, A/Species at Risk Specialist, Permissions and Compliance, Species at Risk Branch, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ We have carried out our review with a view to both the EA and future regulatory authorizations in order to provide you with information that will help enable an efficient approach to project planning and preparation of applications for any necessary Endangered Species Act (ESA) authorizations. Specifically, attention should be paid to the following requirements that form the basis of many of our ESA authorizations:<br>– Minimize adverse effects – you must take reasonable steps to minimize the adverse effects of your activity on the species at risk and their habitat that are likely to be affected by your activity<br>– Ways to minimize adverse effects of your activity on species at risk & their habitat may include modifying the:<br>• location of the activity<br>• geographic scale of the potential effects<br>• activity design (e.g. engineering and technological)<br>• timing of the activity<br>• duration and frequency of the effects<br>• approaches and timing for any site restoration or rehabilitation (such as doing progressive rehabilitation while other parts of the activity are still happening)<br>• general operational protocols· Consider reasonable alternatives – you will need to show the Ministry of the Environment, Conservation and Parks that you have considered reasonable alternatives to your activity.<br>– Alternative approaches to your activity include:<br>• Changing the location of the activity<br>• Using alternative methods, equipment or technical designs<br>• Changing the timing of the activity to avoid times when the species is there or is most sensitive to disturbance<br>• Changing the geographic scale, duration and/or frequency of the potential adverse effects<br>• Adding or changing approaches and timing of site restoration or rehabilitation after the activity is done<br>• When considering reasonable alternatives to your activity, you must consider at least one alternative that would completely avoid any adverse effects on species at risk<br>• Identify alternatives that you considered but did not think were reasonable because of biological, technical, social or economic limitations<br>• Explain why the approach you have chosen is the best alternative.<br>– In addition, should an Overall Benefit Permit be required for the project, as determined through MECP's review and assessment of all the project details, the following requirement would also need to be considered:<br>• Achieve overall benefit – providing an overall benefit to a species means undertaking actions that contribute to improving the circumstances for the species. It must include more than steps to minimize adverse effects on the species or habitats | ■ Lake Sturgeon is considered as an indicator species for this IA / EA. | ■ Section 9 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| | | | • Achieving an overall benefit to a species may involve providing the species with a range of benefits, such as:<br>▪ increasing the number of individuals of the species living in the wild and capable of reproducing<br>▪ increasing the distribution of the species within its natural range<br>▪ increasing the viability or resilience of existing populations of the species<br>▪ slowing or reversing population declines by addressing key threats to the species' survival<br>▪ increasing the quality or amount of habitat for the species<br>– Activities such as filling information gaps, education and outreach may contribute to an overall benefit plan for a species at risk. However, alone they are unlikely to meet the overall benefit requirement<br>– Recovery strategies and government response statements, where available provide information that can be used to form plans to achieve an overall benefit for species at risk. | | |
| **21** | MECP | ■ Email from Kevin Green, Species at Risk Recovery Biologist; Michelle Karam, Management Biologist; Nikki Boucher, A/Species at Risk Specialist - Species at Risk Branch – Permissions & Compliance, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #2 Recommendation to prevent delays should ESA authorization be required.<br>– It is strongly recommended that the project be planned, and the environmental assessment prepared, with the requirements of the Endangered Species Act, 2007 (ESA) in mind. This can potentially facilitate the authorization process under the ESA, where authorization is required. In order to inform any future ESA authorization requirements, reasonable route / project alternatives should be assessed for impacts to all species at risk and their respective habitats, and at least one avoidance alternative should be included. Please refer to the MECP "Avoidance Alternatives Form" for activities that may require an overall benefit permit under clause 17(2)(c) of the Endangered Species Act" and accompanying guide for reference. (http: / /www.forms.ssb.gov.on.ca/mbs/ssb/forms/ssbforms.nsf/MinistryResults?Openform&SRT=T& MAX=5&ENV=WWE&STR=1&TAB=PROFILE&MIN=018&BRN=21&PRG=31) | ■ The requirements of the ESA process were considered in the development of this Study Plan. | ■ No reference |
| **22** | MECP | ■ Email from Kevin Green, Species at Risk Recovery Biologist; Michelle Karam, Management Biologist; Nikki Boucher, A/Species at Risk Specialist - Species at Risk Branch – Permissions & Compliance, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #9 s.7.1.4.9 / pg. 31<br>– Additional information should be provided, in table format, for each SAR that have the potential to occur in the area of the Project, including, but not limited to<br>• Scientific name<br>• Common name<br>• Species Status under SARA (Federal)<br>• Species Status under ESA (Provincial)<br>• Conservation Ranking (i.e., N-Rank, S- Rank)<br>• Information Source(s) used to identify potential occurrence within the area of the Project<br>• Indication of whether a field survey(s) has been conducted already to identify species presence and, if so, whether or not it was observed<br>• General list of habitat requirements<br>– Indication of whether the required habitat exists within the Study Area (i.e., as per comment 5, should include Project Footprint, Local Study Area and Regional Study Area)Update the draft ToR to include additional information for each SAR that have the potential to occur in the area of the Project. | ■ The information requested was included in the ToR and will be included in the IS / EA Report. | ■ No Reference |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| **23** | MECP | ■ Email from Kevin Green, Species at Risk Recovery Biologist; Michelle Karam, Management Biologist; Nikki Boucher, A/Species at Risk Specialist - Species at Risk Branch – Permissions & Compliance, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #16 s.7.1.4.9 / pg. 32<br>– While Lake Sturgeon (Southern Hudson Bay- James Bay populations) do not receive species or habitat protection under the ESA, it is listed as Special Concern. As such, it is recommended MFFN consult with MNRF on the need for field surveys, particularly in portions of the Project where long-span bridges will be constructed across the Albany River, where Lake Sturgeon are known to occur. Consult with MNRF on the need for field surveys for Lake Sturgeon. | ■ Field surveys are described in detail within the Study Plans. There are no targeted surveys planned for Lake Sturgeon. | ■ Section 7 |
| **24** | MECP | ■ Email from Kevin Green, Species at Risk Recovery Biologist; Michelle Karam, Management Biologist; Nikki Boucher, A/Species at Risk Specialist - Species at Risk Branch – Permissions & Compliance, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #18 Table 7-4 / s. 7.2 / pg. 47 and s.7.2.9 / pg. 52.<br>– Preliminary consideration of potential effects to SAR needs to be included, above and beyond those applicable to vegetation (s.7.2.6), wildlife (s.7.27) and fish and fish habitat (s.7.2.8).Both Table 7-4 and s.7.2.9 are lacking any information specific to SAR (e.g., increased mortality risk to caribou resulting from predator efficiencies related to additional linear features, increase in predator/prey populations, etc.).This should include a preliminary list of potential effects, in a table format, including, but not limited to, the following:<br>• Project Component or Activity<br>• Field surveys, staking, layout of Vegetation clearing and grubbing<br>• Construction of supportive infrastructure (e.g. storage and laydown yards, temporary access roads, construction camps, aggregate extraction areas)o Construction of the road<br>• Aggregate extraction and production<br>• Emissions, discharge and waste<br>• Operations and maintenance<br>• Potential Effect<br>• Mitigation Measures<br>– Update the draft ToR to include additional information for preliminary potential effects of the Project components specific to SAR. | ■ Species at risk are considered in the IA / EA and mitigation measures specific to individual species or cohorts where applicable (beyond those that generally apply), will be identified in the IS / EA Report. | ■ Section 9 |
| **26** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 7.1.1 (pg. 19), Sec. 7.1.4 (pg. 22), Sec 10.2.4 (pg. 72), Appendix A<br>– ToR indicates that the study area is 2.5 km on each side of the centreline of each alternative route. Given the range of some of the wildlife species, the distance that some fish species will travel to spawn and the potential impacts on remote tourism operations. The study area described may not be adequate to assess the full range of impacts Please provide rationale for the study area. A data share agreement between the MFFN project team and the Crown is in place. This should be recognized in the ToR and included as a potential data source. Please describe how Crown provided data and data collected for the project will be used and shared amongst organizations. The ToR should recognize the Crown Data Share Agreement and include reference to it in the listing of potential data sources for the criteria and indicators alternatives evaluation. | ■ The Study Areas have been updated and are described in further detail in the Study Plan. | ■ Section 6 |
| **26** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 7.1.4.4 Surface Water (pg. 28) Sec. 7.1.4.8 Fish and Fish Habitat pg. 31.<br>– “An aerial reconnaissance will be undertaken along the full extent of the study area to verify the location of mapped and unmapped water body crossings, and to further augment the existing environment information available through desktop analysis. And, “the aerial and ground-based field surveys will be done in coordination with the collection of surface water information" Reliance on aerial reconnaissance and desktop analyses to assess watercourses is a good start. Further supplemental methods may be required to acquire a full inventory, and analysis. | ■ The effects assessment will be based on existing information, field data collected during previous studies, and the results of field studies undertaken in support of the Project. Further information is provided in the Study Plan. | ■ Section 7 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|---|
| **27** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 7.1.4.4 Surface Water Pg. 28 & Sec. 7.1.4.8 Fish and Fish Habitat pg. 31<br>– "…site-specific field data at a subset of water body crossings to verify or augment the results and assumptions from the desktop analysis. The site selection process will be based primarily on a scaled approach, with a plan to select a representative number of water body crossings under three different categories of watershed size and to get representation across the alternative routes" And,<br>– "…subset of water body crossings….alternative routes." This representative subset approach may not be appropriate for the evaluation of fish and fish habitat values.<br>– MNRF requires site-specific information about each site where work in water is proposed.<br>– Sampling of watercourses where the proponent is sure they are going to put a bridge and no in-water works are proposed is not necessary.<br>– Sampling of watercourses where we are already confident in our knowledge of fish assemblages is a lower priority than watercourses which we know nothing about MNRF suggests that MFFN contact ministry staff to further discuss and consider the approach to field data collection. | ■ Detailed site assessments planned to support the IA/ EA include a subset of crossings. The need for further site assessments may be required during the detailed design phase. | ■ Section 7 |
| **28** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 7.1.4.8 pg. 30 & 31<br>– The text of this section does not reference Lake Sturgeon as a species that is present in the study area. Include mention of its presence | ■ Lake Sturgeon is considered as an indicator species for this IA/ EA. | ■ Section 7, Section 9 |
| **29** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 7.1.4.8 pg. 31 "Ontario Stream Assessment Protocol"<br>– Note: OSAP doesn't include "aerial reconnaissance" or "desktop" approaches | ■ The Study Plan has been updated accordingly. | ■ Section 7 |
| **30** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 7.1.4.9 Pg. 31<br>– It is recommended a more thorough review is conducted of species that have the potential to be impacted by the proposed undertaking that are listed as Special Concern on the Species at Risk list of Ontario as well as species that are currently only listed under the Species at Risk Act. For consideration in the EA. | ■ The information requested will be included in the IS / EA Report. | ■ No reference |
| **31** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Appendix A<br>– Fish and Fish Habitat In addition to the use of large-bodied fish species as environmental indicators, we recommend that you include representative small-bodied forage species. The Fisheries Act considers fish and fish habitat for all fish species. | ■ For the purpose of the IA / EA, indicator species were selected based on several factors including local/cultural significance, economic and social significance, rarity, ecological significance. Studies to characterize the baseline conditions also take into account the different trophic levels in the aquatic environment. | ■ Section 9 |
| **32** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Draft Criteria and Indicators for Alternatives Evaluation Appendix A<br>– Available resources to help inform the draft criteria and indicators include research publications and expert knowledge on topics such as stressor-effects pathways, cumulative effects, and associated environmental components and indicators. Contacting researchers such as Rob Mackereth (MNRF) who has published research on these topics and related subjects is encouraged. - Rempel, R.S., et. al. 2016. Support for development of a long term environmental monitoring strategy for the Ring of Fire area. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Information Report IR-08. 34 p. + append. Catalogue-natural-resource-scientific-and-technical-publicationsWhile no specifics are provided in this submission, MNRF welcomes a discussion with MECP and ENDM to explore what (if any) role this project could play in advancing baseline information and long-term environmental monitoring for the Ring of Fire in partnership with First Nations communities. | ■ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA reports. | ■ Section 7, Appendix A |

## Table 11-3: Study Plan Federal and Provincial Concordance – Requirement Deviations

| ID # | Federal TISG Reference[13] or Provincial Draft ToR Comment Reference[14] | Requirement / Comment / Concern | Response (Rationale for not meeting requirement) | Justification (for not complying with requirement including for example scientific research, precedence) | Proposed TISG Amendment |
|---|---|---|---|---|---|
| **1** | TISG Section 8.8, page 48 | ■ The Impact Statement must provide a characterization of fish (as defined in subsection 2(1) of the *Fisheries Act*) and other aquatic species on the basis of resident and migratory species, food webs and trophic levels, structural and functional linkages, life history and population dynamics, such as dispersion, fertility, recruitment, mortality rates, re-colonization, age structure, sex ratios, population regulation, stability, distribution (communities, stocks, subpopulations, metapopulations), movements, migratory patterns, routes and preferred corridor, seasonal and annual trends in abundance, sensitive habitats and periods in relation to the study area, behavioural habitat selection, mating strategies, social interactions, predator-prey interactions at multiple spatial and temporal scales, which are critical to identifying effects to population persistence and ecological processes; | ■ Detailed habitat assessment and biological sampling (fish and benthic invertebrates) of a subset within the PDA to characterize habitat, fish and benthic invertebrates.<br>■ Fish community sampling using methods to target different trophic levels (as appropriate) and will including benthic invertebrates.<br>■ Biological field studies targeting lower and upper trophic levels will serve to describe food base and predators, species distribution, size and age class.<br>■ Describe sensitive habitat features including habitat connectivity and migration barriers (desktop and field) to identify potential routes and habitat access for migratory species, variances in habitat conditions and species composition will be noted when these are observed.<br>■ Data collection will occur through some combination of desktop, field studies and/or biological sampling specific to assess fertility, recruitment, mortality, re-colonization, sex ratios, population regulation, stability, behavioural studies are not proposed.<br>■ Social and behavioural aspects will be considered in a qualitative manner. | ■ Baseline studies including dispersion, fertility, recruitment, mortality, re-colonization, sex-ratios, etc. are unprecedented for an assessment of projects of similar scope, as it is generally accepted that negative residual effects to these aspects of fish and fish habitat are unlikely to occur with current industry practices. For example, such studies are not required by the DFO Fish Habitat Protection Program project review process to review similar projects to assess the potential for negative residual effects, or harmful alteration, disruption or destruction to fish habitat or harm to fish. The scope of work of the Project can also be compared to works undertaken by the Ontario Ministry of Transportation, who's class EA process and Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings does not require such studies, nor does construction of access roads and water crossing construction under the Ontario Crown Land Bridge Guidelines or Ontario Environmental Guide for Access Roads. | ■ Reword the requirement:<br>– The Impact Statement must provide a characterization of fish (as defined in subsection 2(1) of the Fisheries Act) and other aquatic species following guidance such as DFO Fish Habitat Protection Program, MTO's Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings and the Ontario Crown Land Bridge Guidelines or Ontario Environmental Guide for Access Roads.<br>– Habitat (including sensitive habitat features, connectivity and access) for resident and migratory species must be described.<br>– Information on food webs and trophic levels, structural and functional linkages, life history and population dynamics, such as dispersion, fertility, recruitment, mortality rates, re-colonization, age structure, sex ratios, population regulation, stability, distribution (communities, stocks, subpopulations, metapopulations), movements, and migratory patterns, routes and preferred corridor, seasonal and annual trends in abundance, sensitive habitats and periods in relation to the study area, behavioural habitat selection, mating strategies, social interactions, predator-prey interactions at multiple spatial and temporal scales, which are critical to identifying effects to population persistence and ecological processes, must be considered, where potential project-related effects have potential to occur. |
| **2** | TISG Section 8.8, page 48 | ■ The Impact Statement must provide a description of the biodiversity within the freshwater environment, including:<br>– trophic state, periphyton, phytoplankton, zooplankton, fish and the interactions and relative significance of each species with the identified food chains;<br>■ Description of the aquatic biodiversity including trophic state, periphyton, phytoplankton, | ■ Biological sampling will incorporate methods to target fish species of all trophic levels (where applicable), and benthic invertebrates across subwatersheds and habitat types of the PSA to characterize biodiversity and food base. Observations of periphyton will be noted. Sampling of zooplankton and phytoplankton is not proposed. | ■ Baseline studies including zooplankton and phytoplankton sampling are unprecedented for an assessment of projects of similar scope, as it is generally accepted that negative residual effects to these aspects of fish and fish habitat are unlikely to occur with current industry practices. For example, such studies are not required by the DFO Fish Habitat Protection Program project review process to review similar projects to assess the potential for | ■ Remove this requirement. |

*13. Federal TISG Reference should be the Section or subsection, page etc. that clearly identifies where comment/issue we are addressing can be found (ex. Section 8.1 of TISG)*
*14. This should include ID # reference (from excel table you were provided with all Draft ToR comments) and commenter.*

| ID # | Federal TISG Reference[13] or Provincial Draft ToR Comment Reference[14] | Requirement / Comment / Concern | Response (Rationale for not meeting requirement) | Justification (for not complying with requirement including for example scientific research, precedence) | Proposed TISG Amendment |
|---|---|---|---|---|---|
| | | zooplankton, fish, their interactions and relative significance. and the relative significance in the food chain | | negative residual effects, or harmful alteration, disruption or destruction to fish habitat or harm to fish. The scope of work of the Project can also be compared to works undertaken by the Ontario Ministry of Transportation, who's class EA process and Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings does not require such studies, nor does construction of access roads and water crossing construction under the Ontario Crown Land Bridge Guidelines or Ontario Environmental Guide for Access Roads. | |
| **3** | TISG Section 7.2, page 33 | ■ With regard to field studies, survey work must be planned to include multiple sampling locations and multiple visits to each location to support all required assessment analyses. Existing data should be considered as a limited augmentation of this new data. See the "Establishing Baseline Conditions" (sections 8.5, 8.9, 8.10, 8.11) in this Tailored Impact Statement Guidelines for recommendations on survey design and methodology. Surveys and analyses should be conducted by qualified experts. Baseline data must be collected in a manner that enables reliable analysis, extrapolations and predictions. Resulting data should be suitable for analyses to estimate pre-project baseline conditions, derive predictions of impacts, and evaluate and compare post-project conditions and at scales of within and across the Project, Local and Regional Assessment areas. Modelling methods, error estimates and assumptions should be reported (as per Section 7.1). Modelling and simulations should be used early in the planning phase to estimate the necessary sampling intensity and to quantitatively evaluate the effectiveness of design options. Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to. | ■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IA/EA and are summarized in this Study Plan. We will be sampling a subset of the watercourse crossings and a subset of those will be visited in multiple seasons and/or years to provide insight into annual and seasonal variation. Additional context will be provided by previous studies (Cliffs Chromite Project). | ■ Sufficient field information is available through historic and/or recent field investigations to understand annual and seasonal variation. Given the size of the study areas, we proposed a subset of water crossings to be included for field assessment. Aerial reconnaissance surveys provide additional contextual information at crossings. Historic data further builds our understanding of regional changes. | ■ Reword the requirement:<br>– With regard to field studies, survey work must be planned to include multiple sampling locations and consider multiple visits to each location to support all required assessment analyses. Applicability of using existing data should be described in the IS report. See the "Establishing Baseline Conditions" (sections 8.5, 8.9, 8.10, 8.11) in this Tailored Impact Statement Guidelines for recommendations on survey design and methodology. Surveys and analyses should be conducted by qualified experts.<br>– Baseline data must be collected in a manner that enables reliable analysis, extrapolations and predictions. Resulting data should be suitable for analyses to estimate pre-project baseline conditions, derive predictions of impacts, and evaluate and compare post-project conditions and at scales of within and across the Project, Local and Regional Assessment areas. Modelling methods, error estimates and assumptions should be reported (as per Section 7.1). Modelling and simulations should be used early in the planning phase to estimate the necessary sampling intensity and to quantitatively evaluate the effectiveness of design options. Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to. |

| ID # | Federal TISG Reference[13] or Provincial Draft ToR Comment Reference[14] | Requirement / Comment / Concern | Response (Rationale for not meeting requirement) | Justification (for not complying with requirement including for example scientific research, precedence) | Proposed TISG Amendment |
|---|---|---|---|---|---|
| **4** | TISG Section 8.8, page 49 | ■ The Impact Statement must provide a description of habitat information that includes water depths (bathymetry) and the littoral, sublittoral, limnetic, profundal, and benthic zones. Stratification information will include epilimnion, metalimnion, and hypolimnion depths in combination with a water chemistry profile (dissolved oxygen, pH, conductivity, etc.); | ■ Habitat data including that specific to lake environments (e.g., temperature and water chemistry profile, lakes zonation, depth, etc.) will be provided in the IS where such lake environments fall within the area of detailed habitat assessment. Preliminary route alternatives and site selection does not identify any lakes crossed by either route alignment and therefore no lake environment within the area proposed for field studies. | ■ There are no lakes (specifically those that would thermally or chemically stratify). | ■ Remove requirement |
| **5** | TISG Section 8.8, page 49 | ■ The Impact Statement must describe the use of fish and/or aquatic species (including Walleye (*Sander vitreus*), Northern Pike (*Esox lucius*), Lake Whitefish (*Coregonus clupeaformis*), Brook Trout (*Salvelinus fontinalis*), Chain Pickerel (*Esox niger*), Yellow Perch (*Perca flavescens*), Cisco (*Coregonus artedi*), Burbot (*Lota lota*), Longnose Sucker (*Catostomus catostomus*), White Sucker (*Catostomus commersoni*), Lake Sturgeon (*Acipenser fulvescens*) and Lake chub (*Couesiius plumbeus*) for consumption or where use has Indigenous cultural importance; | ■ The VC list has been refined to focus on relevant and representative species. Selection of these species was conducted considering cultural significance and use for consumption, as well as recreational and economic importance. Details regarding the VC selection and rationale, including cultural importance and Indigenous use for consumption will be included in the IA, and will largely be carried out through desktop analysis and Indigenous consultation. | ■ The list of species continues to evolve as the project progresses. To date, the VCs selected (based on discussions with Marten Falls community, desktop information and public input) are not the same as those listed here. | ■ Reword the requirement:<br>– The Impact Statement must describe the use of fish and/or aquatic species for consumption or where use has Indigenous cultural importance; |
| **6** | TISG Section 14.1, Page 85 | ■ The Impact Statement must assess the potential for emissions from the Project to contribute to acid deposition and exceedances of critical loads for terrestrial and aquatic ecosystems; | ■ There will be no assessment of emissions from the project to contribute exceedances of critical loads for terrestrial and aquatic ecosystems. There is no threshold established to determine that a specific concentration of NOX and SO2 would be detrimental to the terrestrial and aquatic valued components. | ■ There is no threshold established to determine that a specific concentration of NOX and SO2 would be detrimental to the terrestrial and aquatic valued components. Studies to establish these thresholds have never been undertaken. | ■ Remove Requirement |
| **7** | TISG Section 15.1, Page 90 | ■ The assessment must include a consideration of changes to water quality both at the discharge point and in the receiving environment; changes to water quality due to runoff from any temporary and permanent project components; | ■ Qualitative discussion of the potential changes in surface water and subsequent effects on fish will be assessed as part of the IA/EA. Refer to the Surface Water Study Plan for more information. | ■ Information on project discharges, if applicable, will be assessed in the EA/IA. There are no permanent discharges anticipated. | ■ Reword the requirement:<br>– The assessment must include a consideration of potential changes to water quality due to runoff from any temporary and permanent project components; |

# 12. References

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# Appendix A

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# Appendix B

## Agency Comments on the Draft Study Plan

# Draft Study Plan Comments – Federal

| Comment # / Ref # | Draft Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
|---|---|---|---|---|---|---|
| **GC** | ■ General Comment | ■ Sections 5, 6, 7, 13, 19.2 and 25 | ■ In addition to the required actions detailed below, other required actions to be addressed in the update to this study plan are detailed in a separate table titled "2020-07-02 – IAAC to MFCAR - General Comments on MFCAR Draft Study Plans". The Agency has provided these other required actions to highlight common sections of the Guidelines where requirements were not met in the draft study plans submitted to the Agency. These additional actions must be addressed in the updated study plans. | ■ Please see Comment / Context | ■ We have reviewed the relevant comments and incorporated where appropriate. Please refer to the General Comments Table Response submitted separately to the Agency for specific responses. | ■ Various Sections |
| **EC** | ■ Editorial Comment | ■ N/A | ■ Sections 4.2.1 and 4.2.2 of the study plan are referenced multiple times but do not seem to exist in the study plan. If this is an editorial error, please correct the reference provided. | ■ Make editorial edits to the study plan to ensure that all sections referenced in the study plans exist. | ■ Changes made. | ■ No reference |
| **FH-01** | ■ Section 4.1.2.1 Sites Surveyed<br>– "164 waterbody crossings were surveyed from a helicopter during an aerial reconnaissance survey on September 5 and September 6, 2019. All proposed crossings on Route Alternatives 1 and 4 were included in the aerial reconnaissance survey. Eleven proposed waterbody crossings were assessed for fish and fish habitat from September 6 to September 10, 2019 (Table 1). Three of the assessed waterbody crossings were on the Alternative 1 ROW, five were on the Alternative 4 ROW, and three were on overlapping sections of Alternatives 1 and 4. Detailed fish habitat assessments were completed at all 11 waterbody crossings and fish sampling was completed at seven waterbody crossings".<br>■ Section 4.3 Study Methods<br>– "The field study will involve a habitat and biological assessment at a 50% subset of locations where the PSA or Project footprint of route alternatives 1 and 4 intersect potential fish habitat." | ■ Section 7.2 Sources of Baseline Information<br>– "With regard to field studies, survey work must be planned to include multiple sampling locations and multiple visits to each location to support all required assessment analyses."<br>■ Section 7.4.2<br>– "Baseline data collection for all biophysical valued components is to be provided for a minimum of two years, unless specified otherwise. Temporal boundaries spanning more than one year will enable accounting for variation due to irregular events (e.g., masting events, storms on migration, late snowfalls)." | ■ It is unclear whether data will be collected from the same number and site locations in the second year field survey as in the 2019 field survey. Section 7.2 of the Guidelines requires multiple visits to each sampling location to demonstrate any variation. It is unclear if the "50% subset of locations" is a reduction or addition of locations for the 2020 field survey. It is unclear which 11 waterbody crossings were sampled in 2019. The study plan references a "Table 1" when discussing the 2019 field assessment, but does not provide this Table. | ■ Provide details to clarify the proposed number and site locations of field data collection for the second year of baseline data collection, to demonstrate that two years of baseline data will be collected, as per the requirements in Section 7.4.2 of the Guidelines Provide details to clarify which waterbody crossings were sampled in 2019.<br>■ Provide the referenced "Table 1". | ■ Details regarding 2019 / 2020 field studies including site selection rationale are included in the Study Plan. As desktop review continues, the number of sites may be subject to change; as such, we proposed a percent sampling coverage, by aspect of the Fish and Fish Habitat program. Rationale for site selection (for past and future studies) are provided in the Study Plan. The Study Plan was revised to include additional information regarding desktop and proposed field studies. Results of field investigations will be provided at a later date.<br>■ The reference to Table 1 has been removed but we have included Figures showing location of sampling sites previously visited. | ■ Section 7 |

| Comment # / Ref # | Draft Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| **FH-02** | ■ Section 4.2 Desktop Assessment<br>– "desktop analysis and existing background information gathering will also rely heavily of community knowledge, public consultation and Indigenous Knowledge (IK)." | ■ Section 6<br>– "The proponent must engage with all Indigenous groups that may be impacted by the Project. The Indigenous Engagement and Partnership Plan, issued by the Agency, is available to assist the proponent in further developing or refining their engagement strategy and supporting ongoing trust and relationship-building. In addition to the requirements set out in section 6.1, 6.2 and 6.3, the proponent must provide Indigenous groups with an opportunity to: provide Indigenous knowledge during baseline data collection; comment on the list of valued components and indicators…"<br>■ Section 7.4.1<br>– "Spatial boundaries are defined taking into account the appropriate scale and spatial extent of potential effects and impacts of the Project; community knowledge and Indigenous knowledge; current or traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; and physical, ecological, technical, social, health, economic and cultural considerations." | ■ It is not specified whether Indigenous knowledge has been incorporated in the site selection for field surveys. As per Section 6 of the Guidelines, the Agency expects the proponent to engage with, at a minimum, the Indigenous groups listed in the Indigenous Engagement and Partnership Plan. | ■ Provide further details to demonstrate how all Indigenous groups listed in the Indigenous Engagement and Partnership Plan will be engaged with, and provided opportunities to provide Indigenous knowledge on fish and fish habitat. This includes incorporating into the plan where Indigenous groups will be provided with opportunities to: provide Indigenous knowledge during baseline data collection; comment on the list of valued components and indicators; inform the effects assessment and review its conclusions; and inform the development of mitigation measures and follow-up programs. | ■ As identified in Section 4.2 of the Study Plan, the Proponent will provide opportunities for consultation and engagement with Indigenous communities identified in Table 4-1, which is inclusive of all Indigenous communities identified in the Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment (IAAC 2020a).<br>■ Further information on how Indigenous Knowledge will be considered in the IS / EA Report has been included in Section 5 of the Study Plan. Section 5 of the Study Plan provides further details on the two concurrent and complementary avenues for Indigenous communities and groups to be engaged with and provide input on the Project: the Indigenous Knowledge Program and the Consultation and Engagement Program. | ■ Section 4.2<br>■ Section 5 |
| **FH-03** | ■ Section 4.2 Desktop Assessment<br>– "Available existing information will be reviewed to characterize the context of the fish and fish habitat within the study areas of the Project as defined in Section 3. Resources that will be reviewed for existing information will include (but not limited to) waterbodies, thermal regimes, fish species, significant fish habitat features (e.g., spawning habitat, nursery habitat, migration barriers), aquatic Species at Risk (SAR), Species of Conservation Concern, and SAR habitat. The reviewed resources | ■ Section 7.2<br>– "The Impact Statement must provide detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental, health, social and economic condition that is described, in order to corroborate the validity and accuracy of the baseline information collected…"<br>– "If using existing data sources, the Impact Statement must provide justification to show that the data sources are relevant in spatial and | ■ It is unclear what existing data will be used to supplement the field data. Section 7.2 of the Guidelines require that detailed descriptions of specific data sources are provided.<br>■ Additionally, as per Section 7.2 of the Guidelines, the Impact Statement must provide justification to demonstrate the data sources are relevant to the project. | ■ Provide detailed descriptions of specific data sources that will be used to identify baseline conditions, as proposed in Section 4.2 of the study plan. Sources should be listed and preferably correlated to the criteria and indicators that they will inform.<br>■ Provide justifications to demonstrate that each data source is relevant in spatial and temporal coverage to the project. | ■ Appendix A of the Study Plan was revised to include specific sources. The results of the desktop studies will be provided at a later date. | ■ Section 7<br>■ Appendix A |

| Comment # / Ref # | Draft Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| | will include (but not limited to) those listed in Appendix A, in addition to preliminary Project-related reports. Furthermore, desktop analysis and existing background information gathering will also rely heavily of community knowledge, public consultation and Indigenous Knowledge (IK)."</li></ul> | temporal coverage to the Project. Some data sources may have good coverage in Southern Ontario or existing road networks but be unsuitable as a baseline for these northern areas where there are not roads." | | | | |
| **FH-04** | ■ Section 4.3.1.1 Fish<br>– "Fish sampling will be completed once at each assessment site during either the spring, summer, and fall months of a single sampling season"<br>■ Section 5.2.2 Biological Analysis<br>– "The scope of the fish sampling program and data collected as described in Section 4.2.2 will include quantitative and qualitative data that will describe: Species seasonal variation, by conducting sampling over the course of spring, summer and fall (as conditions and access allow)". | ■ Section 7.4.2<br>– "Baseline data collection for all biophysical valued components is to be provided for a minimum of two years, unless specified otherwise. Temporal boundaries spanning more than one year will enable accounting for variation due to irregular events (e.g., masting events, storms on migration, late snowfalls)." | ■ It is unclear if the proposed fish sampling has occurred, or will occur, in either the spring, summer and fall months (as stated in Section 4.3.1.1 of the study plan) or over the course of the spring, summer and fall (as stated in section 5.2.2 of the study plan). It is also unclear whether the sampling in future years will occur during the same season(s) as in 2019. | ■ Provide clarity on timing of the fish sampling conducted in 2019, and for the sampling proposed in future years. Provide justification for situations where the timing may be different in future years from the 2019 timing. | ■ Study Plan was revised to provide additional details on timing of previous surveys. Future studies are anticipated for spring and / or fall of 2021. | ■ Section 7 |
| **FH-05** | ■ Section 4.3.2.2 Lotic Habitat<br>– "Lotic habitat assessment, where there is evidence of unidirectional flow at the time of assessment with the potential to support fish, will include the extent of the watercourse and riparian area within the PSA. Habitat assessments will involve the establishment of a transect at the CL of the proposed route alignment, and at regular intervals upstream and downstream of the CL within the boundaries of the PSA. The following data will be collected at each transect:.." | ■ Section 15.1<br>– "Describe and justify watercourse-crossing techniques to be used and the criteria for determining the techniques proposed for each watercourse crossing." | ■ More detail is needed in relation to fish passage, including velocity measurements at the site location to determine if fish can pass through the culvert structures. | ■ Describe and justify water-crossing techniques for each watercourse crossing, as is required in Section 15.1 of the Guidelines. It is recommended that this include a discussion of fish passage. To meet this requirement, baseline velocity at the site locations should be measured to determine if fish can pass through the culvert structures. | ■ Velocity measurements will be collected for the purpose of characterizing the baseline conditions of the fish habitat.<br>■ Crossing structures will be designed to avoid fish passage issues; a more fulsome discussion of criteria considering when identifying and designing crossing structures will be included in the IS / EA Report. | ■ Section 7 |
| **FH-06** | ■ Section 4.3.2.1 Lentic Habitat and Section 4.3.2.2 Lotic Habitat<br>– "Suitable sensitive habitat features or potential important habitat function such as spawning, migration, overwintering, nursery, productive feeding areas, fish passage barriers, etc. will be delineated or mapped, photographed and described." | ■ Section 8.8<br>– "provide a characterization of fish habitat features that may demonstrate the presence of fish species in terms of appropriate habitats—water quality and quantity characteristics, sediment type characteristics, benthic features, prey, shelter, refuge, feeding, spawning habitats, nursery habitats, | ■ It is unclear how the spawning locations for the species listed in Table 5-1 will be determined. It is also unclear if there have been or will be any spawning surveys conducted, | ■ Provide details to demonstrate how the spawning locations for the species listed in Table 5-1 will be determined. Clarify if spawning surveys have been completed, or will be completed. Provide any desktop or field data that has been collected relating to spawning, including from any spawning surveys that have been undertaken. | ■ Standalone spawning surveys have not been completed, nor are they proposed. The known spawning locations within the PDA for the indicator species will be identified though desktop analysis, field assessment, and Indigenous Knowledge (where available). Where suitable spawning habitat is observed through desktop analysis and fish habitat | ■ Section 7<br>■ Appendix A |

| Comment # / Ref # | Draft Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| | ■ Table 5-1 Examples of Literature Reviewing indicator Species Habitat Suitability Patterns | rearing habitats, overwintering, migration routes and the sensitive times for these activities;" | | | assessment, it will be documented, photographed and mapped.<br>■ The results of the desktop and field assessment studies will be provided at a later date. | |
| **FH-07** | ■ Section 7 Concordance with Federal and Provincial Guidance<br>– "Qualitative and/or quantitative description (as applicable) of potential stressors and effects, and anticipated residual effects will include potential changes to such changes to fish habitat" | ■ Section 15.1<br>(relevant to many requirements) | ■ An incomplete list of the requirements of Section 15.1 of the Guidelines is presented in Section 7 of the study plan. For most of the requirements listed, the study plan only states that "Qualitative and/or quantitative description (as applicable) of potential stressors and effects, and anticipated residual effects will include potential changes to such changes to fish habitat" but no further detail is provided. | ■ Update the study plan to explain the proposed approach and methods used to fully integrate the requirements of Section 15.1 of the Guidelines into the study plan. | ■ The Concordance Table 7 (now numbered Table 11-1, 1-2, and 11-3) has been revised to provide concise responses to the requirements of the TISG. The Study Plan was revised to specify the potential effects that are expected to be quantified and measurable, such as the area of direct loss or alteration of habitat caused by project infrastructure (water crossings), area of loss of riparian vegetation, area of loss or alteration of important habitat features (e.g. suitable spawning habitat), and those that are not expected to be measurable (i.e. changes in light penetration effects of existing local activities). | ■ Section 9<br>■ Section 11 |
| **FH-08** | ■ Section 7 Concordance with Federal and Provincial Guidance<br>– "Sampling of zooplankton and phytoplankton is not proposed." | ■ Section 8.8<br>– "provide a description of the biodiversity within the freshwater environment, including: trophic state, periphyton, phytoplankton, zooplankton, fish and the interactions and relative significance of each species with the identified food chains;" | ■ It is unclear how the requirements of Section 8.8 of the Guidelines will be met if sampling of zooplankton and phytoplankton is not proposed. | ■ Provide further detail on proposed methodologies, including the rationale, to demonstrate how the baseline studies described in the study plan will meet all requirements of Section 8.8 of the Guidelines. | ■ Amendment to this requirement will be requested (please refer to Table 11-2 of the Study Plan). Baseline studies including zooplankton and phytoplankton sampling are unprecedented for an assessment of projects of similar scope, as it is generally accepted that negative residual effects to these aspects of fish and fish habitat are unlikely to occur with current industry practices. Studies are not typically required by the DFO Fish Habitat Protection Program, the Ontario Ministry of Transportation Class EA process and Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings, and the Ontario Crown Land Bridge Guidelines or Ontario Environmental Guide for Access Roads. | ■ Section 11 |

| Comment # / Ref # | Draft Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| **FH-09** | ■ Section 7 Concordance with Federal and Provincial Guidance<br>– "data collection through desktop or field studies and/or biological sampling specific to assess fertility, recruitment, mortality, re-colonization, sex ratios, population regulation, stability, and behavioural studies are not proposed." | ■ Section 8.8<br>– "provides a characterization of fish (as defined in subsection 2(1) of the Fisheries Act) and other aquatic species on the basis of resident and migratory species, food webs and trophic levels, structural and functional linkages, life history and population dynamics, such as dispersion, fertility, recruitment, mortality rates, re-colonization, age structure, sex ratios, population regulation, stability, distribution (communities, stocks, subpopulations, metapopulations), movements, migratory patterns, routes and preferred corridor, seasonal and annual trends in abundance, sensitive habitats and periods in relation to the study area, behavioural habitat selection, mating strategies, social interactions, predator-prey interactions at multiple spatial and temporal scales, which are critical to identifying effects to population persistence and ecological processes". | ■ It is unclear why biological sampling specific to assess fertility, recruitment, mortality, re-colonization, sex ratios, population regulation, stability, and behavioural studies are not proposed. | ■ Provide a rationale for the decision to exclude biological sampling specific to assess fertility, recruitment, mortality, re-colonization, sex ratios, population regulation, stability, and behavioural studies from the proposed desktop or field studies, as required in Section 8.8 of the Guidelines. | ■ Amendment to this requirement will be requested (please refer to Table 11-3 of the Study Plan). Baseline studies including dispersion, fertility, recruitment, mortality, re-colonization, sex-ratios, etc. are unprecedented for an assessment of projects of similar scope, as it is generally accepted that negative residual effects to these aspects of fish and fish habitat are unlikely to occur with current industry practices. Such studies are not required by the DFO Fish Habitat Protection Program project review process, Ontario Ministry of Transportation Class EA process and Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings, and the Ontario Crown Land Bridge Guidelines or Ontario Environmental Guide for Access Roads. | ■ Section 11 |
| **FH-10** | ■ Section 7 Concordance with Federal and Provincial Guidance<br>– "To be completed during desktop analysis and field habitat assessment for geophysical information including depth." | ■ Section 15.1<br>– "provide a characterization of fish habitat features that may demonstrate the presence of fish species in terms of appropriate habitats—water quality and quantity characteristics, sediment type characteristics, benthic features, prey, shelter, refuge, feeding, spawning habitats, nursery habitats, rearing habitats, overwintering, migration routes and the sensitive times for these activities; provide a description of habitat information that includes water depths (bathymetry) and the littoral, sublittoral, limnetic, profundal, and benthic zones. Stratification information will include epilimnion, metalimnion, and hypolimnion depths in combination with a water chemistry profile (dissolved oxygen, pH, conductivity, etc.)". | ■ It is unclear which aspects of the requirements in Section 15.1 of the Guidelines will be completed during a desktop analysis and what aspects will be completed during the field habitat assessment. | ■ Provide details to demonstrate which aspects of the requirements in Section 15.1 of the Guidelines will be completed by a desktop analysis or habitat assessment. Provide details about methods and specific data that will be used. | ■ Information to be collected through fish habitat field assessment and desktop analysis are described in Section 7 of the Study Plan. Additional detail of the relevant desktop information sources to-date was provided in Appendix A.<br>■ Additional information on water chemistry can be found in the Surface Water VC Study Plan. | ■ Section 7<br>■ Appendix A<br>■ Surface Water VC Study Plan |

| Comment # / Ref # | Draft Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| **FH-11** | ■ Section 7 Concordance with Federal and Provincial Guidance<br>– "Summary of desktop analysis and background information review will provide a description of such effects and activities" | ■ Section 15.1<br>– "describe any existing effects associated with previous or current activities (e.g., angling pressures, commercial fisheries)" | ■ Section 7 of the study plan states that effects associated with previous or current activities (e.g. angling pressures, commercial fisheries) will be described using background information and a desktop analysis. More details are needed about the desktop assessment to determine if the requirement in section 15.1 of the Guidelines will be met. | ■ Provide details to demonstrate how any existing effects associated with previous or current activities (e.g., angling pressures, commercial fisheries) will be assessed, including descriptions of specific data sources that will be used. | ■ The IS / EA Report will include a discussion of these activities and the identified or and potential effects of these activities to fish and fish habitat, where available and relevant to understanding Project-related effects. Consequential effects on Land and Resource Use and Aboriginal and Treaty Rights and Interests will also be considered in the IS / EA Report. Data on resource use activities will be gathered as described in those referenced Study Plans. | ■ Section 9<br>■ Land and Resource Use Study Plan<br>Aboriginal and Treaty Rights and Interests Study Plan |
| **FH-12** | ■ Section 7 Concordance with Federal and Provincial Guidance<br>– "Currently not proposed for fish program baseline assessment. Refer to Field Work Plan – Surface Water"<br>– Surface Water Study Plan: "…additional in situ measurements may be collected as part of the Fish and Fish Habitat VC field program (refer to the Fish and Fish Habitat VC Study Plan)."<br>– "Qualitative methods will be used to assess potential effects of the Project to surface water quality based on an understanding of baseline surface water quality, likely Contaminants of Potential Concern associated with different project activities and in consideration of mitigation measures." | ■ Section 15.1<br>– "potential for direct effects of contamination downstream of the Project on fish and bioaccumulation of contaminants (e.g., selenium, mercury, chromium, arsenic) in fish that may be consumed by Indigenous groups; …describe the effects of changes to the aquatic environment on fish and fish habitat, including: contaminant levels in harvested species and their prey". | ■ It is unclear how the requirement in Section 15.1 of the Guidelines will be met. The study plan references the surface water study plan, however, the surface water study plan does not discuss bioaccumulation of contaminates in fish that may be consumed or harvested by Indigenous groups. | ■ Provide details to demonstrate how effects of contamination downstream of the Project on fish, and bioaccumulation of contaminants (e.g., selenium, mercury, chromium, arsenic) in fish that may be consumed by Indigenous groups will be assessed. Provide information about methods and approaches that will be used to meet the requirements in Section 15.1 of the Guidelines. | ■ The IA / EA will evaluate the potential for contaminant bioaccumulation as result of the project. If it is determined by the IA / EA that a residual effect pathway for contaminant bioaccumulation exists (i.e., after mitigation), additional baseline studies may be proposed. Please see the Physiography, Terrain and Soils Study Plan, the Groundwater and Geochemistry Study Plan, and the Surface Water Study Plan for details on methods and approaches for assessing the potential for contaminant release into the environment as result of the Project. | ■ Physiography, Terrain and Soils Study Plan<br>■ Groundwater Study Plan<br>■ Surface Water Study Plan |

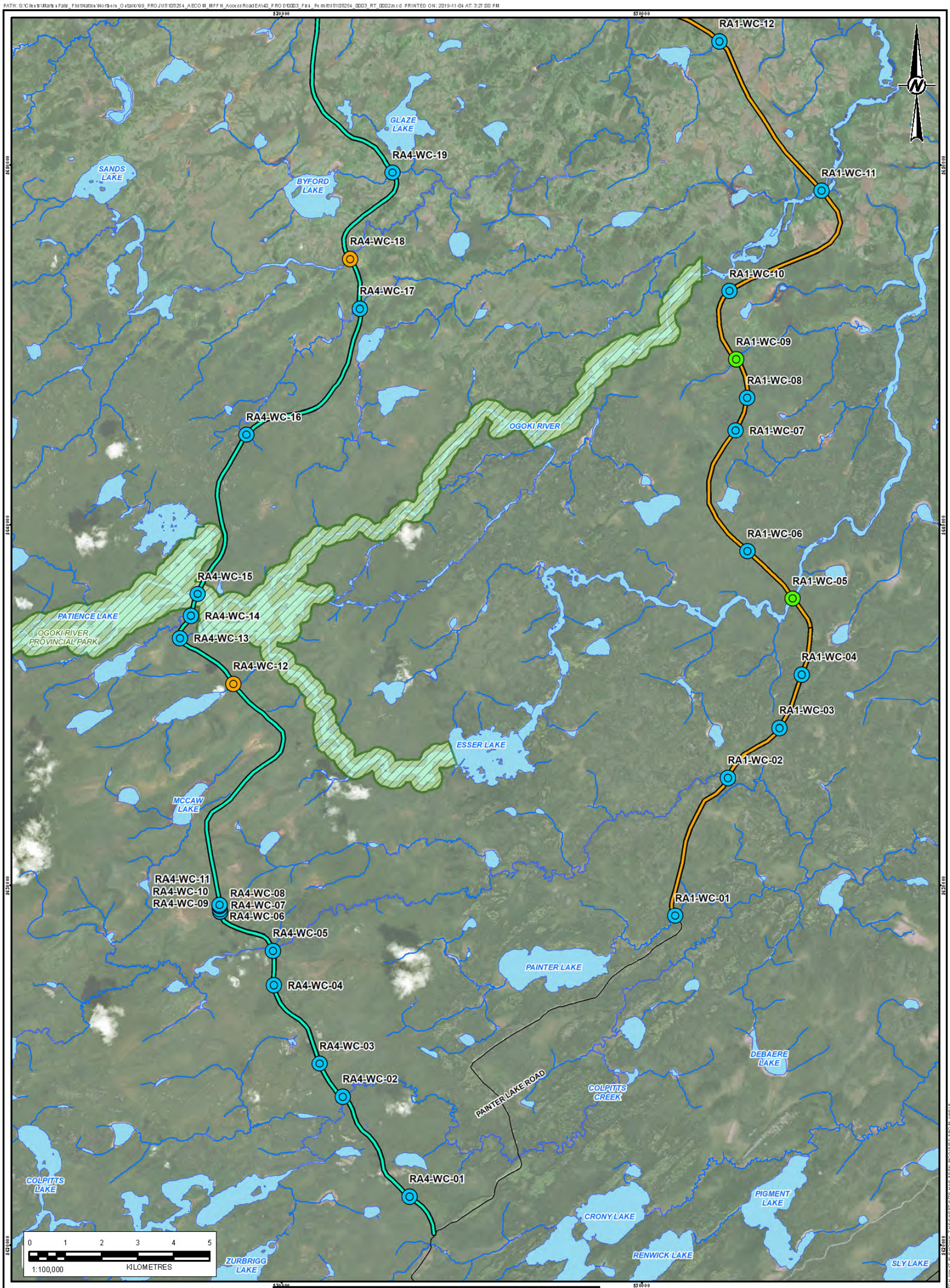
# Draft Study Plan Comments – Provincial

| Comment ID | Draft Study Plan Section | Agency / Regulatory Body Comments Received From | Comment / Context | Action Item | Final Response | Study Plan Reference |
|---|---|---|---|---|---|---|
| 1 | ■ N/A | ■ MECP, Environmental Assessment Branch | ■ Please review EAB comments on the Wildlife, Ungulates and Vegetation work plans that may apply to this work plan. | ■ Please review EAB comments on the Wildlife, Ungulates and Vegetation work plans that may apply to this work plan. | ■ We have reviewed the relevant comments and incorporated where appropriate. Please refer to the Comment Tables appended to the Wildlife, Ungulates and Vegetation Study Plans for specific responses. | ■ Wildlife Study Plan<br>■ Ungulates Study Plan<br>■ Vegetation Study Plan |
| 1 | ■ Page 12 / Section 4.3.2.1 | ■ MECP, Surface Water Specialist | ■ Benthic Invertebrate – This section mentions that the benthic invertebrate community will be sampled at each assessment site during either the spring, summer, or fall of one sampling season and concurrent with fish sampling efforts. | ■ It is recommended that benthic invertebrate sampling take place when water temperatures are no greater than 5°C, as emergence tends to happen when water is >8°C with an increase in photoperiod. Fall sampling is preferred as it provides a better baseline. | ■ Field sampling for benthic invertebrates will be conducted under appropriate conditions. | ■ Section 7 |

# Appendix C

## 2019, 2020 Field Assessment Site Location

PATH: S:\Clients\Marten Falls_First Nation\Northern_Ontario\99_PROJ\18108254_AECOM_MFFN_Access Road EA\40_PRODUCTION\3_Fish_Permit\18108254_0003_RT_0002.mxd PRINTED ON: 2019-11-04 AT: 3:27:00 PM



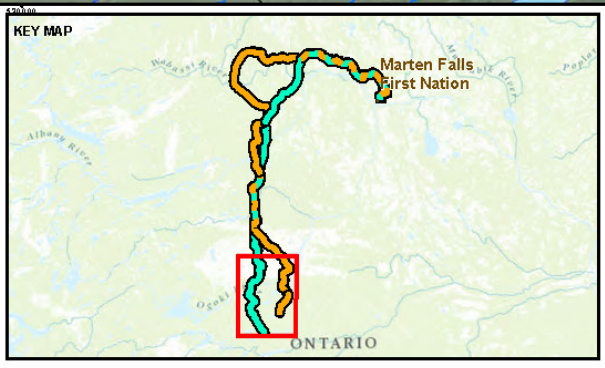

**LEGEND**

- WATERBODY CROSSING - FISH HABITAT ASSESSMENT AND FISH SAMPLING
- WATERBODY CROSSING - FISH HABITAT ASSESSMENT AND FISH SAMPLING (MINNOW TRAPPING)
- WATERBODY CROSSING - FISH HABITAT ASSESSMENT AND FISH SAMPLING (ELECTROFISHING)
- WATERBODY CROSSING

PHASE 1 ROUTE ALTERNATIVE CENTERLINE
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- PHASE 2 ROUTE ALTERNATIVES
- ROAD
- WATERCOURSE
- WATERBODY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK

**REFERENCE(S)**
1. BASE DATA MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: BING © 2019 MICROSOFT CORPORATION
3. PHASE 1 ROUTE ALTERNATIVES PROVIDED BY AECOM (MAY 30, 2019, R01)
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 16N

KEY MAP




CLIENT
MARTEN FALLS FIRST NATION

PROJECT
MARTEN FALLS FIRST NATION
COMMUNITY ACCESS ROAD

**DRAFT**

TITLE
**FIELD ASSESSMENT LOCATIONS**

CONSULTANT
GOLDER

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| YYYY-MM-DD | 2019-11-04 |
| DESIGNED | SO |
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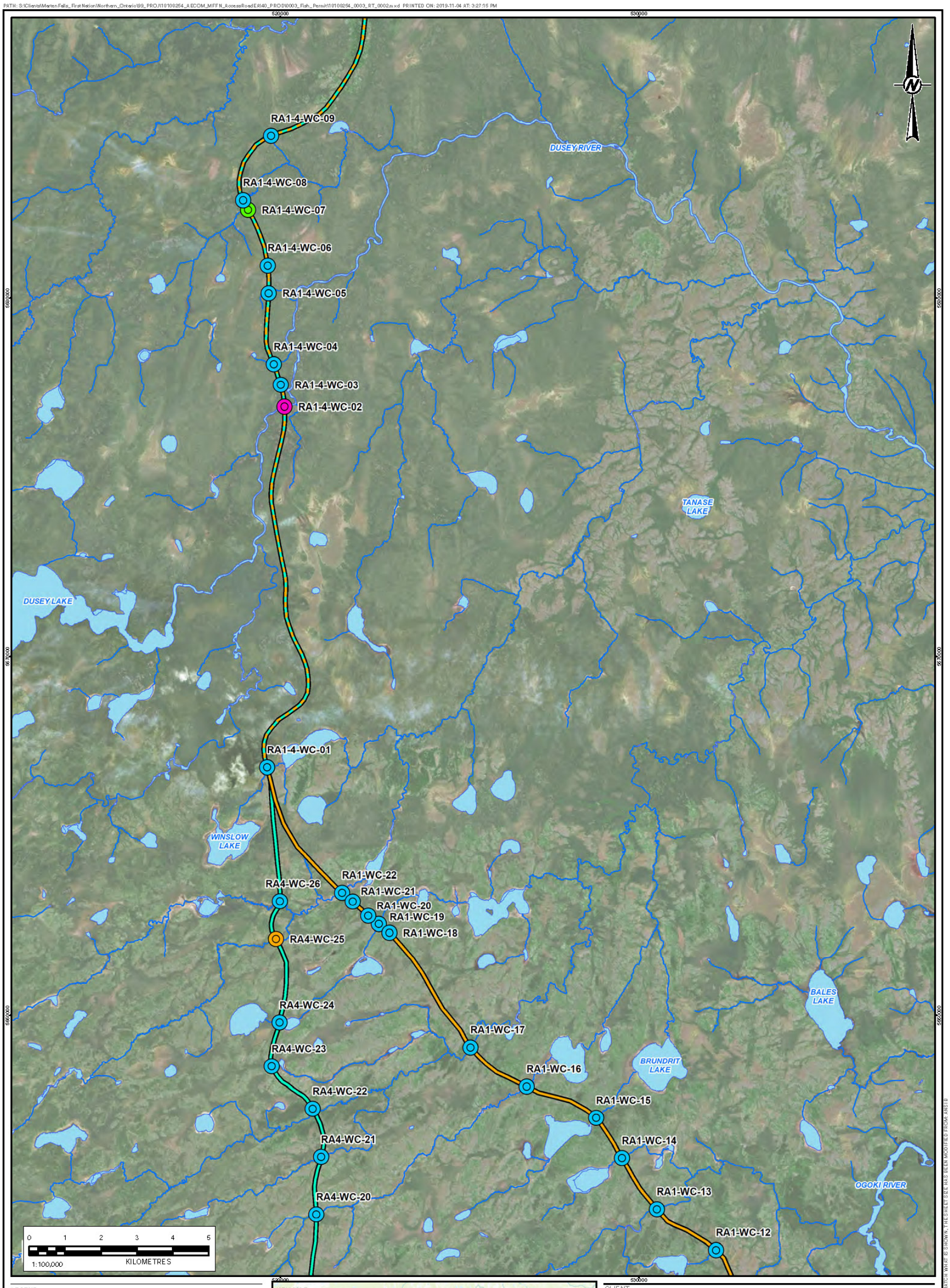


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- WATERBODY CROSSING

PHASE 1 ROUTE ALTERNATIVE CENTERLINE

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- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- PHASE 2 ROUTE ALTERNATIVES
- ROAD
- WATERCOURSE
- WATERBODY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK

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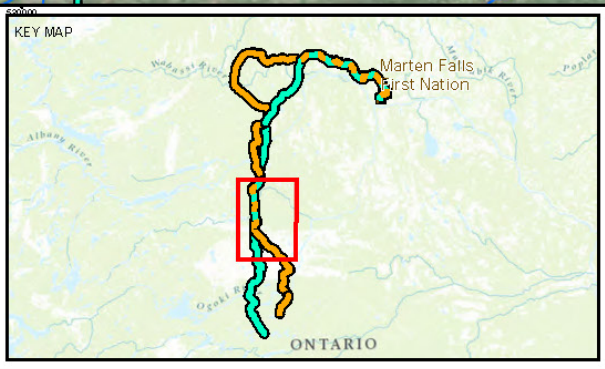


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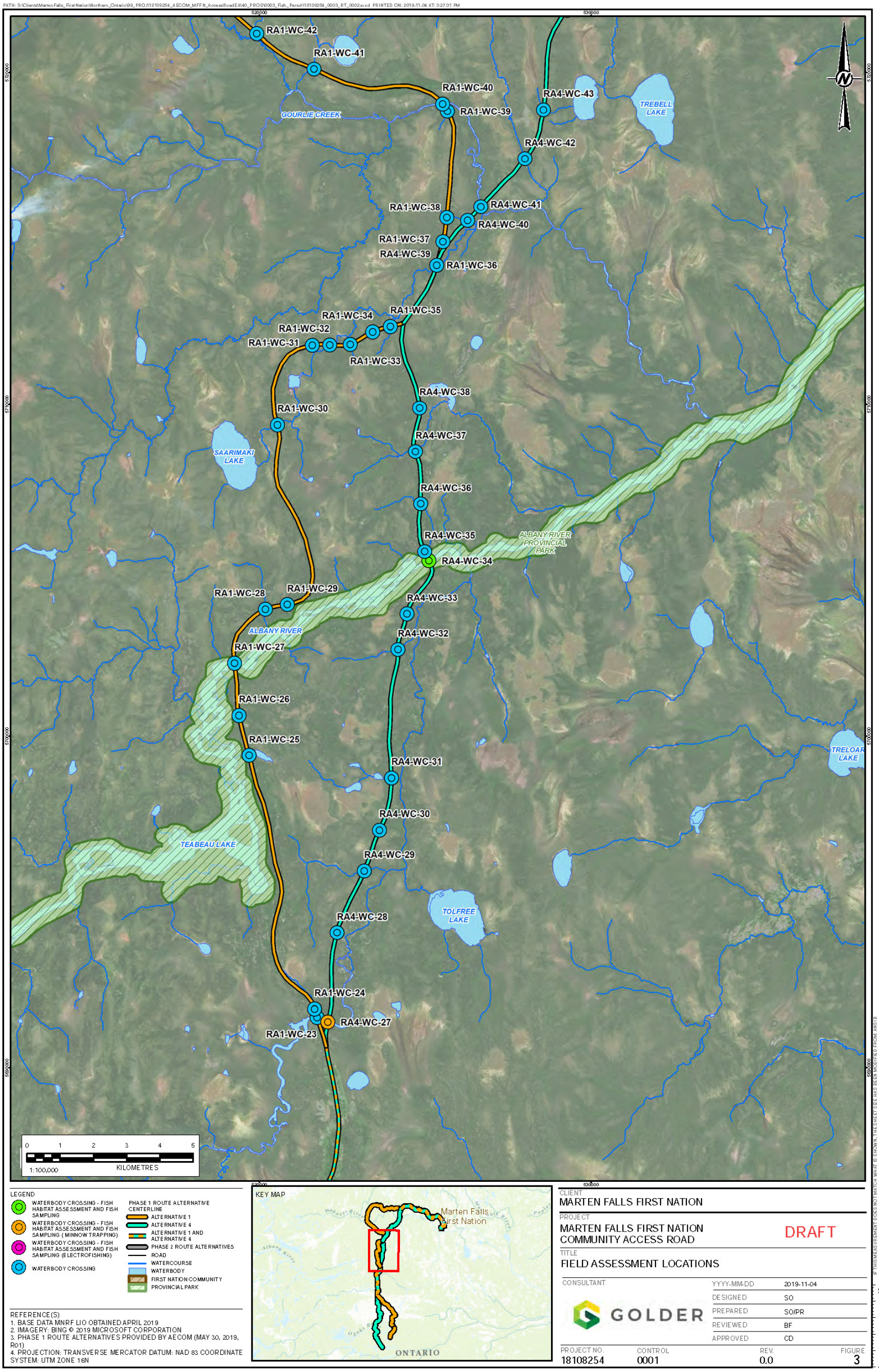


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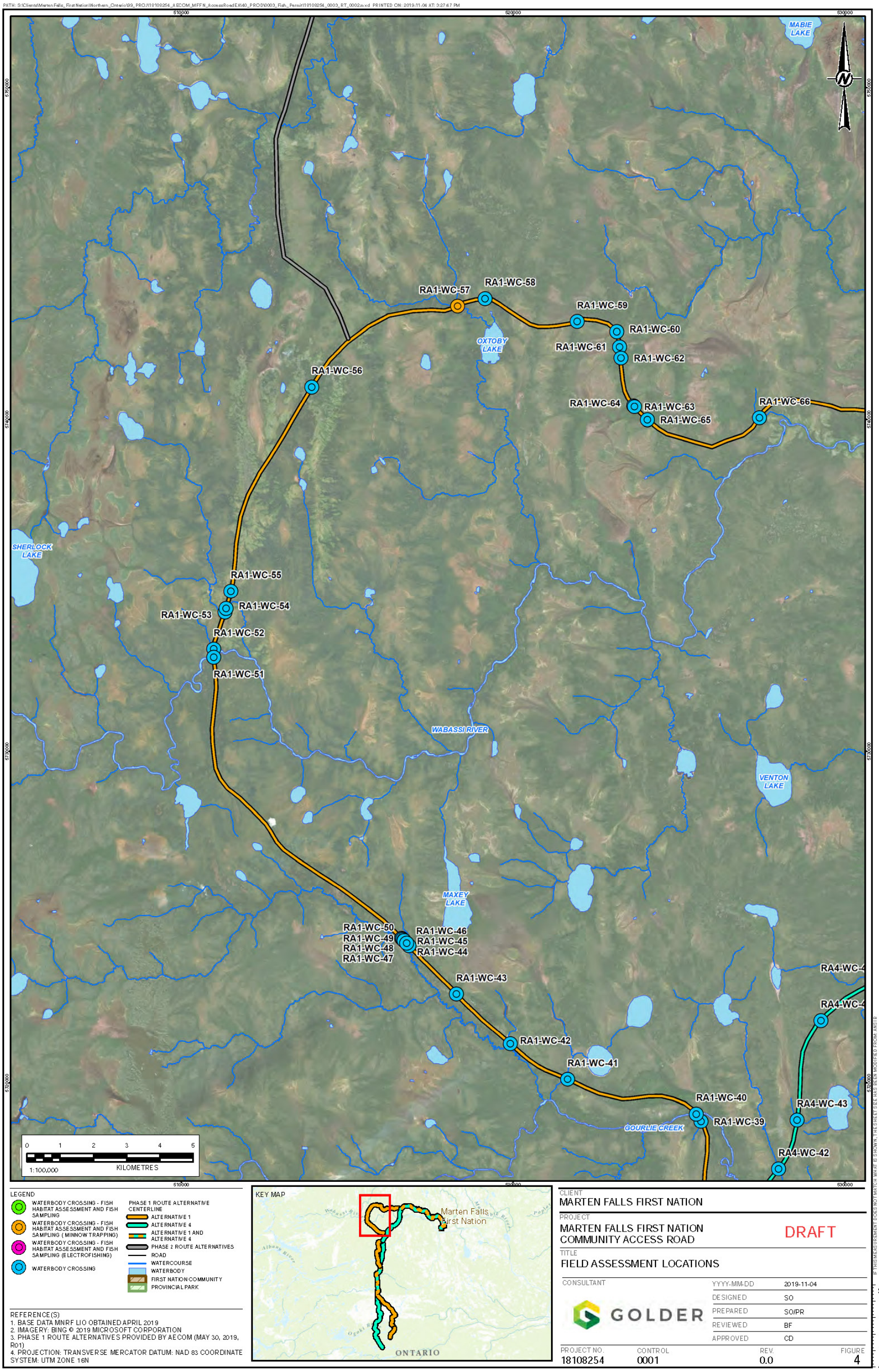
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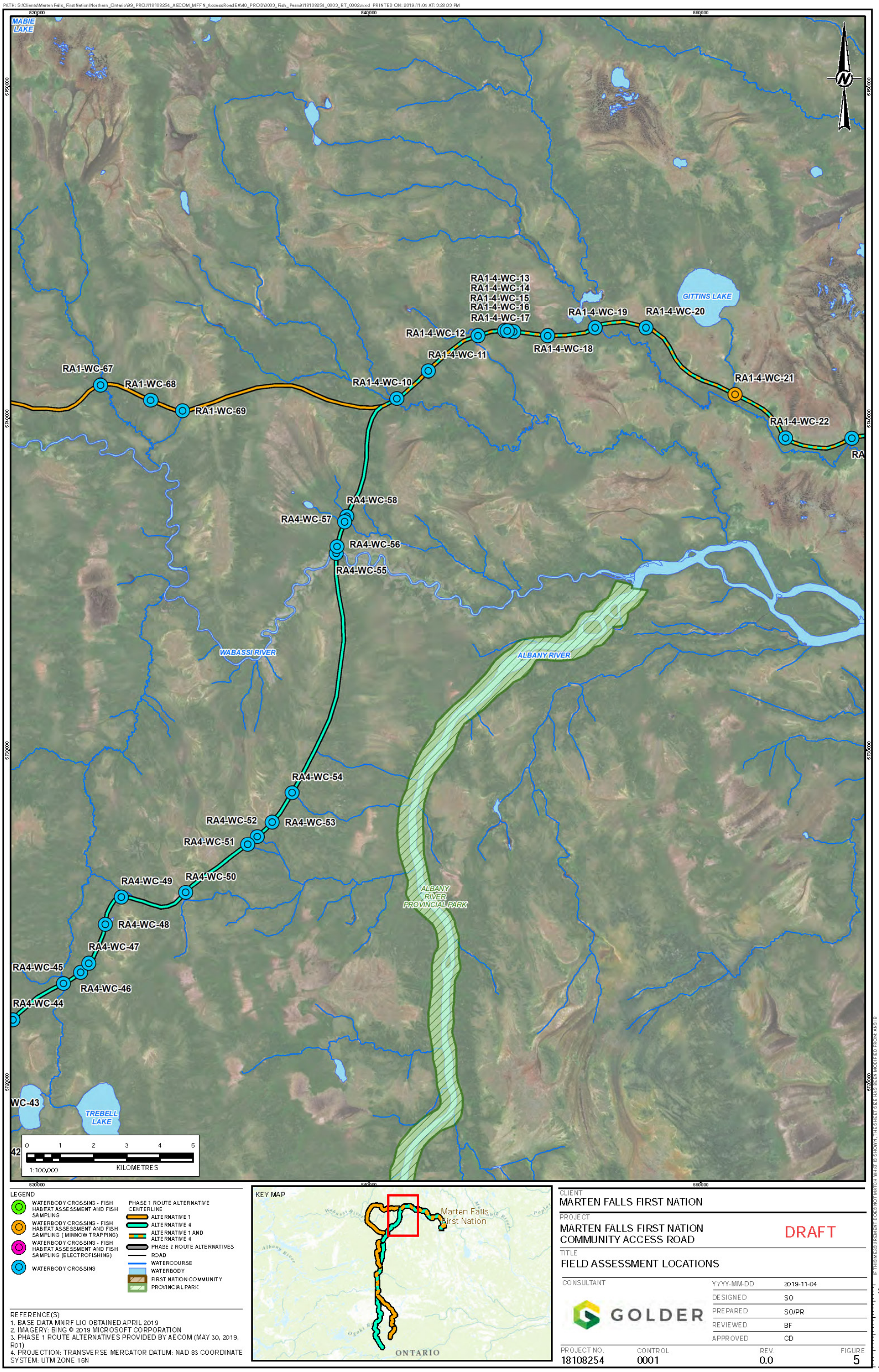


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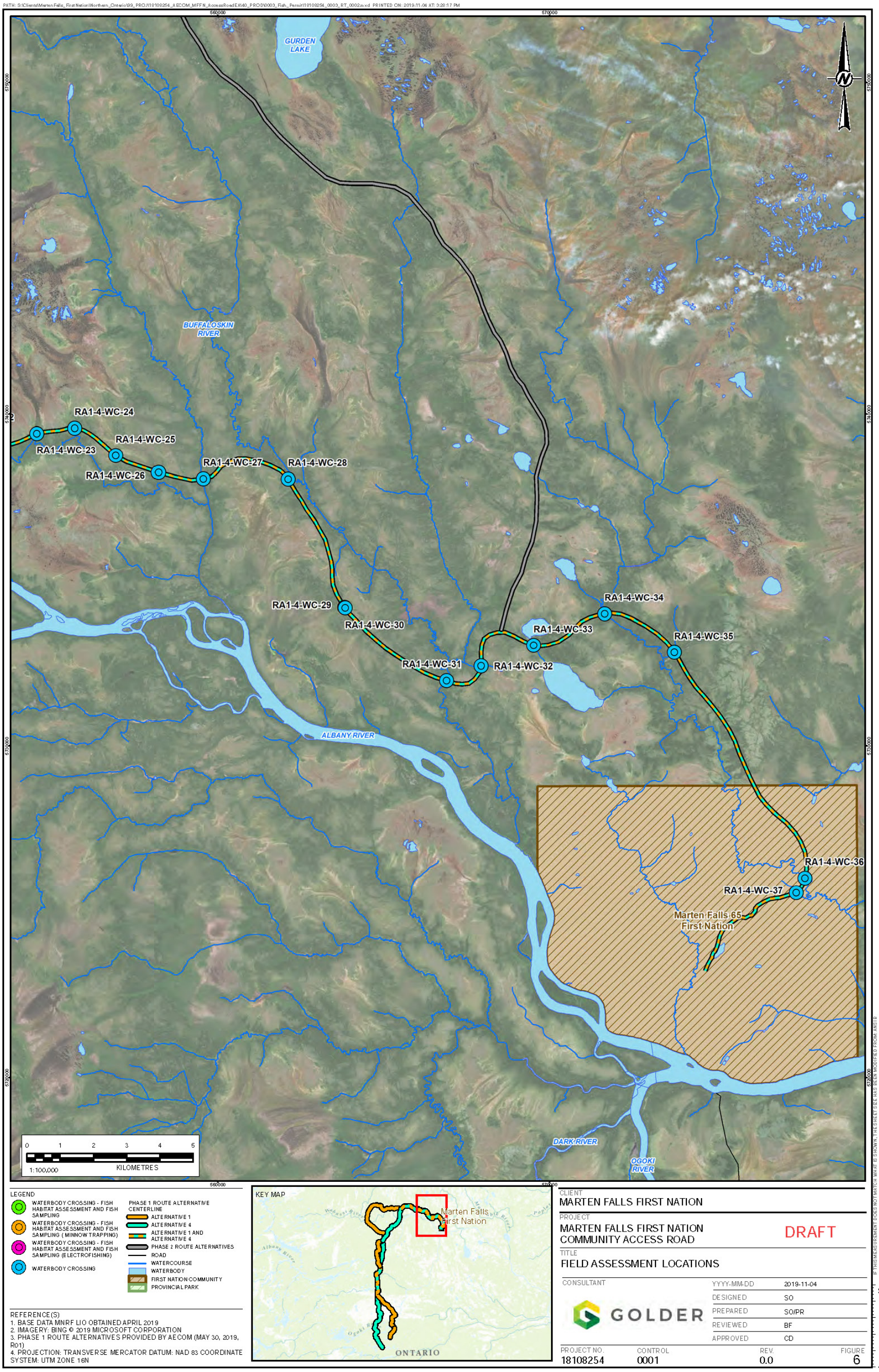


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KEY MAP




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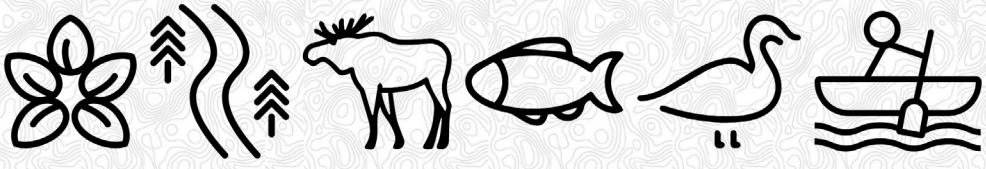
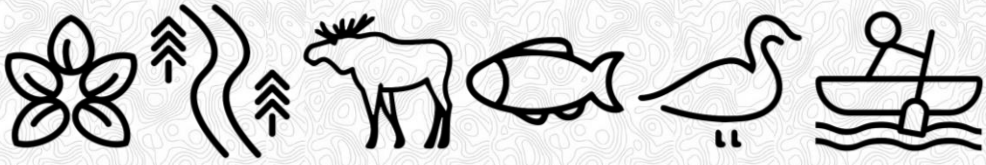


MARTEN FALLS FIRST NATION
**ALL SEASON COMMUNITY ACCESS ROAD**

FINAL

# Aquatics Field Logistics Work Plan for 2021 Field Studies

***July 2021***



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## Acronyms

Agency, the ... Impact Assessment Agency of Canada
CAR ..... Community Access Road
EA ..... Environmental Assessment

HaSEP ..... Health and Safety and Environmental Protection Plan
IA ..... Impact Assessment
IAA ..... *Impact Assessment Act*
IS ..... Impact Statement
JSEA ..... Job Safety and Environmental Analysis
km ..... kilometre
MECP ..... Ontario Ministry of the Environment, Conservation and Parks
MFFN ..... Marten Falls First Nation
TISG ..... Tailored Impact Statement Guidelines
ToR ..... Terms of Reference
VC ..... Valued Component

# 1. Introduction

The Proponent of the Community Access Road (CAR or the Project) is Marten Falls First Nation (MFFN), a remote First Nation community in northern Ontario located at the junction of the Albany and Ogoki rivers, approximately 430 kilometres (km) from Thunder Bay, Ontario. The MFFN community is proposing an all-season CAR that will connect the MFFN community to Ontario's provincial highway network (Highway 643) to the south via the existing Painter Lake Road. MFFN, as the Proponent of the Project, has formed a MFFN CAR Project Team that includes MFFN CAR Community Member Advisors and MFFN CAR Project Consultants who act with input, guidance, and direction from the MFFN Chief and Council.

This document outlines the work plan to implement the 2021 field studies for surface water and fish and fish habitat (described herein as 'aquatics'), recognizing that the results of these field surveys will be used to support a coordinated Impact Assessment (IA), required for Project review by the Impact Assessment Agency of Canada (the Agency) under the federal *Impact Assessment Act* (IAA), and an Environmental Assessment (EA), required for Project review by the Ontario Ministry of the Environment, Conservation and Parks (MECP) under the Ontario *Environmental Assessment Act*. The Aquatics Work Plan (i.e., for surface water and fish and fish habitat) describes the proposed methods and schedule to complete the 2021 field program and considers both the Agency's Tailored Impact Statement Guidelines for the Marten Falls Community Access Road Project (TISG) (IAAC 2020) and the comments received on the Draft Terms of Reference (ToR) (AECOM 2020).

# 2. Overview and Approach

The approach and associated study areas for the aquatics field program are detailed in the Surface Water Study Plan and Fish and Fish Habitat Study Plan (MFFN CAR 2021a,b). These considerations were developed based on guidance from and discussions with both federal and provincial regulators. A brief description of the proposed methodology and staffing plan to complete the aquatics field program is provided below, with the understanding that the technical content is limited to supplementary information not previously included in the Surface Water and Fish and Fish Habitat Study Plans.

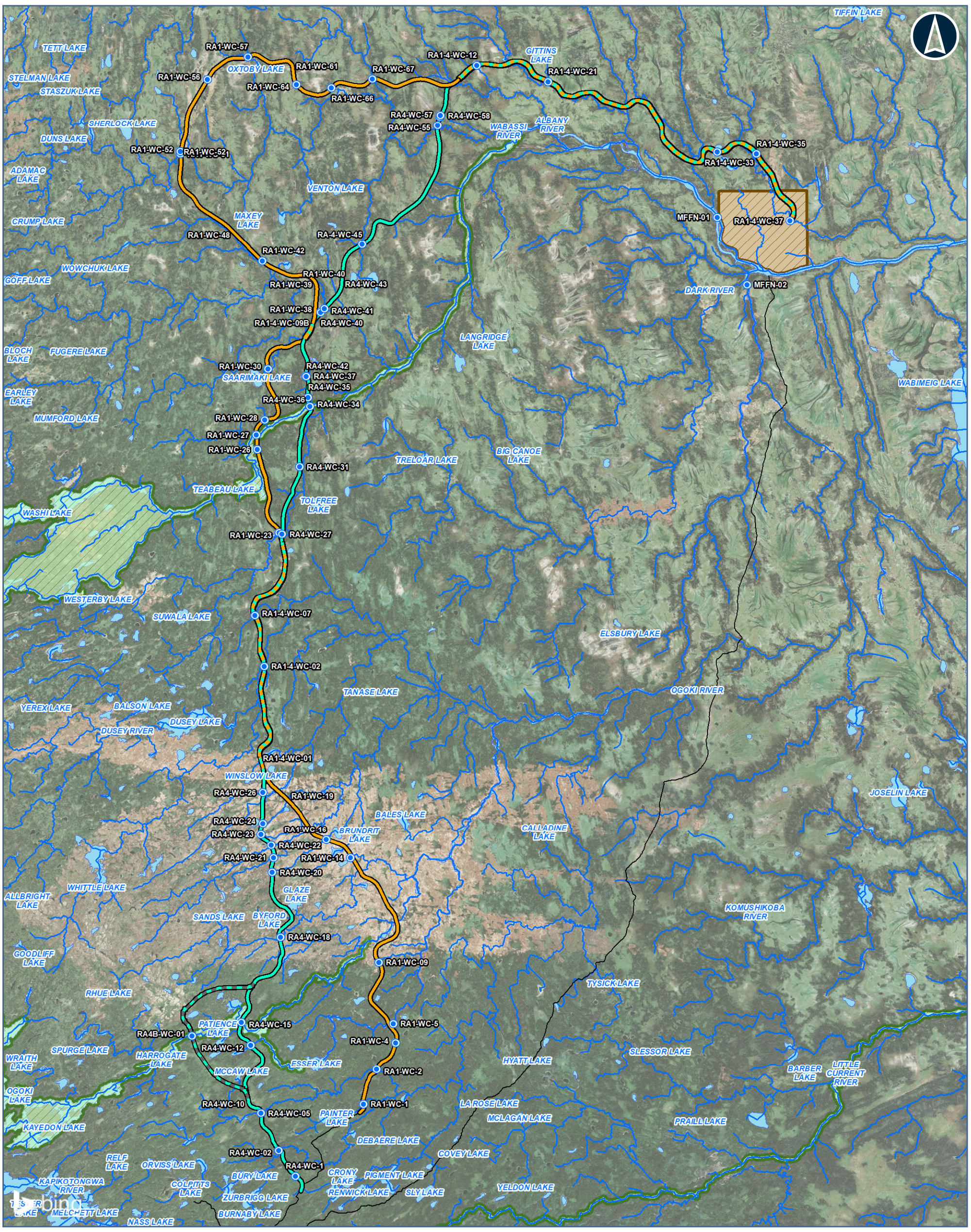
## 2.1 Methodology

The proposed methodology for the 2021 aquatics field program is described in **Table 2-1** and the corresponding survey locations are shown in **Figure 2-1**. The proposed methodology described below is in line with what was initially detailed in the Surface Water Study Plan and Fish and Fish Habitat Study Plan. No deviations are anticipated at this time.

**Table 2-1: Methodology for Aquatics Field Study**

| Fish and Fish Habitat Assessments | |
|---|---|
| **Permits to Conduct Field Study** | ■ MECP Letter of Authorization to Conduct Research in a Provincial Park or Conservation Reserve: valid from August 14, 2021 to December 31, 2022<br>■ MNRF Licence to Collect Fish for Scientific Purposes: valid from August 1, 2021 to August 31, 2021 |
| **Field Study Methods** | ■ The 2021 aquatic field program will consist of a summer field survey.<br>■ 57 waterbody crossings have been targeted for aquatic field surveys in 2021 (fish and fish habitat and / or surface water) as a percentage of the total number of waterbody crossings (n = 98), with the understanding that the following tasks / studies for a subset of the crossing locations were determined based on the remaining requirements from the 2019 and 2020 field programs to reach the 50% subset of total crossings for fish and fish habitat and 25% subset of total crossings for benthic invertebrates:<br>– Fish habitat assessments will be completed at 33 waterbody crossings in 2021.<br>– Fish community sampling will be completed at 50 waterbody crossings in 2021.<br>– Benthic invertebrate community sampling will be completed at 18 waterbody crossings in 2021.<br>– Contingency locations will be assessed as substitutes if the selected crossing locations are shown to be inaccessible (e.g., no clear landing area for helicopter within 300 m, site flooded with no possibility of safe landing).<br>■ Detailed methods for fish and benthic invertebrates are described in the Fish and Fish Habitat Study Plan. |
| **Lab Analysis Methods** | ■ Benthic invertebrate taxonomic identification and enumeration to lowest taxonomic level possible will be completed by ZEAS Laboratories Inc. (Nobleton, ON). |

| Surface Water Assessments | |
|---|---|
| **Permits to Conduct Field Study** | ■ MECP Letter of Authorization to Conduct Research in a Provincial Park or Conservation Reserve: valid from August 14, 2021 to December 31, 2022 |
| **Field Study Methods** | ■ The 2021 aquatic field program will consist of a summer field survey.<br>■ Surface water assessments will be targeted at all 57 waterbody crossings that have been selected for the 2021 summer field program (refer to details and rationale above from the concurrent fish and fish habitat assessment). Field surveys at each site will include general waterbody assessments, streamflow measurements, topographic surveys, water quality sampling, and sediment quality sampling.<br>■ It is understood that the plan to target 57 waterbody crossing locations for field surveys could result in data collection activities being completed at a larger number of crossings than originally identified in the Surface Water Study Plan (where field surveys had been proposed at approximately 40% of the total number of crossing locations during each field campaign). However, based on past experience at the Project site, it is expected that field surveys will not be practical or even required at all of the proposed sites, given that (1) access for safe helicopter landings may not be possible at a subset of the crossing locations and (2) conditions at one or more of the unmapped / assumed waterbody crossing locations may not actually satisfy the criteria for a waterbody feature (i.e., incised channel with a defined bank and / or bed), and, hence, eliminate the need for data collection. To that end, site selection for the aquatics field surveys has been developed with the goal of collecting ground-based field data at a minimum of 40 crossing locations, with a plan to target a higher number of crossings from the outset of the program to account for access constraints or the absence of defined channel conditions.<br>■ Detailed methods for surface water are described in the Surface Water Study Plan. |
| **Lab Analysis Methods** | ■ The analysis of surface water quality samples will be performed by Bureau Veritas Environmental Services Laboratory (Mississauga, ON).<br>■ The analysis of sediment quality samples will be performed by Bureau Veritas Environmental Services Laboratory (Mississauga, ON). |



## Legend

- Water Body Crossing targeted for Surface Water Field Surveys in 2021

**Community Access Road Alternatives Centerline**

- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION

- Road
- Watercourse
- Provincial Park
- Waterbody
- First Nation Community

**Notes:**
None

**Data Source:**
Base Data: Provided by MNRF 2019; Route Infrastructure - Provided by AECOM 2019. Contains Information licensed under the Open Government Licence Ontario.
Aerial photography provided by: Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Survey Locations for 2021 Aquatics Field Program

0 5 10 20
Kilometres
Datum: NAD 1983 UTM Zone 16N

| | |
|---|---|
| Jul, 2021 | 1:400,000 * when printed 11"x17" |
| Rev:00 | CGE/RRD |

**Figure 2-1**

Contains information provided by Ontario Ministry of the Environment, Conservation and Parks or by Ontario Ministry of Natural Resources and Forestry (Copyright: Queen's Printer of Ontario 2020), through a Sensitive Data License Agreement. This drawing has been prepared for use of AECOM client and may not be reproduced or relied upon by third parties, except as agreed by AECOM and its client, as required by law or for use by governmental reviewing agencies. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without AECOM express written consent. The use of Sensitive Data in this drawing does not constitute an endorsement by the Ministry for this drawing or by AECOM of the Sensitive Data.

Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\18108254_AECOM_MFFN_AccessRoadEA\40_PROD\0028_AquaticFieldProgram_2021\18108254_0028_RQ_0001.mxd
Date Saved: 7/23/2021 10:01:54 AM User Name: RDuval

## 2.2 Program Staffing

The proposed staff participating in the 2021 aquatics field program are outlined in **Table 2-2** .

**Table 2-2: Personnel Qualifications**

| Name | Title | Project Role | Credentials | Years of Experience* |
|---|---|---|---|---|
| **Andrew Forbes** | Senior Consultant and Associate | Technical Director for Water Program; Surface Water Senior Reviewer | M.Sc., P.Geo. | 20 |
| **Kristine Mason** | Principal, Senior Fisheries Biologist | Fish and Fish Habitat Senior Reviewer | M.Sc., P.Biol. | 25 |
| **Zsolt Kovats** | Associate, Senior Aquatic Ecologist | Benthos Senior Reviewer | M.Sc. | 25 |
| **Craig DeVito** | Water Resources Engineer | Surface Water Component Lead, Lead Author on Baseline Report | P.Eng. | 15 |
| **Barb Fortin** | Aquatic Biologist | Fish and Fish Habitat Component Lead, Lead Author on Baseline Report | M.Sc., P.Biol. | 13 |
| **Jill LaPorte** | Aquatic Biologist | Benthos Specialist | B.Sc. | 15 |
| **Brian Lingelbach** | Surface Water Technician | Surface Water Field Crew 1 Lead | B.Sc., C.Tech. | 5 |
| **Jason Fregoe** | Environmental Technician | Fish and Fish Habitat Field 1 Crew Lead | Dipl. Tech | 15 |
| **Kevin Easton** | Surface Water Technician | Surface Water Field Crew 2 Lead | B.E.S. | 4 |
| **Jamie Weir** | Fish and Wildlife Technologist | Fish and Fish Habitat Field Crew 2 Lead | Dipl. Tech | 15 |

*Note: * Experience as of March 2021*

Please note that the staffing for the aquatics field program may also rely on additional members from the MFFN CAR Project Consultant Team and / or members from local Indigenous communities.

# 3. Discipline Specific-Schedule

The proposed schedule for the aquatics field program is presented below in **Table 3-1**. This schedule is subject to change based on evolving climactic conditions in the Project Area, including forest fires.

**Table 3-1: Aquatics Program Schedule**

| Task / Program | Start Date (MM/YR) | Approximate Duration | Targeted VC Interaction |
|---|---|---|---|
| ■ Field Surveys | ■ August 2021 | ■ Ten days | ■ Surface Water<br>■ Fish and Fish Habitat |

Prior to field programs commencing, the following groups from the Project Contact List will be notified:

- Indigenous Community Key Contacts
- Tribal Councils, Provincial Territorial Organizations, and Métis Nation of Ontario
- Other Indigenous Persons Identified for Consultation (including MFFN community members)
- Businesses
- Tourism Operators
- Community and Interest Groups and Non-Governmental Organizations
- Interested Parties / Potential Stakeholders – Unaffiliated
- Government Review Team
- Non-Government Review Team agency representatives
- Forest Management Companies
- Mining Claim Holders
- Emergency Medical Services and Law Enforcement
- Neighbouring Projects and their Contacts
- Other Agency Representatives (elected Members of Parliament and Provincial Parliament of Ontario)

# 4. Health and Safety

## 4.1 General

Golder is committed to the health and safety of employees, clients, contractors and the public, with the understanding that all work performed by Golder is subject to strict health and safety policies and applicable federal, provincial, and municipal acts and regulations. Golder has internal Work Safe Practices for aerial work, remote work, cold weather work, and working around water. All field crew members will be expected to review these protocols prior to commencing surveys. In addition, the Golder survey teams will develop a project specific Health and Safety and Environmental Protection Plan (HaSEP) prior to conducting field work. The Project's HaSEP will be reviewed and discussed with all field crew members (including pilot and Indigenous crew members) prior to the survey's commencement.

The aerial / helicopter support for the Project will be designed and scheduled according to Golder's and the client's health and safety policies, procedures, and training. Restrictions on aircraft type and pilot proficiency will apply. Prior to daily take-off, the pilot will provide an aircraft orientation and safety briefing to all members of the survey team. The briefing will include identifying hazards, emergency response plans and procedures, and general helicopter protocol (including how to exit and enter an aircraft). As part of these briefings, hazards specific to the day's task will also be identified, discussed, and documented on a job safety and environmental analysis (JSEA) form, with a plan for all crew members to sign the JSEA. Field surveys will only occur when weather conditions allow safe aircraft operations, recognizing that (1) field crew members have the right to refuse substandard actions or conditions if the worker feels that these actions / conditions are imminently dangerous to their safety or to the safety of others and (2) field crew members should rely on pilot judgement as well as their own experience and comfort level to determine if flights should occur or be prematurely terminated.

As part of each field day, field crew members will pack extra food, water, and clothing in case of aircraft mechanical trouble and unexpected delays. In addition, each field crew will carry a survival and first aid kit for emergency situations (supplementary to the aircraft emergency survival kit). Daily check-in times with a designated contact will be pre-determined as part of the HaSEP, noting that satellite phones or satellite communication devices (e.g., Garmin inReach) will be used in areas where cell phone coverage is not reliable.

## 4.2 COVID-19

All COVID-19 related risk mitigation and recovery measures have been established in line with government protocols and AECOM corporate measures. Field crews will employ preventative COVID-19 actions including daily screening questionnaires and the use of Personal Protective Equipment such as gloves, masks, regular disinfection, and social distancing.

Members of the field crews are not to attend site, or must remove themselves from site, if they fit any of the following criteria:

- They have symptoms associated with COVID-19 (e.g., fever, cough, sore throat, shortness of breath, sneezing / running nose, or loss of sense of smell);
- They have been confirmed for COVID-19 or are awaiting the results from being tested for COVID-19;
- They have been in close contact with a known or suspected case of COVID-19 in the past 14 days; and / or
- They have returned, or been in contact with someone who has returned, from overseas in the past 14 days.

When working in the community, field crews will strictly adhere to the COVID-19 preventative measures as described above. Where community access is required to facilitate a field survey, entry will be discussed with the community in advance. As needed, a negative COVID-19 test will be presented prior to entering Indigenous communities.

Field crews will have access to an adequate supply of sanitizer, and, as part of this, the crew members will regularly sanitize their hands. Further to this: field crews will minimize use of shared tools and equipment, as practical (including the use of hand tools, electronic devices, pens, clipboards, and notepads); all work surfaces and equipment used in the course of work will be adequately cleaned and disinfected at the end of the work shift or more frequently when visibly soiled or used repeatedly; and cloth or surgical masks (as a minimum) will be worn by field crews at all times during the course of work and in transit to the work site in line with government direction.

For all workers, regardless of specific exposure risks, it is always a good practice to:

- Frequently wash your hands with soap and water for at least 20 seconds, noting that, when soap and running water are unavailable, use of an alcohol-based hand rub with at least 60% alcohol is suggested.
- Avoid touching your eyes, nose, or mouth with unwashed hands.
- Avoid close contact with people who are sick.
- Cover your mouth and nose with your bent elbow or tissue when you cough or sneeze, and immediately dispose of the used tissue.
- Stay home if you are sick.

# 5. References

AECOM (AECOM Canada Ltd.), 2020:

Marten Falls First Nation Proposed Terms of Reference Marten Falls Community Access Road – Environmental Assessment

Impact Assessment Agency of Canada (IAAC), 2020:

Tailored Impact Statement Guidelines for the Marten Falls Community Access Road Project. https://iaac-aeic.gc.ca/050/documents/p80184/133937E.pdf

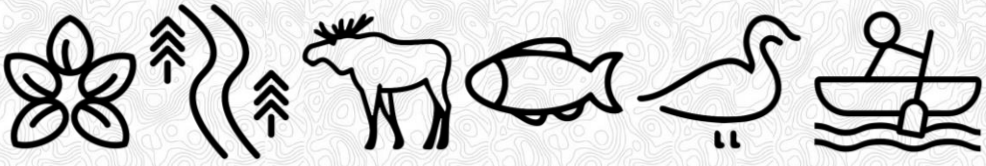
Marten Falls First Nation Community Access Road Project (MFFN CAR), 2021a:

Surface Water Study Plan

Marten Falls First Nation Community Access Road Project (MFFN CAR), 2021b:

Fish and Fish Habitat Study Plan

**Phone:** 1-800-764-9114 **Email:** info@martenfallsaccessroad.ca **Web:** http://www.martenfallsaccessroad.ca



# Attachment B – Fish and Fish Habitat Baseline Report

MARTEN FALLS FIRST NATION
COMMUNITY ACCESS ROAD

# Attachment B: Fish and Fish Habitat Technical Report

*November 2024*

# Disclaimer: WSP Canada

WSP prepared this report solely for the use of the intended recipient, AECOM Canada Ltd., in accordance with the professional services agreement between the parties. The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this Project.

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Design recommendations given in this report are applicable only to the Project and areas as described in the text and then only if constructed in accordance with the details stated in this report. The comments made in this report on potential construction issues and possible methods are intended only for the guidance of the designer. The number of testing and/or sampling locations may not be sufficient to determine all the factors that may affect construction methods and costs. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

This limitations statement is considered an integral part of this report.

# Authors

| Revision | Name | Title | Company |
|---|---|---|---|
| **Original** | Lyndsey Stewart | Aquatic Biologist | WSP |
| **Original** | Barbra Fortin | Lead, Aquatic Biologist | WSP |
| **Review** | Kristine Mason | Senior Principal, Fisheries Biologist | WSP |
| **Approval** | Kristine Mason | Senior Principal, Fisheries Biologist | WSP |

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# Executive Summary

Fish and fish habitat field surveys were conducted between 2019 and 2022 to support the Environmental Assessment/Impact Statement for the Marten Falls First Nation (Marten Falls) Community Access Road (the Project). These surveys consisted of aerial reconnaissance, detailed fish and fish habitat assessments, rapid aerial fish habitat assessments, and fish sampling.

A total of 168 waterbodies on Route Alternatives 1 and 4 were identified as potential crossings and were targeted for fish and fish habitat field surveys. A total of 164 potential waterbody crossings were surveyed by aerial reconnaissance, 56 were surveyed by detailed fish and fish habitat assessment, and 40 were surveyed by rapid aerial habitat assessment. Fish sampling was completed at 46 waterbody crossings during the detailed fish and fish habitat assessments. A total of 11 crossings were surveyed both by rapid aerial assessment and detailed assessment, and 35 were assessed over multiple seasons and/or years.

Based on the results of the field surveys and taking a conservative approach, fish habitat potential was present at 91 of the 168 waterbody crossings. Fish were captured or observed at 20 of the 46 sites sampled for fish.

# 1. Introduction and Objectives

Marten Falls First Nation (Marten Falls) is a remote First Nation community in northern Ontario, approximately 430 kilometres from Thunder Bay, Ontario, located at the junction of the Albany and Ogoki rivers. Marten Falls is proposing to construct a multi-purpose all-season Community Access Road (CAR) that will connect the community to the Ontario provincial highway network (the Project).

This report has been prepared to describe the methods and results of field investigations that were undertaken to gather site specific information on the existing fish and fish habitat conditions in the Construction Disturbance Area This report contains the field-collected information to supplement the desktop review of fish and fish habitat in the Construction Disturbance Area, which are presented in the Fish and Fish Habitat Baseline Report.

The results of both the desktop review and this field survey report will be used to describe the existing fish and fish habitat conditions to support the Environmental Assessment/Impact Statement.

# 2. Methods

## 2.1 Site Selection

### 2.1.1 Waterbody Crossing List Development

The first step to identify potential sites for fish and fish habitat field investigations was to identify locations where the Construction Disturbance Area intersected waterbodies, thereby the development of a waterbody crossing list. This list was developed by using GIS to overlay the Project footprint with the Ontario Hydro Network (MNRF 2011) data layer to identify potential hydrology features crossed by the Project. Additional potential waterbodies that were not mapped in the Ontario Hydro Network were identified through manual review of the routes overlaid on aerial imagery. These “unmapped”, potential waterbody crossings were then added to the waterbody crossing list. Waterbody crossings were then assigned a site identification code that consisted of a route alternative identifier (RA-1 = Route Alternative 1, RA-4 = Route Alternative 4, or RA1-4 = overlapped section of both Route Alternative 1 and Route Alternative 4), followed by “WC” (waterbody crossing) and then a two-digit number in sequential order from south to north. The two-digit number is unique for each waterbody crossing (i.e., there is no repetition of numbers).

Once Light Detection and Ranging imagery was available, the crossing list was refined by re-examining the unmapped crossings to determine if the digital elevation model from Light Detection and Ranging showed evidence of a defined channel. Unmapped water features without defined bed or banks (a criterion for the definition of a waterbody in Ontario [*Conservation Authorities Act*; Government of Ontario 2003; Stanfield 2017; Government of Ontario 1990]) were not considered waterbodies, and thus, not included in the crossing list.

The crossing list was refined further by incorporating data gathered from the field investigations (i.e., aerial reconnaissance and ground-based surveys) to verify the presence of a waterbody and to characterize channel morphology and fish habitat.

### 2.1.2 Revisions to Route Alignments

The initial waterbody crossing list was developed based on the Rev01 alignment for route Alternatives 1 and 4 and was considered for the Terms of Reference. The final revision to the alignment (Rev02) is presented in this report and includes any route modifications since Rev01.

### 2.1.3 Site Selection for Field Surveys

Waterbody crossings surveyed during field surveys were selected from the waterbody crossing list. Sites for the 2019 field programs were selected based on the Rev01

alignment. All sites on the initial 2019 crossing list (i.e., those determined by desktop methods) were surveyed during the aerial reconnaissance. Sites selected for the 2020, 2021, and 2022 field programs were based on the Rev 02 alignment and included both options (east and west) for the Ogoki River crossing.

All sites selected for field survey were selected based on a 'scaled approach'. For this approach, a representative number of waterbody crossings were selected under three different categories of watershed size: small (areas of 2 to 50 $km^2$), medium (areas of 50 to 500 $km^2$), and large (areas greater than 500 $km^2$). The waterbodies chosen for field surveys were distributed evenly along the alternative routes and among tertiary watersheds. The percentage of each class of waterbody (i.e., small, medium, large) chosen for field investigations was also representative of the total number of each class across the entire alternative route. For example, if 50% of the crossings along the alternative routes are classified as small waterbodies, then approximately 50% of the selected sites were small waterbodies. Secondary to this, site selection also considered waterbody crossing locations that were previously surveyed during the Cliffs Chromite Project (Golder 2013) (i.e., sections of the alternative routes that overlapped with the alignment of the Cliffs Chromite Project route). Access to the waterbody crossings also had a role in site selection. Some sites planned for surveys were located in heavily treed areas, or in bogs, where no helicopter landing area was available within 500 m. Sites that did not have helicopter landing areas within 500 m were assessed by aerial survey (e.g., aerial reconnaissance or rapid assessment).

## 2.2 Sites Surveyed

Aerial reconnaissance and group-based filed programs were completed between 2019 and 2022 to gather site-specific information on fish and fish habitat at each waterbody crossing. Five field programs were completed on the following dates (**Figure 2-1** to **Figure 2-4**):

- September 5 to 10, 2019
- October 14 to 26, 2020
- September 11 to 18, 2021
- June 24 to July 1, 2022
- August 16 to 25 2022

In 2019, a two-day aerial reconnaissance was completed on September 5 and 6, 2019 at all waterbody crossings that were initially identified by desktop methods. From September 6 to 10, 2019, 11 proposed waterbody crossings were assessed for fish and/or fish habitat (**Table 2-1**). Three of the assessed waterbody crossings were on Route Alternative 1, five were on Route Alternative 4, and three were on overlapping sections of Route Alternatives 1 and 4 (**Figure 2-1** to **Figure 2-7**). Detailed fish habitat assessments were completed at

11 waterbody crossings and fish sampling was completed at seven waterbody crossings (**Table 2-1**).

In 2020, 29 proposed waterbody crossings were assessed for fish habitat during a fall field program from October 14 to 26, 2020 (**Table 2-1**). Of the assessed waterbody crossings 11 were on Route Alternative 1, 10 were on Route Alternative 4, and six were on overlapping sections of Route Alternatives 1 and 4 (**Figure 2-1** to **Figure 2-7**). Nine were rapid aerial assessments and 20 were detailed fish habitat assessments (**Table 2-1**). Fish sampling was not completed due to the field program being scheduled during the fall restricted activity timing window (September 1 to June 15) (DFO 2013).

In 2021, 16 proposed waterbody crossings were assessed for fish and/or fish habitat from September 11 to 18, 2021 **(Table 2-1**). Four of the assessed waterbody crossings were on Route Alternative 1, nine were on Route Alternative 4, and three were on overlapping sections of Route Alternatives 1 and 4 (**Figure 2-1** to **Figure 2-7**). Three were rapid aerial assessments and 13 were detailed fish and fish habitat assessments (Table 2-1). Special conditions in the Licence to Collect Fish for Scientific Purposes were implemented, and permission was granted by the Ontario Ministry of Natural Resources and Forestry to sample for fish within the fall restricted activity timing window for coldwater streams to protect fall-spawning Brook Trout (*masamekos; Salvelinus fontinalis*) and their eggs. Fish sampling was completed at seven waterbody crossings (Table 2-1). Fish sampling was not completed at the large watercourses (i.e., Albany and Ogoki rivers) where historical records exist on the fish community (MNRF 2020; Government of Ontario 2015). The other sites were not sampled for fish due to time constraints, equipment problems, or safety issues in accessing the watercourse (**Section 2.2.2**).

In 2022, 58 proposed waterbody crossings were assessed for fish and/or fish habitat from June 24 to July 1, 2022 and August 16 to 25, 2022. Twenty-five of the assessed waterbody crossings were on Route Alternative 1, 25 were on Route Alternative 4, and seven were on overlapping sections of Route Alternatives 1 and 4 (**Figure 2-1** to **Figure 2-7**). Twenty-nine were rapid aerial assessments and 33 were detailed fish and fish habitat assessments. Fish sampling was completed at 33 waterbody crossings (**Table 2-1**). Eighteen sites were assessed during both programs (i.e., data collected in spring and summer).

**Table 2-1: Summary of Field Assessments Completed at Waterbody Crossings from 2019 to 2022.**

| Waterbody Crossing ID | Waterbody Name | UTM (Zone 16U) | | Survey Type | | Date Completed | |
|---|---|---|---|---|---|---|---|
| | | Easting | Northing | Rapid | Detailed | Fish Habitat | Fish Sampling |
| RA1-4-WC-01 | Unnamed | 519622 | 5666913 | N | Y | Sep-21 | Sep-21 |
| RA1-4-WC-02 | Dusey River | 520105 | 5676979 | Y | Y | Sep-19 (detailed) Oct-20 (rapid) | Sep-19 |
| RA1-4-WC-07 | Unnamed | 519091 | 5682476 | N | Y | Sep-19 Sep-21 | Sep-21 |

| Waterbody Crossing ID | Waterbody Name | UTM (Zone 16U) | | Survey Type | | Date Completed | |
|---|---|---|---|---|---|---|---|
| | | Easting | Northing | Rapid | Detailed | Fish Habitat | Fish Sampling |
| RA1-4-WC-09B | Unnamed | 525332 | 5714194 | Y | N | Sep-21 | N/A |
| RA1-4-WC-10 | Unnamed | 540829 | 5740602 | Y | Y | June-22 (rapid)<br>Aug-22 (detailed) | Aug-22 |
| RA1-4-WC-19 | Unnamed | 546802 | 5742739 | N | Y | Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-4-WC-21 | Unnamed | 551025 | 5740733 | N | Y | Sep-19<br>Jul-22<br>Aug-22 | Sep-19<br>Jul-22<br>Aug-22 |
| RA1-4-WC-27 | Unnamed | 559549 | 5738052 | Y | N | Oct-20 | N/A |
| RA1-4-WC-31 | Unnamed | 566883 | 5731970 | Y | N | Aug-22 | N/A |
| RA1-4-WC-33 | Unnamed | 569502 | 5733028 | N | Y | Oct-20<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-4-WC-35 | Unnamed | 573750 | 5732816 | N | Y | Oct-20<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-4-WC-36 | Unnamed | 577681 | 5726015 | N | Y | Aug-22 | Aug-22 |
| RA1-4-WC-37 | Unnamed | 577418 | 5725568 | N | Y | Oct-20<br>Aug-22 | Aug-22 |
| RA1-WC-01 | Unnamed | 530918 | 5629153 | Y | Y | Jun-22 (rapid)<br>Aug-22 (detailed) | Aug-22 |
| RA1-WC-02 | Unnamed | 532383 | 5632976 | N | Y | Sep-21 | Sep-21 |
| RA1-WC-05 | Ogoki River | 534157 | 5637986 | N | Y | Sep-19 | - |
| RA1-WC-09 | Unnamed | 532606 | 5644605 | Y | Y | Sep-19<br>Sep-21 (rapid)<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-WC-11 | Unnamed | 534983 | 5649288 | N | Y | Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-WC-13 | Unnamed | 530495 | 5654590 | Y | N | Jun-22 | - |
| RA1-WC-14 | Unnamed | 529515 | 5656013 | N | Y | Oct-20<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-WC-15 | Unnamed | 528799 | 5657136 | Y | N | Jun-22 | N/A |
| RA1-WC-16 | Unnamed | 526864 | 5658007 | N | Y | Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-WC-17 | Unnamed | 525296 | 5659102 | N | Y | Aug-22 | Aug-22 |
| RA1-WC-19 | Unnamed | 522734 | 5662540 | Y | N | Oct-20 | N/A |
| RA1-WC-19B | Unnamed | 522500 | 5662725 | Y | N | Jun-22<br>Aug-22 | N/A |
| RA1-WC-20 | Unnamed | 522442 | 5662774 | Y | N | Jun-22 | N/A |
| RA1-WC-22 | Unnamed | 521713 | 5663417 | N | Y | Aug-22 | Aug-22 |
| RA1-WC-23 | Unnamed | 521732 | 5691515 | N | Y | Sep-21 | Sep-21 |
| RA1-WC-25 | Unnamed | 519678 | 5699413 | Y | N | Jun-22 | N/A |
| RA1-WC-26 | Unnamed | 519375 | 5700620 | Y | Y | Oct-20 (detailed)<br>Jun-22 (rapid) | N/A |

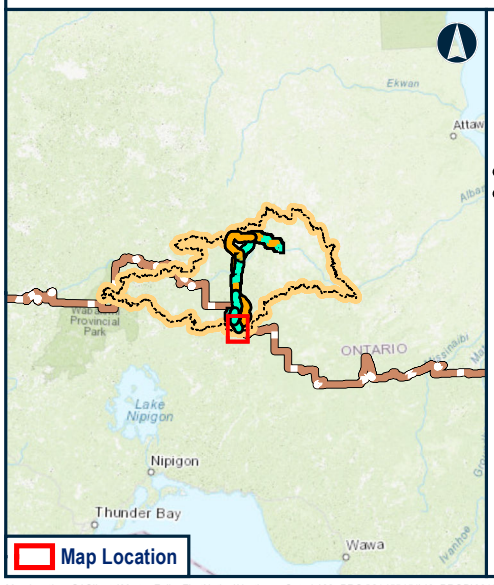
| Waterbody Crossing ID | Waterbody Name | UTM (Zone 16U) | | Survey Type | | Date Completed | |
|---|---|---|---|---|---|---|---|
| | | Easting | Northing | Rapid | Detailed | Fish Habitat | Fish Sampling |
| RA1-WC-27 | Albany River | 519244 | 5702193 | N | Y | Oct-20 | N/A |
| RA1-WC-28 | Unnamed | 520172 | 5703819 | N | Y | Oct-20<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-WC-30 | Unnamed | 520534 | 5709379 | Y | Y | Oct-20 (rapid)<br>Aug-22 (detailed) | Aug-22 |
| RA1-WC-31 | Unnamed | 521586 | 5711787 | Y | N | Jul-22 | N/A |
| RA1-WC-32 | Unnamed | 522111 | 5711797 | N | Y | Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA1-WC-33 | Unnamed | 522725 | 5711811 | Y | N | Jun-22 | N/A |
| RA1-WC-38 | Unnamed | 525639 | 5715632 | Y | N | Oct-20 | N/A |
| RA1-WC-39 | Unnamed | 525660 | 5718841 | Y | N | Oct-20 | N/A |
| RA1-WC-40 | Gourlie Creek | 525513 | 5719057 | Y | N | Aug-22 | N/A |
| RA1-WC-41 | Unnamed | 521635 | 5720108 | N | Y | Aug-22 | Aug-22 |
| RA1-WC-51 | Wabassi River | 510970 | 5732829 | Y | Y | Jun-22 (rapid)<br>Aug-22 (detailed) | Aug-22 |
| RA1-WC-52 | Unnamed | 510968 | 5733080 | Y | Y | Oct-20 (detailed)<br>Jun-22 (rapid) | N/A |
| RA1-WC-53 | Unnamed | 511307 | 5734190 | Y | N | Jun-22 | N/A |
| RA1-WC-54 | Unnamed | 511339 | 5734297 | Y | N | Jun-22 | N/A |
| RA1-WC-56 | Unnamed | 513924 | 5740981 | Y | N | Oct-20<br>Jun-22 | N/A |
| RA1-WC-57 | Unnamed | 518320 | 5743418 | N | Y | Sep-19<br>Oct-20 | Sep-19 |
| RA1-WC-66 | Unnamed | 527414 | 5740047 | N | Y | Oct-20<br>Jun-22 | Jun-22 |
| RA1-WC-67 | Unnamed | 533421 | 5740556 | N | Y | Sep-21<br>Jun-22 | Jun-22 |
| RA4-WC-00 | Unnamed | 524202 | 5620008 | N | Y | Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA4B-WC-01 | Ogoki River | 512246 | 5636612 | N | Y | Oct-20 | - |
| RA4B-WC-02 | Unnamed | 517166 | 5631036 | Y | Y | Jun-22 (rapid)<br>Aug-22 (detailed) | Aug-22 |
| RA4B-WC-03 | Unnamed | 516056 | 5631437 | Y | N | Jun-22 | N/A |
| RA4B-WC-04 | Unnamed | 511308 | 5638417 | Y | N | Jun-22 | N/A |
| RA4-WC-02 | Colpitts Creek | 521688 | 5624119 | N | Y | Sep-21 | N/A |
| RA4-WC-02[a] | Colpitts Creek | 521819 | 5624190 | N | Y | Jun-22 | Jun-22 |
| RA4-WC-05 | Unnamed | 519747 | 5628176 | N | Y | Jun-22 | Jun-22 |
| RA4-WC-06 | Unnamed | 518282 | 5629251 | Y | N | Jun-22 | N/A |
| RA4-WC-07 | Unnamed | 518280 | 5629260 | Y | N | Jun-22 | N/A |
| RA4-WC-08 | Unnamed | 518276 | 5629324 | Y | N | Jun-22 | N/A |

| Waterbody Crossing ID | Waterbody Name | UTM (Zone 16U) | | Survey Type | | Date Completed | |
|---|---|---|---|---|---|---|---|
| | | Easting | Northing | Rapid | Detailed | Fish Habitat | Fish Sampling |
| RA4-WC-09 | Unnamed | 518270 | 5629412 | Y | N | Jun-22 | N/A |
| RA4-WC-10 | Unnamed | 518270 | 5629419 | Y | N | Jun-22 | N/A |
| RA4-WC-11 | Unnamed | 518268 | 5629451 | Y | N | Jun-22 | N/A |
| RA4-WC-12 | Unnamed | 518056 | 5635605 | N | Y | Sep-19 | Sep-19 |
| RA4-WC-17 | Unnamed | 522159 | 5646017 | N | Y | Jun-22 | Jun-22 |
| RA4-WC-18 | Rock Beaver Creek | 521894 | 5647392 | N | Y | Sep-19<br>Oct-20 | Sep-19 |
| RA4-WC-19 | Unnamed | 523071 | 5649798 | N | Y | Aug-22 | Aug-22 |
| RA4-WC-21 | Unnamed | 521131 | 5656047 | N | Y | Sep-21<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA4-WC-22 | Unnamed | 520890 | 5657391 | N | Y | Oct-20<br>Jun-22 | Jun-22<br>Aug-22 |
| RA4-WC-23 | Unnamed | 519751 | 5658577 | Y | N | Sep-21 | - |
| RA4-WC-24 | Unnamed | 519967 | 5659797 | N | Y | Jun-22 | Jun-22 |
| RA4-WC-25 | Unnamed | 519870 | 5662127 | Y | Y | Sep-19 (detailed)<br>Oct-20 (rapid) | Sep-19 |
| RA4-WC-26 | Unnamed | 519974 | 5663183 | Y | Y | Sep-21 | Sep-21 |
| RA4-WC-27 | Unnamed | 522053 | 5691380 | N | Y | Sep-19<br>Sep-21 | Sep-19 |
| RA4-WC-29 | Unnamed | 523148 | 5695934 | Y | N | Jun-22 | N/A |
| RA4-WC-31 | Unnamed | 523972 | 5698738 | Y | Y | Oct-20 (detailed)<br>Jun-22 (rapid) | N/A |
| RA4-WC-32 | Unnamed | 524169 | 5702612 | Y | N | Jul-22 | N/A |
| RA4-WC-34 | Albany River | 525100 | 5705282 | N | Y | Sep-19<br>Oct-20<br>Sep-21 | Sep-21 |
| RA4-WC-35 | Unnamed | 524970 | 5705565 | N | Y | Oct-20 | N/A |
| RA4-WC-37 | Unnamed | 524697 | 5708581 | N | Y | Sep-21 | Sep-21 |
| RA4-WC-41 | Gourlie Creek | 526665 | 5715963 | N | Y | Jun-22 | Jun-22 |
| RA4-WC-42 | Unnamed | 527995 | 5717404 | N | Y | Oct-20 | N/A |
| RA4-WC-43 | Unnamed | 528554 | 5718881 | Y | N | Oct-20 | N/A |
| RA4-WC-45 | Unnamed | 530801 | 5722972 | N | Y | Oct-20<br>Jun-22<br>Aug-22 | Jun-22<br>Aug-22 |
| RA4-WC-55 | Wabassi River | 539004 | 5735928 | N | Y | Oct-20<br>Sep-21<br>Jun-22 | Jun-22 |
| RA4-WC-57 | Unnamed | 539258 | 5736888 | N | Y | Sep-21 | N/A |
| RA4-WC-58 | Unnamed | 539324 | 5737051 | N | Y | Oct-20 | N/A |

Notes: Universal Transverse Mercator.

[a] - Crossing location changed between field programs Note: - = not completed.

RA4-WC-12
HARROGATE LAKE
ESSER LAKE
OGOKI RIVER
RA1-WC-02
MCCAW LAKE
RA4B-WC-03
RA4B-WC-02
RA1-WC-01
ARA04-WC-02
ARA04-WC-04
ARA04-WC-03
RA4-WC-05
ARA04-WC-01
PAINTER LAKE
DEBAERE LAKE
RA4-WC-02
ORVISS LAKE
COLPITTS LAKE
BURY LAKE
PIGMENT LAKE
RA4-WC-00
CRONY LAKE
RENWICK LAKE
ZURBRIGG LAKE
BURNABY LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
PERCY LAKE
LITTLE CURRENT RIVER
JUNGFRAU LAKE
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE




**Legend**

**WATER CROSSING**
- DEFINED
- ROAD
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 2.25 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Nov, 2024 | 1:100,000 * when printed 11"x17" |
| Rev:0 | |

**Figure 2-1**

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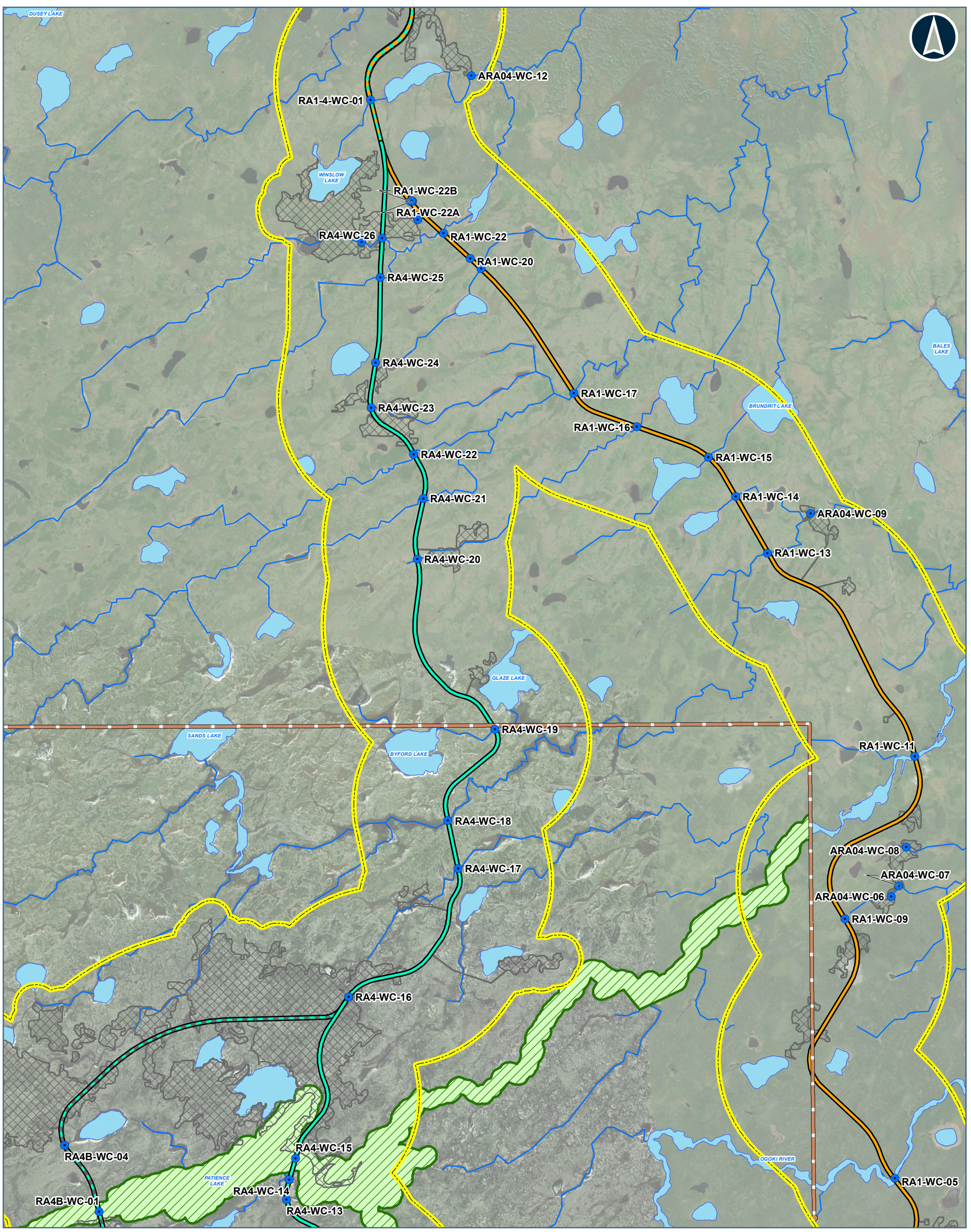
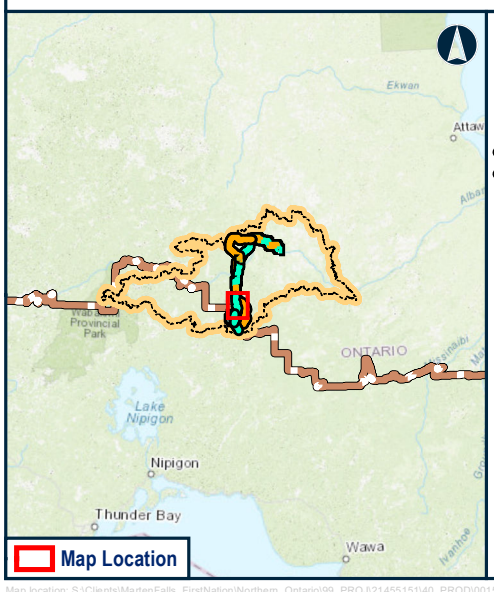
Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy




**Legend**

WATER CROSSING
- DEFINED
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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**Figure 2-2**

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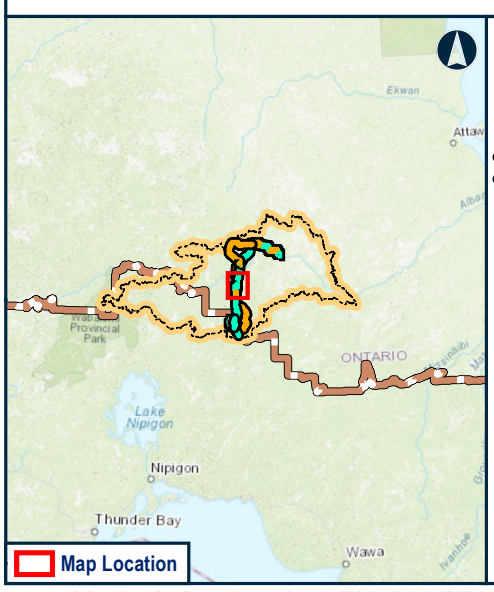
Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

ARA04-WC-15
RA4-WC-32
RA1-WC-26
RA4-WC-31
TEABEAU LAKE
RA4-WC-29
TOLFREE LAKE
ALBANY RIVER
RA1-WC-23
RA4-WC-27
SUWALA LAKE
RA1-4-WC-07
DUSEY RIVER
ARA04-WC-13
ARA04-WC-14
RA1-4-WC-02
TANASE LAKE
DUSEY LAKE




**Legend**

**WATER CROSSING**
- DEFINED
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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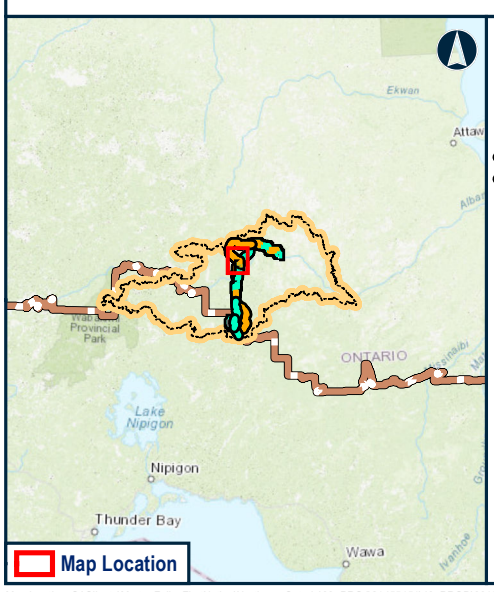
Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

RA1-WC-54
RA1-WC-53
RA1-WC-52
WABASSI RIVER
VENTON LAKE
MAXEY LAKE
RA1-WC-44
RA1-WC-42
RA1-WC-41
ARA04-WC-22
RA1-WC-40
RA1-WC-39
RA1-WC-38
RA1-WC-32
RA1-WC-30
RA1-WC-29
RA1-WC-28
ARA04-WC-15
RA4-WC-32
SAARIMAKI LAKE
ARA04-WC-21
ARA04-WC-20
RA4-WC-50
RA4-WC-45
TREBELL LAKE
RA4-WC-43
ARA04-WC-19
RA4-WC-42
RA4-WC-41
RA1-4-WC-09B
ARA04-WC-18
RA4-WC-37
RA4-WC-36
ARA04-WC-17
ARA04-WC-16
RA4-WC-35
RA4-WC-34
ALBANY RIVER




**Legend**

WATER CROSSING
- DEFINED
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Nov, 2024 | 1:100,000 * when printed 11"x17" |
| Rev:0 | |

**Figure 2-4**

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Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\121455151\40_PROD\0015_Aquatics_WaterCrossings\21455151-0015-RT-0003.mxd
Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

GARVEY LAKE

SLADE LAKE

MABIE LAKE

OXTOBY LAKE

RA1-WC-56

RA1-WC-57

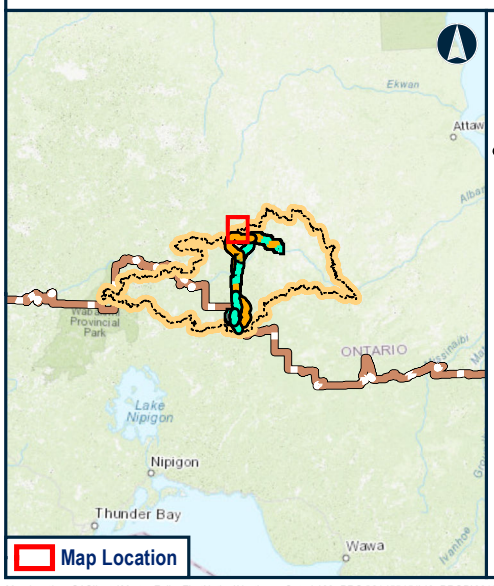
RA1-WC-58

RA1-WC-60

RA1-WC-66

RA1-WC-67

RA1-WC-68




**Legend**

WATER CROSSING
- DEFINED
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1

- FAR NORTH BOUNDARY
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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**Figure 2-5**

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Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

GURDEN LAKE

GITTINS LAKE

RA1-4-WC-19

ARA04-WC-23

RA1-4-WC-10

RA1-4-WC-21

RA1-4-WC-27

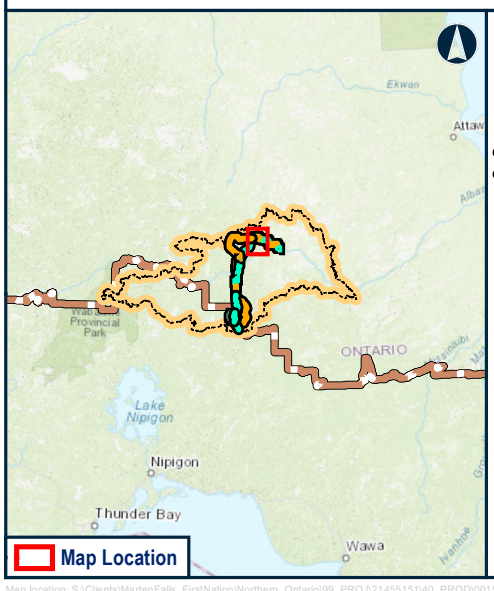
RA4-WC-58

RA4-WC-57

RA4-WC-55

WABASSI RIVER

ALBANY RIVER




**Legend**

**WATER CROSSING**
- DEFINED
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| Nov, 2024 | 1:100,000 * when printed 11"x17" |
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| Rev:0 | |

**Figure 2-6**

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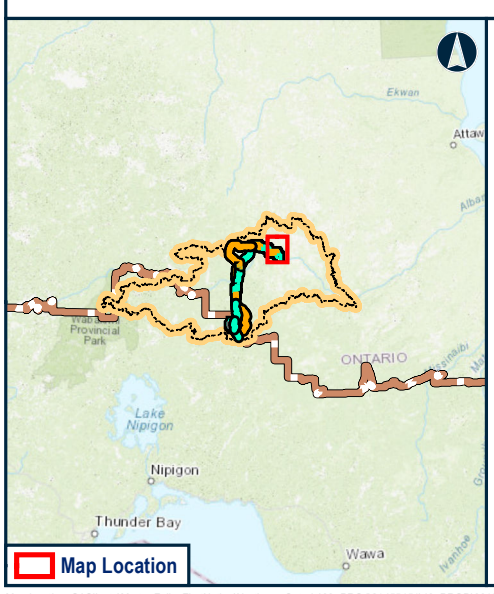
Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0015_Aquatics_WaterCrossings\21455151-0015-RT-0003.mxd
Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

SEBERT LAKE
GURDEN LAKE
TIFFIN LAKE
RA1-4-WC-31
RA1-4-WC-33
RA1-4-WC-34
RA1-4-WC-35
RA1-4-WC-36
ALBANY RIVER




**Legend**

WATER CROSSING
- DEFINED
- ROAD
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

**Data Source:**
Base Data: Provided by MNRF 2019; Route Infrastructure - Provided by AECOM 2019. Contains Information licensed under the Open Government Licence Ontario.
Aerial photography provided by:
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 2.25 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
| Nov, 2024 | 1:100,000 * when printed 11"x17" |
| Rev:0 | |

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Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

### 2.2.1 Aerial Reconnaissance

A total of 164 proposed waterbody crossings were identified on Route Alternatives 1 and 4 based on the Rev01 alignment by desktop methods (**Section 2.1.1**) to establish the initial waterbody crossing list. These crossings were surveyed by aerial reconnaissance on September 5 and 6, 2019. The objective of the aerial reconnaissance was to:

- Provide high-level information on waterbody crossings to refine the waterbody crossing list, evaluate crossings for waterbody permanence, gather information for site access for future field programs, and support the aerial imagery review in the desktop baseline characterization.

A fly-over from a helicopter was conducted along both route alternatives to survey fish habitat in the waterbodies, to gain an understanding of the geographic context, and to rapidly characterize and photograph the aquatic habitats.

During the aerial reconnaissance, waterbodies were characterized based on the presence of bed and banks:

- defined (consistent bed and banks, channel substrate)
- undefined (no bed and banks, no scour)
- poorly defined (i.e., areas with some sections of defined and undefined bed and banks)

For defined or poorly defined waterbodies, the following variables were visually assessed, where possible:

- waterbody type (i.e., lake/pond/wetland, watercourse);
- bank-full width (estimated as less than 2 m, less than 5 m, less than 10 m, greater than 10 m, or greater than 100 m); and
- general observations on aquatic habitat, presence of aquatic vegetation, or barriers to fish movement when waterbody was clearly visible (e.g., there was limited overhanging vegetation or trees that obstructed the view).

For undefined water features, notes on general site conditions were taken.

Detailed assessment of fish habitat potential for rearing, spawning, or overwintering was not determined during aerial reconnaissance.

### 2.2.2 Detailed Fish and Fish Habitat Assessments

The objectives of the detailed fish and fish habitat assessments were to:

- Obtain site-specific field data at a subset of waterbody crossings to verify or augment the results and assumptions from the aerial reconnaissance and imagery review.
- Describe fish habitat and channel characteristics in the vicinity of the proposed crossing location (e.g., instream habitat types, channel width and depth, bed material, instream cover, bank stability, in situ water quality).
- Evaluate fish presence and habitat use in the vicinity of the proposed crossing location (e.g., species presence and composition in the waterbody). Potential habitat was evaluated for sport fish (i.e., large-bodied fish targeted for sport angling), non-sport fish (i.e., coarse, large-bodied fish not targeted for sport angling), and forage fish (i.e., small-bodied fish where adult body size remains small).

Field survey methods followed standard practices for fish and fish habitat assessments, including relevant methods of the Ontario Stream Assessment Protocol (Stanfield 2017). Waterbody crossings were accessed by helicopter. The field crews for the surveys consisted of one fisheries technician/biologist and one surface water field technician. The crews were accompanied by an Indigenous field assistant whenever possible.

Fish sampling was completed under a licence to collect fish for scientific purposes under the *Fish and Wildlife Conservation Act, 1997* issued from the Ontario Ministry of Natural Resources and Forestry in the Nipigon District (licence numbers 1094219 [2019], 1098669 [2021] and 1100355 [2022]). Further authorization for field surveys was granted from the Species at Risk Branch of the Ontario Ministry of Environment, Conservation and Parks to work around Species at Risk (e.g., caribou) and from Ontario Parks to complete field work in the Albany River and Ogoki River Provincial Parks. The fish and fish habitat assessments complied with the conditions of the issued licences and authorizations. The mandatory post survey reporting of field data results was completed per the conditions of the Ministry of Natural Resources Forestry licences to collect fish and the Ontario Parks letters of authorization.

Some sites were visited more than once, either in a different season (e.g., spring and fall) and/or in a different year (e.g., 2019 to 2022). The purpose of the multiple visits was to capture the seasonal and/or annual variations of the fish communities and fish habitat in the waterbodies.

#### 2.2.2.1 Fish Habitat

Detailed habitat assessments were completed at 55 waterbody crossings (**Table 2-1**, **Figure 2-1** to **Figure 2-7**). The target minimum length of watercourse channel assessed was 100 m upstream and 200 m downstream from the proposed crossing location. In certain circumstances, the length was reduced due to time constraints, inaccessibility, or unsafe wading conditions. Fish habitat was qualitatively described in the surveyed section, in addition to an assessment of which fish species could potentially inhabit the waterbody.

The following variables were assessed for instream habitat during the detailed surveys:

- waterbody type (i.e., lake/pond, watercourse, or drainage with no defined bed or banks);
- geomorphic measurements (wetted width, wetted depth, bankfull depth, bankfull width);
- habitat type, estimated in accordance with the classification system outlined by O'Neil and Hildebrand (1986):
  - riffle – portion of channel with increased velocity relative to run and pool habitat types; broken water surface due to effects of submerged or exposed bed materials; relatively shallow (less than 0.25 m) during moderate to low flow periods.
  - rapids – portion of channel with highest velocity relative to other habitat types. Deeper than riffle (ranging from approximately 0.25 m to 0.5 m); often formed by channel constriction. Substrate extremely coarse; dominated by large cobble and boulder material. Instream cover provided in pocket eddies and associated with cobble/boulder substrate.
  - run – portion of channel characterized by moderate to high current velocity relative to pool and flat habitat, water surface largely unbroken. Deeper than riffle habitat type.
  - flat – area of channel characterized by low current velocities (relative to riffle and run cover types); near laminar (i.e., non turbulent) flow character. Depositional area featuring predominantly sand/silt substrate. Differentiated from pool habitat type on basis of high channel uniformity and lack of direct riffle/run association. More depositional in nature than run habitat (e.g., sand/silt substrate, lower food production, low cover).
  - pool – discrete portion of channel featuring increased depth and reduced velocity (downstream oriented) relative to riffle and run habitat types; formed by channel scour (i.e., removal of bed or bank material by flowing water).

  - impoundment – pools formed behind dams; tend to accumulate sediment/organic debris more than scour pools; may have cover associated with damming structure.
  - backwater – discrete, localized area of variable size, exhibiting reverse flow direction; generally produced by bank irregularities; velocities variable but generally lower than the main flow; substrate similar to adjacent channel, but with higher proportion of fines.
  - waterfall – vertical drop typically greater than 2 m.
  - bedrock chute – a straight fast-moving channel with bedrock substrates.
  - subterranean flow – underground flow of water.
- the quality of run, flat, pool, or impoundment habitat type is related to the water depth:
  - low (mean water depth less than 0.5 m)
  - moderate (mean water depth between 0.5 m and 1.0m)
  - high (mean water depth greater than 1.0 m)
- substrate type, estimated using the Modified Wentworth Scale (Wentworth 1922):
  - organic – organic material
  - silt – particles less than 0.1 mm in diameter
  - sand – particles between 0.1 mm and 2.0 mm in diameter
  - gravel – particles between 2 mm and 64 mm in diameter; range of sizes may be present
  - cobble – particles between 64 mm and 256 mm in diameter
  - boulder – particles greater than 256 mm in diameter
  - bedrock – consolidated rock
- type of cover available for fish (e.g., aquatic vegetation, depth, turbidity, large woody debris).
- bank stability (e.g., slumping, undercut, vegetated, or stable)

Habitat potential at each waterbody crossing was also evaluated. Habitat potential is an assessment of whether a particular habitat can satisfy the requirements of a given life stage of a species. Fish use of the habitat does not have to be directly observed for it to have potential; rather, habitat potential is based on whether the habitat meets the known requirements for the particular species or life stage. Habitat potential can also apply to groups of species (e.g., all sucker species) and is assessed separately for the various life stages (spawning, rearing, overwintering) since the requirements will often be different.

For selected large-bodied fish that may be present in the area (e.g., Northern Pike [*najwabe; Esox lucius*]), habitat potential was assessed for each life stage since sufficient information was available to describe the habitat requirements of the various stages. Small-bodied fish (e.g., minnows, where adult body size remains small) have habitat requirements that can overlap, and some communities can be grouped where multiple species and are often found using similar habitats.

Habitat potential for each species or group of species (e.g., guild) was rated for spawning (i.e., areas where fish reproduce and lay eggs), rearing (i.e., areas where juvenile fish find food and shelter), and overwintering habitat (i.e., areas with sufficient depths [i.e., greater than 1 m] and potential for adequate dissolved oxygen levels for fish to overwinter) as follows:

- nil – the waterbody had no habitat available and would not support fish because of unsuitable habitat conditions, which may include small size, lack of defined channel characteristics, and/or lack of water;
- low – the waterbody had low quality habitat available, which may include limited abundance of habitat and substrate types to provide life history functions for fish (e.g., only pool habitat with silt substrate), and minimal instream cover;
- moderate – the waterbody had moderate quality habitat available, which may include some habitat and substrate type variety (e.g., more than two types available) and multiple sources of instream cover; and
- high – the waterbody had high quality habitat available, without limitations, which may include a variety of habitat and substrate types to meet life history requirements for fish (including spawning habitat) and variety of instream cover types.

Basic water quality parameters (i.e., conductivity, pH, temperature, and dissolved oxygen) were measured using a multi parameter water quality meter. A visual estimate of water clarity was also completed.

Photographs were taken at each waterbody including upstream, downstream, and of the left and right downstream banks at the proposed crossing location. Representative photos of habitat types were also taken along the surveyed section.

#### 2.2.2.2 Fish Sampling

Fish sampling was completed at 46 waterbody crossing sites. Fish presence in the vicinity of the waterbody crossings was documented through sampling with baited minnow traps and/or a backpack electrofisher.

A Smith Root LR24 high output backpack electrofisher and minnow traps (Gee type) were used for fish sampling. The standard electrofisher settings were used (125 to 905 Volts of

direct current and frequency of 25 to 100 Hz). Some sites were not electrofished due to unsuitable conditions for electrofishing or for safety reasons (e.g., soft bottom, fast flowing water, water too deep), or equipment problems.

Two to five minnow traps were set upon arrival at each site and left to soak for approximately two to five hours while the crew completed the habitat assessment. Traps were pulled and fish enumerated before departing the site. Traps were set in the preferred habitat of target fish (i.e., large-bodied juvenile fish and all life stages of small-bodied fish) such as pools, low velocity water, side channels, beaver ponds, and in areas with cover (e.g., weed beds, logs, boulders, overhanging vegetation). All sites were minnow trapped, with the exception of the Dusey River at RA1-4-WC-02.

All captured fish were identified to species and measured (either fork length or total length, to the nearest millimetre). Large-bodied fish species were also weighed to the nearest gram (g). Observed fish were enumerated and identified to species and approximate length classes. Fish were released near their capture locations. Catch-per-unit effort (CPUE), a measure of the relative abundance of fish based on fishing effort, was calculated for each waterbody that was sampled.

Limited fish sampling occurred in the Ogoki and Albany rivers since the fish communities are well documented in both rivers (Eakins 2020; Golder 2013; Marshall and Jones 2011; Holm et al. 2010; Scott and Crossman 1998, MNRF 2023).

#### 2.2.2.3 Data Quality and Control

A quality assurance / quality control program was used for the Project to minimize the possibility of error during data collection, data entry, and data interpretation. Trained and experienced field personnel were used. Standardized data entry spreadsheets and methods were used as a means of consistency and to control the quality of data collected. Specific work instructions were written to provide field crews with detailed methods to collect data. Water quality meters were calibrated at the start of each field day using standardized calibration methods for conductivity, pH, and dissolved oxygen. All data were entered into a waterbody crossing list. Data entry was evaluated for errors or omissions to verify that the electronic database accurately reflected the data collected during the aerial reconnaissance and fish and fish habitat assessments. Quality assurance/ quality control for the waterbody crossing list involved the following tasks:

- review by more than one person, including a senior fish biologist; and
- review by a fish biologist and a water resources engineer.

### 2.2.3 Rapid Fish Habitat Assessments

The objective of the rapid aerial habitat assessments were to:

- describe fish habitat and channel characteristics in the vicinity of the proposed crossing location from a low-level helicopter fly-over when sites were inaccessible for detailed habitat assessments; and
- obtain site specific field data at a subset of waterbody crossings to verify or augment the results and assumptions from the aerial reconnaissance and imagery review.

Rapid fish habitat assessments were completed at 40 proposed waterbody crossings by low-level helicopter fly-over (**Table 2-1**, **Figure 2-1** to **Figure 2-7**). The rapid assessments were conducted at sites originally planned for detailed fish and fish habitat assessment, but where no safe helicopter landing site was available within 500 m of a waterbody crossing and a detailed, on-the-ground fish and fish habitat assessment could not be completed. The channel was characterized based on the presence of bed and banks:

- defined (e.g., consistent bed and banks, channel substrate)
- undefined (e.g., no bed and banks, ne scour)
- poorly defined (i.e., areas with some sections of defined and undefined bed and banks)

Estimates and observations were noted to describe the following information, where possible:

- dominant habitat type
- dominant substrate
- flow regime
- overhead cover percentage
- direction of flow
- riparian characteristics
- presence of fish barriers
- bankfull width, bankfull depth, and wetted width at crossing
- mean bankfull width of assessed reach
- estimated channel slope
- bank stability and shape

Photographs were taken from the air of aquatic habitat and/or features. Where possible, the habitat features were evaluated to make an estimation of the habitat suitability to support small-bodied fish (e.g., Brook Stickleback [*Culaea inconstans*]) or large-bodied fish (e.g., Northern Pike). Where bed and banks were poorly defined and habitat potential was challenging to determine from the air, the crossing was conservatively assumed to have suitable habitat for fish.

# 3. Results

## 3.1 Waterbody Crossing List

In 2019, 164 potential water crossings were identified on Route Alternatives 1 and 4 (alignment Rev01) to generate the initial waterbody crossing list. As described in **Section 2.1.3** (Site Selection for Field Surveys), sites selected for the 2019 field program (i.e., aerial reconnaissance, and fish and fish habitat assessment) were selected from this list.

In 2020, a second option to cross the Ogoki River on Route Alternative 4 was added (alignment Rev02). Both Ogoki routes and their associated waterbody crossings were assessed during the field surveys. This second option added six waterbody crossings to the waterbody crossing list, for at total of 170 potential locations.

In 2022, there were some minor changes in the locations (alignment Rev03), and two sites that were longer on the alignment were removed from the crossing list, resulting in a final waterbody crossing list with a total of 168 waterbody crossings.

## 3.2 Aerial Reconnaissance

In 2019, 164 potential water crossings were identified on Route Alternatives 1 and 4 (alignment Rev01) and were surveyed by aerial reconnaissance. Of the 164 sites, 107 were verified or were assumed to be waterbodies with defined channels, beds, and/or banks. Thirty-eight of these sites were conservatively assumed to have a defined channel with bed and banks since the visibility from the helicopter was poor and the potential for bed and banks and fish habitat could not be observed.

Fifty-six sites were determined to not have defined bed or banks. These undefined drainages were generally swales inundated with terrestrial vegetation or areas with unconnected ponded water in low-lying areas. Results of the aerial reconnaissance are provided in Annex A.

Overall, the aerial reconnaissance provided the first level of field verification of waterbody crossings for the Project. Habitat type, bed substrates, and cover for fish could be seen from the air for most sites. A variety of habitat types were observed, including flats, runs, and some riffles. Bed substrate types included organics, silt/sand, gravel/cobble, and boulder. Cover types for fish included large woody debris and aquatic vegetation. Barriers to fish movement included beaver dams and woody debris.

To provide an understanding of the overall characteristics of waterbodies that were assessed along Route Alternatives 1 and 4, representative photos from the aerial reconnaissance show the following:

- a low-lying wetted area that was determined to have no channel, bed, or banks (Photo 1)
- a watercourse crossing where fish habitat potential could not be determined from aerial reconnaissance because view of the watercourse was obstructed by trees (the status of such a watercourse was determined to be “unknown” and conservatively assumed to have fish habitat potential) (Photo 2)
- a watercourse with an estimated bank-full width less than 2 m (Photo 3)
- a watercourse with riffle/run habitat and coarse substrate and an estimated bank full width greater than 5 m (Photo 4)
- a watercourse with flat habitat and an estimated bank-full width greater than 10 m (Photo 5)
- a watercourse with a beaver dam and an estimated bank-full width less than 10 m (Photo 6)
- a named watercourse with woody debris (Photo 7)
- a watercourse with an estimated bank-full width greater than 100 m (Photo 8)

**Photo 1: A potential low-lying wetted area at crossing RA1-4-WC-11 with no defined bed or banks (September 5, 2019).**

**Photo 2: An unnamed watercourse at crossing RA4-WC-36 where fish suitability and waterbody characteristics could not be determined during the aerial reconnaissance (September 5, 2019).**

**Photo 3: An unnamed watercourse at crossing RA4-WC-23 with an estimated bank-full width of less than 2 m (September 6, 2019).**

**Photo 4: An unnamed watercourse at crossing RA1-WC-41 with run/riffle habitat, coarse bed substrates and an estimated bank-full width greater than 5 m (September 5, 2019).**

**Photo 5: An unnamed watercourse at crossing RA4-WC-05 with deep flat habitat and an estimated bank-full width greater than 10 m (September 6, 2019).**

**Photo 6: An unnamed watercourse at crossing RA1-4-WC-27 with overhanging and instream aquatic vegetation, beaver dam (red arrow), and an estimated bank-full width less than 10 m (September 5, 2019).**

**Photo 7: Buffaloskin River at crossing RA1-4-WC-31 with flat habitat, instream woody debris (red arrow), and a bank-full width of approximately 10 m (September 5, 2019).**

**Photo 8: Patience Lake (wide section of the Ogoki River) at crossing RA4-WC-15 with flat habitat, fine substrates with some boulder, and a bank-full width greater than 100 m (September 6, 2019).**

# 3.3 Detailed Fish and Fish Habitat Assessments

## 3.3.1 Unnamed Watercourse at Crossing RA1-4-WC-01

A detailed fish and fish habitat assessment was completed on September 11, 2021 at an unnamed watercourse at crossing RA1-4-WC-01 (Photos 9 to 12). The proposed crossing location was in moderately shallow, flat habitat with mixed substrates of organics and silt (Photo 9). The unnamed watercourse is a tributary to Winslow Lake, located approximately 1.8 km upstream from the crossing.

The surveyed section had a mean wetted width of 1.3 m, a mean bank-full width of 3 m, and a mean depth of 0.7 m. Fish habitat within the surveyed section consisted entirely of flat habitat (100%). Bed substrates in the surveyed section were organics (80%) and silt (20%). No potential barriers to fish passage were observed during the time of the survey. Cover for fish was provided by aquatic vegetation, undercut banks, and overhanging vegetation. The riparian area up to 25 m of the watercourse was a combination of shrubs and grasses, and forbs. Both banks had low stability. The surveyed section had low potential for overwintering habitat, with water depths generally less than 1 m deep. There was no potential spawning habitat for fish species that spawn over coarse substrates such as (i.e., trout species). However, suitable spawning habitat was present for Northern Pike (i.e., aquatic vegetation) and some small-bodied fish species that spawn over soft substrates (e.g., Finescale Dace [*Chrosomus neogaeus*]). Rearing habitat potential was moderate for small-bodied fish species and low for large-bodied fish.

Water temperature was 12.7°C, conductivity was 58 microseimens per centimetre (µS/cm), and pH was 6.14. The dissolved oxygen concentration was 9.96 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by backpack electrofishing for 575 seconds over 100 m. Two Pearl Dace (*Margariscus nachtriebi*), four Finescale Dace, and two Brook Stickleback were captured by electrofishing (catch per unit effort [CPUE] = 1.39 fish per 100 seconds). Two sets of three baited minnow traps were deployed for approximately 3.5 hours each (21 trap-hours [trap-h] total effort). A total of 136 Pearl Dace, 28 Finescale Dace, and 19 Brook Stickleback were captured in the minnow traps (CPUE = 8.91 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 9: An unnamed watercourse at crossing RA1-4-WC-01 looking across at proposed crossing (September 11, 2021).**

**Photo 10: An unnamed watercourse at crossing RA1-4-WC-01 looking upstream near the proposed crossing (September 11, 2021).**

**Photo 11: An unnamed watercourse at crossing RA1-4-WC-01 looking downstream near the proposed crossing (September 11, 2021).**

**Photo 12: Aerial imagery at the proposed crossing RA1-4-WC-01 (Project right-of-way in black, flow direction in blue).**

### 3.3.2 Dusey River at Crossing RA1-4-WC-02

A fish and fish habitat assessment was completed on September 8, 2019 on the Dusey River at crossing RA1-4-WC-02 (Photos 13 to 16). The proposed crossing location was in deep, high quality flat habitat, with mixed substrates of cobble, gravel, boulder, sand, and silt (Photo 13 and 16). The stream section was surveyed 100 m upstream (Photo 14) and 200 m downstream of the proposed crossing (Photo 15). A beaver lodge was observed near the crossing, but no beaver dams were present at the time of the survey. The crossing was also assessed by rapid aerial assessment on 24 October 2020, as the closest suitable landing location at the time of that survey was over 750 m downstream of the crossing location.

The overall fish habitat results were comparable between the detailed ground assessment in 2019 and the rapid aerial assessment in 2020. On September 8, 2019, the surveyed section had a mean wetted width of 34.7 m, a mean bank-full width of 44 m, and a mean bank-full depth of 1.3 m. Within the surveyed section, fish habitat consisted almost entirely of flats (98%), with some riffles (2%). No barriers to fish movement were observed in the surveyed section. Substrates consisted mainly of cobbles (35%) and boulders (30%) with gravel, sand and silt also present in smaller amounts. Cover for fish was provided by large substrate (boulders), water depth, woody debris, and small amounts of aquatic vegetation. The riparian area within 3 m of the watercourse was a combination of shrubs, grasses, and forbs. Beyond 3 m, the riparian area was coniferous forest. Both banks were mainly stable.

The surveyed section has moderate to high overwintering potential for most fish species as average water depths were greater than 1 m. Rearing habitat was rated as moderate for large-bodied species such as Walleye (okaas; *Sander vitreus)* and Brook Trout and for small-bodied species such as Brook Stickleback. Potential rearing and spawning habitat for Northern Pike was low due to limited aquatic vegetation (8% of total area). The mix of coarse substrates provides moderate potential spawning habitat for large-bodied fish (e.g., Walleye, White Sucker (*namebin; Catostomus commersonii*), and Brook Trout). Locations for Brook Trout fishing and spawning were identified in the Dusey River at the crossing location (MFCAR community meeting 2022). Northern Pike (described as Jackfish) spawning was also identified at a location in the Dusey River approximately 10 km upstream from the crossing (MFFN 2019).

Water temperature was 13.5°C, conductivity was 82.0 µS/cm, and pH was 8.1. The dissolved oxygen concentration was 10.9 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by backpack electrofishing for 398 seconds over 120 m. No fish were captured; however, one Yellow Perch (ajaawes; *Perca flavescens*) and two unidentified darters (family Percidae) were observed (Annex B; Tables B1 to B3).

**Photo 13: The Dusey River at crossing RA1-4-WC-02 looking across at the proposed crossing (September 8, 2019).**

**Photo 14: The Dusey River at crossing RA1-4-WC-02 looking upstream near proposed crossing representative of a flat habitat (September 8, 2019).**

**Photo 15: The Dusey River at crossing RA1-4-WC-02 looking downstream near the proposed crossing (September 8, 2019).**

**Photo 16: Aerial imagery at the proposed crossing RA1-4-WC-02 (Project right-of-way Project right-of-way in black, flow direction in blue).**

### 3.3.3 Unnamed Watercourse at Crossing RA1-4-WC-07

A fish habitat assessment was completed on September 6, 2019 on an unnamed watercourse at crossing RA1-4-WC-07 (Photos 17 to 20). The potential crossing was in a flooded wetland with soft and unstable ground, which limited the level of habitat assessment and fishing effort that could be completed by the field crew (Photo 17). However, photographs were taken from 100 m upstream (Photo 18) to 200 m downstream from the proposed crossing (Photo 19). A ground assessment and fish sampling were completed on September 11, 2021.

The overall fish habitat results were comparable between the 2019 and 2021 assessments. The proposed crossing was in flat habitat with organic substrates (100%) (Photo 33). In September 2021, the proposed crossing had a wetted width of approximately 6 m, and water depth was approximately 1.5 m deep. Cover for fish was provided by water depth and aquatic vegetation. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs within the wetland (Photo 34). Beyond 3 m, the riparian vegetation was also mainly grasses and forbs, with some shrubs, willows, and coniferous forest. Both banks were poorly defined, soft, and unstable.

The surveyed section had low overwintering potential for fish. Although there may be potential for overwintering based on depths (greater than 1 m), low dissolved oxygen concentrations below the ice may be limiting. Rearing habitat was rated as low for large-bodied species (e.g., Brook Trout) and moderate for small-bodied species. Spawning habitat was suitable for Northern Pike and certain small-bodied species (e.g., Northern Redbelly Dace [*Chrosomus eos*], Finescale Dace) that spawn in soft substrates or vegetation.

Water temperature was 11.2°C, conductivity was 49.5 µS/cm, and pH was 6.6. The dissolved oxygen concentration was 3.78 mg/L, which was below the guideline for the protection of aquatic life (6.5 mg/L) (CCME 1999), which could limit the potential for rearing and overwintering.

The surveyed section was fish sampled by backpack electrofishing for 553 seconds over 100 m. Two sets of minnow traps with two and three trap clusters (5 traps total) were set for four hours (20 trap-h effort). No fish were captured (Annex B; Tables B1 to B3).

**Photo 17: An unnamed watercourse at crossing RA1-4-WC-07 looking across at proposed crossing (September 11, 2021).**

**Photo 18: An unnamed watercourse at crossing RA1-4-WC-07 looking upstream near the proposed crossing (September 11, 2021).**

**Photo 19: An unnamed watercourse at crossing RA1-4-WC-07 looking downstream near the proposed crossing (September 11, 2021).**

**Photo 20: Aerial imagery at the proposed crossing RA1-4-WC-07 (Project right-of-way in black, flow direction in blue).**

### 3.3.4 Unnamed Watercourse at Crossing RA1-4-WC-10

A fish and fish habitat assessment was completed on August 18, 2022 at Alder River Wadobii Wih Ziibih (Oji-Cree name)/Alder River (local name)/ unnamed watercourse at crossing RA1-4-WC-10 (Photos 21 to 24). The proposed crossing was in a deep, flat habitat with organic substrates (Photo 21). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 22) to 120 m downstream of the proposed crossing (Photo 23). The surveyed section had a mean wetted width of 6.0 m, a mean bank-full width of 6.0 m, and a mean depth greater than 1.5 m. Fish habitat consisted entirely of deep (i.e., greater than 1 m deep) flats. No potential barriers to fish movement were observed. Bed substrates consisted of organics (100%). Cover for fish was provided primarily by water depths with small amounts of aquatic vegetation and woody debris. The riparian area up to 25 m from the banks was made up of grasses and forbs with some shrubs. Both banks were moderately stable.

The surveyed section had high overwintering potential to support a variety of small-bodied fish and moderate for large-bodied fish due to average water depths over 1.5 m. Rearing and spawning habitat potential was high for small-bodied fish species that spawn over soft organic substrates (e.g., Brook Stickleback) and low for large-bodied fish as substrates were not suitable (organics) for large-bodied fish that spawn over coarse substrates or riffles the and limited presence of aquatic vegetation to support Northern Pike spawning.

Water temperature was 17.6°C, conductivity was 61 µS/cm, and pH was 6.45. The dissolved oxygen concentration was 10.75 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying two sets of three baited minnow traps for approximately 2 hours each (12 trap-h effort). No fish were caught (Annex B; Tables B1 to B3).

**Photo 21: An unnamed watercourse at RA1-4-WC-10 looking across at crossing location (August 18, 2022).**

**Photo 22: An unnamed watercourse at RA1-4-WC-10 looking upstream from crossing location (August 18, 2022).**

**Photo 23: An unnamed watercourse at RA1-4-WC-10 looking downstream from crossing location (August 18, 2022).**

**Photo 24: Aerial imagery at the proposed crossing RA1-4-WC-10 (Project right-of-way in black, flow direction in blue).**

### 3.3.5 Unnamed Watercourse at Crossing RA1-4-WC-19

A fish habitat assessment was completed on June 29 and August 18, 2022 on the Biitakweya Wih Ziibih (Oji-Cree name)/unnamed watercourse at crossing RA1-4-WC-19 (Photos 25 to 28). The proposed crossing was in deep, flat habitat with organic substrates (Photo 25 and 28). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 26) to 120 m downstream of the proposed crossing (Photo 27).

The overall fish habitat results were reasonably similar between the June and August 2022 assessments. In August 2022, the surveyed section had a mean wetted width of 35 m, a mean bank-full width of 27 m and a mean depth greater than 1.5 m. Fish habitat consisted entirely of deep flat. No potential barriers to fish movement were observed. Bed substrates consisted of organics (100%). Cover for fish was provided primarily water depth and aquatic vegetation. The riparian area up to 25 m from the banks was made up of grasses and forbs with shrubs. Both banks were moderately stable.

The surveyed section had low overwintering potential to support small-bodied fish and large-bodied fish due to low dissolved oxygen concentrations in August. Rearing habitat potential was high for Northern Pike, Burbot (*Lota lota*), Sucker species and small-bodied fish species due to water depth and presence of aquatic vegetation. Spawning habitat was moderate for Northern Pike due to aquatic vegetation and high for small-bodied fish due to suitable cover and water depth, and nil for all other large-bodied fish that spawn over coarse substrates.

Water temperature in August was 21.9°C, conductivity was 68 µS/cm, and pH was 6.30. The dissolved oxygen concentration was 5.68 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species. No water quality parameters were collected in June.

In June, fish sampling was conducted by deploying one baited minnow trap for approximately three hours (3-trap-h effort). In August, fish sampling was conducted by deploying two sets of baited minnow traps for approximately two hours (4 trap-h effort). No fish were caught (Annex B; Tables B1 to B3).

**Photo 25: An unnamed watercourse at RA1-4-WC-19 looking across at crossing location (August 18, 2022).**

**Photo 26: An unnamed watercourse at crossing RA1-4-WC-19 looking upstream from crossing location (August 18, 2022).**

**Photo 27: An unnamed watercourse at crossing RA1-4-WC-19 looking downstream from crossing location (August 18, 2022).**

**Photo 28: Aerial imagery at the proposed crossing RA1-4-WC-19 (Project right-of-way in black, flow direction in blue).**

## 3.3.6 Unnamed Watercourse at Crossing RA1-4-WC-21

Fish and fish habitat assessments were completed on September 8, 2019, July 1, 2022, and August 16, 2022 at mahtahbiisiitahgun (Oji-Cree name)/the unnamed watercourse at crossing RA1-4-WC-21 (Photos 29 to 32). The unnamed watercourse is a tributary to Gittins Lake, located approximately 2.6 km upstream from the crossing. The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 30) to 120 m downstream of the proposed crossing (Photo 31). The proposed crossing location was in flat habitat within a muskeg with organic substrates (Photo 29 and 32).

The results of the 2022 habitat assessments were comparable between seasons; the surveyed section had a mean wetted width of 5.5 m, a mean bank-full width of 6.0 m and a mean water depth of 1.2 m. During the 2019 assessment, the watercourse was in flooded bog/wetland (up to 156 m). In sections with a defined channel, wetted width was 8.5 m, mean bank-full width was 156 m, and mean water depth was greater than 1.5 m. During all surveys, fish habitat consisted entirely of deep flats. No potential barriers to fish movement were observed. Bed substrates consisted entirely of organics (100%). Cover for fish was provided primarily by aquatic vegetation with some deep-water sections. The riparian area up to 25 m of the banks were bog/wetland, grasses, and forbs with some shrubs. Both banks had low stability.

The surveyed section had moderate overwintering potential for small-bodied fish and low for large-bodied fish due to mean water depth around 1.2 m, with the watercourse unlikely to freeze to bottom in winter. However, dissolved oxygen may be a limiting factor in the winter, due to concentrations in the summer being less than the guideline for the protection of aquatic life. There was moderate to high potential rearing habitat for White Sucker, Northern Pike, and small-bodied fish species. There was high potential Northern Pike spawning habitat due to the presence of aquatic vegetation. Spawning potential was nil to low for other large-bodied species (e.g., Brook Trout and Walleye [*okaas*]) due to lack of coarse substrates.

During the field surveys, water temperatures ranged from 13.9°C to 21.9°C, conductivity ranged from 31 to 68 µS/cm, and pH ranged from 6.22 to 7.35 (**Table 3-1).** The dissolved oxygen concentration ranged from 3.22 to 7.45 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) during two sampling events and unsuitable for most fish species.

**Table 3-1: Water quality parameters at proposed crossing RA1-4-WC-21 in 2019 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| September 8, 2019 | 21.87 | 68 | 6.30 | 5.68 |
| July 1,2022 | 13.9 | 41.3 | 6.22 | 3.22 |
| August 16, 2022 | 16.5 | 31 | 7.35 | 7.45 |

Fish sampling in 2019 was conducted by deploying two minnow traps for one hour (two trap-h total effort). In August 2022, six minnow traps were deployed for two hours (12 trap-h effort). No fish were captured but a juvenile Northern Pike was observed. In July 2022, 10 minnow traps were deployed for three hours (30 trap-h effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 29: An unnamed watercourse at crossing RA1-4-WC-21 looking across at crossing location (August, 16 2022).**

**Photo 30: An unnamed watercourse at crossing RA1-4-WC-21 looking upstream from crossing location (August 16, 2022).**

**Photo 31: An unnamed watercourse at crossing RA1-4-WC-21 looking downstream from crossing location (September 8, 2019).**

**Photo 32: Aerial imagery at the proposed crossing RA1-4-WC-21 (Project right-of-way in black, flow direction in blue).**

## 3.3.7 Unnamed Watercourse at Crossing RA1-4-WC-33

Fish and fish habitat assessments were completed on October 19, 2020, June 24, 2022, and August 19, 2022 at the unnamed watercourse at crossing RA1-4-WC-33 (Photos 33 to 36). The unnamed watercourse is a tributary to a lake, Jiigaakodigweyaa Wih Zaagaihgan (Oji-Cree name), located approximately 685 m from the crossing. The proposed crossing was in a low quality, shallow flat habitat with organic substrates (Photo 33 and 36). The

watercourse was assessed from 120 m upstream of the proposed crossing (Photo 34) to 210 m downstream of the proposed crossing (Photo 35).

During the 2020 assessment, the surveyed section had a mean wetted width of 5.2 m, a mean bank-full width of 5.7 m, and a mean water depth of 0.55 m. A beaver dam was observed near the crossing which could be a potential barrier to large-bodied fish movement since water was passing through the dam. Bed substrates consisted entirely of organics (100%). Cover for fish was provided primarily by aquatic vegetation with small amounts of overhanging vegetation and deep water. The riparian area within 0 to 25 m of the watercourse was coniferous trees with shrubs.

During the 2022 assessments, the fish habitat was comparable between seasons with a mean wetted width of 2.0 m, bank-full width of 2.5 m, and an average water depth of 0.65 m. The variation in widths between 2020 and 2022 may be due the seasonality of the assessments and the beaver dam no longer being present in 2022, which likely affected flows in the watercourse. Instream cover and substrate were the same as in 2020.

The surveyed section had low overwintering potential to support small-bodied fish and nil for large-bodied fish due to mean water depth less than 1 m and low dissolved oxygen concentrations in late summer. Rearing and spawning habitat potential was low for small-bodied fish species and nil for large-bodied fish due to shallow mean water depth, lack of suitable substrates, and limited amounts of aquatic vegetation.

Water temperature in June 2022 was 21.4°C, conductivity was 16.4 µS/cm, and pH was 6.36. The dissolved oxygen concentration was 7.18 mg/L. In August 2022, temperature was 20.5°C, conductivity was 25 µS/cm, and pH was 5.54. The dissolved oxygen concentration was 4.18 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most large-bodied fish species. No water quality parameters were collected in 2020.

In August 2022, fish sampling was conducted by electrofishing a 105 m stream section for 471 seconds. No fish were captured or observed. In June 2022, fish sampling was conducted by setting three sets of two minnow traps for three hours (18 trap-h effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 33: An unnamed watercourse at crossing RA1-4-WC-33 looking across at the proposed crossing location (October 19, 2020).**

**Photo 34: An unnamed watercourse at crossing RA1-4-WC-33 looking upstream at the proposed crossing location (June 24, 2022).**

**Photo 35: An unnamed watercourse at crossing RA1-4-WC-33 looking downstream at the proposed crossing location (August 19, 2022).**

**Photo 36: Aerial imagery at the proposed crossing RA1-4-WC-33 (Project right-of-way in black and flow direction arrow in blue).**

### 3.3.8 Unnamed Watercourse at Crossing RA1-4-WC-35

Fish and fish habitat assessments were completed on October 16, 2020, June 28, 2022, and August 19, 2022 at an unnamed watercourse at proposed crossing RA1-4-WC-35 (Photos 37 to 40). The crossing was in a moderate quality flat habitat with organic (90%) and sand (10%) substrates (Photo 37 and 40). The watercourse was assessed from approximately 120 m upstream of the crossing (Photo 38) to 60 m downstream of the crossing (Photo 39).

During the 2020 assessment, the surveyed section had a mean wetted width of 2.7 m, a mean bank-full width of 3.2 m, and mean water depth was 0.7 m. Within the surveyed section, the channel primarily consisted of moderately shallow flats (84%) and a deep impoundment (16%). A beaver dam was noted upstream and was approximately 0.5 m wide, which could be a potential barrier to fish movement in the future but was not a barrier at the time of the survey (Photo 39). Bed substrates throughout the surveyed section primarily consisted of organics (90%) and small amounts of sand (10%). Cover for fish was provided by undercut banks, woody debris, water depths, aquatic vegetation, and overhanging vegetation (Photo 10). The riparian area up to 25 m of the banks were shrub, coniferous forest, and some grasses. The area was noted to be entirely flooded.

In 2022, the fish habitat conditions in the surveyed section were comparable to the conditions observed in 2020; however, a second beaver dam was present, measuring approximately 1.25 m wide.

The surveyed section had low fish habitat potential for large-bodied fish, although the watercourse could support small-bodied fish species such as Brook Stickleback or Finescale Dace. The deep impoundment may provide moderate overwintering habitat potential for small-bodied fish species and large-bodied species with tolerance for lower dissolved oxygen levels. Obstructions from beaver dams and a general absence of water may limit fish movement throughout the surveyed section. Lack of coarse substrates and low water levels resulted in low spawning potential for many fish species; however, moderate spawning and rearing potential is present for small-bodied fish that spawn over soft, fine substrates.

Water temperature in October 2020 was 5.4°C, dissolved oxygen concentration was 6.62 mg/L, conductivity was 20.6 µS/cm, and pH was 5.05. Water temperature in August 2022 was 16.48°C, conductivity was 49 µS/cm, and pH was 5.40. The dissolved oxygen concentration was 3.53 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

In August 2022, fish sampling was conducted by setting two clusters of three baited minnow traps for two hours (12 trap-h effort) and by backpack electrofishing a 60 m stream section for 678 seconds. No fish were captured or observed by either method. In June

2022, one minnow trap was set for three hours (3 trap-h effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 37: An unnamed watercourse at crossing RA1-4-WC-35 looking across at the proposed crossing (October 16, 2020).**

**Photo 38: An unnamed watercourse at crossing RA1-4-WC-35 looking upstream at the proposed crossing (June 28, 2022).**

**Photo 39: An unnamed watercourse at crossing RA1-4-WC-35 looking downstream with a beaver dam near the proposed crossing (October 16, 2020; arrow pointing to dam).**

**Photo 40: Aerial imagery at the proposed crossing RA1-4-WC-35 (Project right-of-way in black and flow direction arrow in blue).**

### 3.3.9 Unnamed Watercourse at Crossing RA1-4-WC-36

A fish and fish habitat assessment was completed on August 25, 2022 on the unnamed watercourse at crossing RA1-4-WC-36 (Photos 41 to 44). The proposed crossing was in a high quality, deep flat habitat (Photo 41 and 44). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 42) to 120 m downstream of the proposed crossing (Photo 43).

The surveyed section had a mean wetted width of 14.5 m, a mean bank-full width of 15.5 m, and a mean water depth greater than 2 m. Fish habitat consisted entirely of deep flats (100%). A beaver dam was observed upstream of the crossing posing as a potential barrier to fish movement; however, water was still moving through the dam at the time of the survey. Bed substrates were not visible due to water depths. Cover for fish was provided primarily by deep water, with some aquatic vegetation, woody debris, and overhanging vegetation. The riparian area up to 25 m of the banks was coniferous trees with shrubs.

The surveyed section had moderate to high overwintering potential to support all fish due to mean water depth greater than 2 m. Spawning potential for small-bodied fish was high for fish that use woody debris or soft substrate (e.g., Fathead Minnow), but low for Northern Pike due to only small amounts of aquatic vegetation present, and nil for other large-bodied fish due to lack of suitable spawning substrates. Rearing habitat potential was high for small-bodied fish species, moderate for sucker species, Northern pike (*najwabe*), Walleye (*okaas*), Perch (*ajaawes*), and Burbot, and low for other large-bodied fish species.

Water temperature was 14.4°C, conductivity was 36.2 µS/cm, and pH was 6.68. The dissolved oxygen concentration was 7.55 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying one baited minnow trap for approximately 5 hours (5 trap-h effort). No fish were caught (Annex B; Tables B1 to B3).

**Photo 41: An unnamed watercourse at crossing RA1-4-WC-36 looking across at crossing location (August 25, 2022).**

**Photo 42: An unnamed watercourse at crossing RA1-4-WC-36 looking upstream from crossing location (August 25, 2022).**

**Photo 43: An unnamed watercourse at crossing RA1-4-WC-36 looking downstream from crossing location (August 25, 2022).**

**Photo 44: Aerial imagery at the proposed crossing RA1-4-WC-36 (Project right-of-way in black, flow direction in blue).**

### 3.3.10 Unnamed Watercourse at Crossing RA1-4-WC-37

Fish and fish habitat assessments were completed on October 14, 2020 and August 16, 2022 at an unnamed watercourse at proposed crossing RA1-4-WC-37 (Photos 45 to 48). The original route alignment (prior to Rev03 reroute of September 2022), crossed the unnamed watercourse at RA1-4-WC-37. With the Rev03 alignment revision, the route now terminates 25 m away from the watercourse at RA1-4-WC-37. However, since the route alignment it is within 30 m of the unnamed watercourse, the results of the assessments are still provided.

The proposed crossing was in a shallow, low quality flat habitat, with mixed substrates of organic (80%), silt (10%), and sand (10%) (Photo 45 and 48). The watercourse was assessed from 75 m upstream of the proposed crossing up to the large impoundment (Photo 46) to 100 m downstream of the crossing (Photo 47).

During the 2020 assessment, the surveyed section had a mean wetted width of 0.45 m, a mean bank-full width of 0.5 m, and a mean water depth of 0.25 m, with depths greater than 1 m in the upstream impoundment. Habitat in the surveyed section consisted of low-quality shallow flats (33%), subterranean flow downstream of the crossing (33%), and a large impoundment upstream (33%). Cover for fish was provided by overhanging vegetation and undercut banks. No potential barrier to fish passage was observed. The riparian vegetation within 3 m of the watercourse was a combination of shrubs and grasses. Beyond 3 m, the riparian vegetation was coniferous forest. Both banks were mainly unstable and subject to undercutting. The fish habitat conditions in 2022 were comparable to those observed in 2020; however, in 2022, no subterranean flow was observed, and all habitat consisted of shallow flats downstream of the crossing and an impoundment upstream of the crossing.

Due to the shallow nature of the surveyed section, overwintering potential was low for most fish species with the watercourse likely freezing to bed in winter with water depths less than 1 m; however, there may be habitat for small-bodied fish to overwinter in the upstream impoundment. Due to limited suitable substrates for most fish and absence of aquatic vegetation, spawning habitat potential for large-bodied fish was nil but was moderate for small-bodied fish that can spawn over soft substrates (e.g., Brook Stickleback). Rearing habitat potential was high for small-bodied fish and nil for large-bodied fish species.

Water temperature was 5.2°C, conductivity was 137.7 µS/cm, and pH was 7.07. The dissolved oxygen concentration was 9.75 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was completed by setting three minnow traps for one hour (3 trap-h effort) and by backpack electrofishing a 75 m stream section for 268 seconds. No fish were captured or observed by either method (Annex B; Tables B1 to B3).

**Photo 45: An unnamed watercourse at crossing RA1-4-WC-37 looking across at the proposed crossing (October 14, 2020).**

**Photo 46: An unnamed watercourse at crossing RA1-4-WC-37 looking upstream opening to a large impoundment near proposed crossing (October 14, 2020).**

**Photo 47: An unnamed watercourse at crossing RA1-4-WC-37 looking downstream near the proposed crossing (October 14, 2020).**

**Photo 48: Aerial imagery at proposed crossing RA1-4-WC-37 (Project right-of-way in black and flow direction arrow in blue).**

### 3.3.11 Unnamed Watercourse at Crossing RA1-WC-01

A fish and fish habitat assessment was completed on August 20, 2022 on the unnamed watercourse at crossing RA1-WC-01 (Photos 49 to 52). The proposed crossing was in a riffle habitat with cobble and boulder substrates (Photo 49 and 52). The watercourse, a tributary to Painter Lake, was assessed from 85 m upstream of the proposed crossing (Photo 50) to 145 m downstream of the proposed crossing (Photo 51). A rapid aerial assessment had also been conducted on June 28, 2022, as the closest suitable landing location was over 800 m from the crossing location in spring conditions.

The overall fish habitat results were reasonably similar between rapid aerial assessment and detailed ground assessment. In August 2020, the surveyed section had a mean wetted width of 4.75 m, a mean bank-full width of 5.5 m, and a mean water depth of 0.50 m. Fish habitat consisted of deep impoundments over 2 m deep (35%), flats (30%), riffles (20%), moderate pools (0.8 m deep) (9%), and shallow runs (7%). Two beaver dams (one upstream and downstream of the crossing) were observed, which may be potential barriers to fish movement (Photo 45). Bed substrates in the impoundments consisted of organics (100%). Riffles consisted of boulders (70%) and cobbles (30%); flats consisted of silt (60%) and organic (40%); pools consisted of boulders (70%) and cobbles (30%), and runs consisted of cobble (60%), sand (35%), and boulders (5%). Cover for fish was provided primarily depth and turbulence with some aquatic vegetation, woody debris, substrates (i.e., boulders), and overhanging vegetation. The riparian area up to 25 m of the banks was coniferous trees with shrubs. Both banks were moderately stable.

The surveyed section had overwintering potential for both small and large-bodied fish species with some deep pools and impoundments. Spawning potential was high for small-bodied species that spawn over both soft and coarse substrates and moderate for large-bodied species due to of the presence of coarse substrates and aquatic vegetation. Rearing potential was also moderate to high for Northern Pike, Walleye (*okaas*), Perch (*ajaawes*), sucker species (*namebin*), and small-bodied species.

Water temperature was 17.97°C, conductivity was 85 µS/cm, and pH was 6.55. The dissolved oxygen concentration was 6.86 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying two sets of three baited minnow traps for approximately 5 hours each (30 trap-h total effort). No fish were caught (Annex B; Tables B1 to B3).

**Photo 49: An unnamed watercourse at crossing RA1-WC-01 looking beaver dam upstream of the crossing location (August 20, 2022).**

**Photo 50: An unnamed watercourse at crossing RA1-WC-01 looking upstream from crossing location (August 20, 2022).**

**Photo 51: An unnamed watercourse at crossing RA1-WC-01 looking downstream from crossing location (August 20, 2022).**

**Photo 52: Aerial imagery at the proposed crossing RA1-WC-01 (Project right-of-way in black, flow direction in blue).**

### 3.3.12 Unnamed Watercourse at Crossing RA1-WC-02

A fish and fish habitat assessment was completed on September 14, 2021 on the unnamed watercourse at crossing RA1-WC-02 (Photos 53 to 56). The crossing was in a moderately deep (i.e., water depths between 0.5 and 1.0 m) flat habitat, with mixed substrates of cobble, boulder, and silt (Photo 53 and 56). The reach was surveyed 140 m upstream (Photo 54) and 120 m downstream of the proposed crossing (Photo 55).

The surveyed section had a mean wetted width of 8 m, a mean bank-full width of 8 m, and a mean water depth of 1.3 m. Within the surveyed section, fish habitat consisted of moderately deep flats (73%), deep pools (i.e.,1.3 m) (12%), and rapids (15%). No barriers to fish movement were observed in the surveyed section. Substrates were mainly boulders (50%), cobble (30%), and silt (20%). Cover for fish was provided primarily by depth/turbulence, with some substrate, woody debris, and overhanging vegetation. The riparian area within 3 m of the watercourse was primarily coniferous forest with some shrubs. Beyond 3 m, the riparian area was coniferous forest. Both banks were mainly stable.

The surveyed section had moderate to high overwintering potential for most species as average water depths were greater than 1 m and dissolved oxygen concentrations were likely to support fish over winter. Rearing and spawning habitat potential was moderate to high for all species due to suitable cover, habitat, bed substrates (i.e., mix of coarse and fine), and flows.

Water temperature was 12.7°C, conductivity was 100 µS/cm, and pH was 6.81. The dissolved oxygen concentration was 8.81 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying two sets of baited minnow traps in clusters of two and three traps, for approximately 5 hours each (25 trap-h effort). No fish were caught (Annex B; Tables B1 to B3).

**Photo 53: An unnamed watercourse at crossing RA1-WC-02 looking at the proposed crossing location (September 11, 2021).**

**Photo 54: An unnamed watercourse at crossing RA1-WC-02 looking upstream near proposed crossing (September 11, 2021).**

**Photo 55: An unnamed watercourse at crossing RA1-WC-02 looking downstream near the proposed crossing (September 11, 2021).**

**Photo 56: Aerial imagery at the proposed crossing RA1-WC-02 (Project right-of-way in black, flow direction in blue).**

## 3.3.13 Ogoki River at Crossing RA1-WC-05

A fish habitat assessment was completed on September 8, 2019 on the Ogoki River at crossing RA1-WC-05 (Photos 57 to 60). The proposed crossing was in run habitat with boulder and cobble substrates (Photo 57 and 60). The watercourse was assessed from 100 m upstream of the proposed crossing (Photo 58) to 200 m downstream of the proposed crossing (Photo 59).

The surveyed section had a mean wetted width of 48.3 m, a mean bank-full width of 73.3 m, and a mean water depth of greater than 1.5 m. Fish habitat consisted of runs (81%) and riffles (19%). No barriers to fish movement were observed in the surveyed section. Bed substrates consisted of boulders (45%), cobbles (29%), gravel (17%), and sand (9%). Cover for fish was provided primarily by large substrate (boulders) and water depth, with small amounts of woody debris and aquatic vegetation. The riparian vegetation consisted mainly of coniferous forest with some shrubs, willows, grass, and forbs. Both banks were stable.

The surveyed section had potential to support a variety of small-bodied fish species as well as large-bodied fish. With average water depths greater than 1 m, the surveyed section had high overwintering potential for most fish species. Rearing and spawning habitat potential was high for both small and large-bodied fish species due to suitable flow, water depths, and suitable types of cover, substrate (i.e., mix of coarse and fine), and habitats.

Water temperature was 16.3°C, conductivity was 97.1 µS/cm, and pH was 8.5. The dissolved oxygen concentration of 11 mg/L was above the guideline for the protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for fish.

Fish sampling was not completed in September 2019, but the fish community in the Ogoki River is well documented. Large-bodied fish including Brook Trout, Northern Pike, Walleye (*okaas*), Lake Sturgeon (*nameh; Acipenser fulvescens*), and Lake Whitefish (*atikameg*) have all been documented in the Ogoki River as well as several small-bodied forage fish species (e.g., Lake Chub [*Couesius plumbeus*]) (MNRF 2023, Government of Ontario 2015, Golder 2013).

Fish sampling was conducted in the Ogoki River at another crossing location (RA1-WC-11) in June and August 2022 (**Section 3.3.15**). Three Northern Pike, three Burbot, an unknown dace species, and one Mottled Sculpin (*Cottus bairdii*) were captured. Another juvenile Northern Pike and multiple unknown dace species were observed (Annex B; Tables B1 to B3).

**Photo 57: The Ogoki River at crossing RA1-WC-05 looking across at the proposed crossing (September 9, 2019).**

**Photo 58: The Ogoki River at crossing RA1-WC-05 looking upstream near the proposed crossing (September 9, 2019).**

**Photo 59: The Ogoki River at crossing RA1-WC-05 looking downstream near the proposed crossing (September 9, 2019).**

**Photo 60: Aerial imagery at the proposed crossing RA1-WC-05 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.14 Unnamed Watercourse at Crossing RA1-WC-09

Fish and fish habitat assessments were completed on September 9, 2019, June 23, 2022, and August 17, 2022, and a rapid ground assessment was conducted on September 17, 2021, on an unnamed watercourse at crossing RA1-WC-09 (Photos 61 to 64). The proposed crossing was in shallow, flat habitat with mixed organic substrates (Photo 61 and 64). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 62) to 120 m downstream of the crossing (Photo 63).

Fish habitat conditions were generally consistent between all assessments over all years and seasons, other than a beaver dam observed in 2019 was no longer present in 2022. The surveyed section had a mean wetted width of 2.1 m, a mean bank-full width of 2.4 m, and a maximum bank-full depth of 2.6 m. Water depths were shallow, ranging from 0.05 m to 0.8 m. Within the surveyed section, the channel consisted entirely of shallow, low-quality impoundments. Several beaver dams were present in the surveyed section, which could be barriers to fish movement (Photo 18). Bed substrates throughout the surveyed section consisted entirely of organics. Cover for fish was provided by undercut banks, woody debris, and overhanging vegetation (Photo 17). The riparian vegetation within 3 m of the watercourse was a combination of grasses and forbs, with shrubs and willows. Beyond 3 m, the riparian vegetation was coniferous forest with some shrubs and willows, and grasses and forbs. Both banks exhibited slumping and low stability.

The surveyed section had low quality fish habitat potential, although the watercourse could support small-bodied fish species such as Brook Stickleback which can inhabit shallow water. Shallow water depths limit the overwintering habitat potential for most fish species therefore overwintering is low for all fish. Lack of coarse substrates and aquatic vegetation and low water levels resulted in low spawning potential for many fish species.

Water temperature ranged from 10.2 to 16.4°C, conductivity ranged from 67.3 to 78 µS/cm, and pH ranged from 6.15 to 7.2 (**Table 3-2**). The dissolved oxygen concentration ranged from 6.88 to 10.51 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

**Table 3-2: Water quality parameters at proposed crossing RA1-WC-09 in 2019 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| September 9, 2019 | 10.2 | 69.6 | 7.2 | 9.1 |
| June 23, 2022 | 16.4 | 67.3 | 6.2 | 6.88 |
| August 17, 2022 | 16.44 | 78 | 6.15 | 10.51 |

Fish sampling was completed in August 2022 by backpack electrofishing a 100 m stream section for 961 seconds. Three small-bodied fish species were captured: Northern Redbelly Dace (n= 25), Pearl Dace (n= 10), and Brook Stickleback (n= 14) (CPUE= 5.1 fish per 100 seconds). Fish sampling in June 2022 was completed by setting five minnow traps for three hours (15 trap-h effort). Northern Redbelly Dace (n=60), Pearl Dace (n=16), and Brook Stickleback (n=27) were captured (CPUE = 11.98 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 61: An unnamed watercourse at crossing RA1-WC-09 looking across at the proposed crossing (August 17, 2022).**

**Photo 62: An unnamed watercourse at crossing RA1-WC-09 looking upstream near the proposed crossing (August 17, 2022).**

**Photo 63: An unnamed watercourse at crossing RA1-WC-09 looking downstream near the proposed crossing (August 17, 2022).**

**Photo 64: Aerial imagery at the proposed crossing RA1-WC-09 (Project right-of-way in black and flow direction arrow in blue)**

### 3.3.15 Ogoki River at Crossing RA1-WC-11

Fish and fish habitat assessments were completed on June 29, 2022 and August 21, 2022 on the Ogoki River at crossing RA1-WC-11 (Photos 65 to 68). The proposed crossing was in deep flat habitat with cobble and silt substrates (Photo 65 and 68). The watercourse was assessed from 35 m upstream of the proposed crossing (Photo 66) to 205 m downstream of the proposed crossing (Photo 67).

The overall fish habitat results were comparable between seasons. In June 2022, the surveyed section had a mean wetted width of 100 m, a mean bank-full width of 110 m, and a mean water depth of greater than 2 m. Fish habitat consisted of deep flats (60%) and deep runs (40%). No potential barriers to fish movement were observed. Bed substrates consisted of cobble (55%), silt (40%), and organics (5%). Cover for fish was provided primarily by water depths, boulders, and aquatic vegetation. The riparian area up to 25 m of the watercourse is deciduous trees with shrubs and grasses. Both banks were stable.

With mean water depths greater than 2.0 m, suitable substrates (i.e., a mix of coarse and fine), and adequate dissolved oxygen conecentrations, and sufficient flow, the surveyed section had moderate to high overwintering, spawning, and rearing potential for small and large-bodied fish.

Water temperature in June 2022 was 16.7°C, conductivity was 63.6 µS/cm, pH was 6.62, and the dissolved oxygen concentration was 8.85 mg/L. In August 2022, water temperature was 21.5°C, conductivity was 79 µS/cm, and pH was 7.09. The dissolved oxygen concentration was 9.45 mg/L which was above the guideline for the protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

The fish community in the Ogoki River is well documented. Large-bodied fish including Brook Trout, Northern Pike, Walleye (*okaas*), Lake Sturgeon (*nameh*), and Lake Whitefish (*atikameg*) have all been documented in the Ogoki River as well as several small-bodied forage fish species (e.g., Lake Chub) (MNRF 2023, Government of Ontario 2015, Golder 2013)

In June 2022, fish sampling was conducted by setting three minnow traps for two hours (6 trap-h effort). No fish were captured but a juvenile Northern Pike and multiple unknown dace species were observed (Annex B; Tables B1 to B3).

In August 2022, fish sampling was conducted by backpack electrofishing a 235 m stream section for 1,447 seconds. Three Northern Pike, three Burbot, an unknown dace species, and one Mottled Sculpin were captured (CPUE= 0.55 fish per 100 seconds) (Annex B; Tables B1 to B3).

**Photo 65: The Ogoki River at crossing RA1-WC-11 looking across at crossing location (August 21, 2022).**

**Photo 66: The Ogoki River at crossing RA1-WC-11 looking upstream from crossing location (August 21, 2022).**

**Photo 67: The Ogoki River at crossing RA1-WC-11 looking downstream from crossing location (August 21, 2022).**

**Photo 68: Aerial imagery at the proposed crossing RA1-WC-11 (Project right-of-way in black, flow direction in blue).**

## 3.3.16 Unnamed Watercourse at Crossing RA1-WC-14

Fish and fish habitat assessments were completed on October 19, 2020, June 23, 2022, and August 22, 2022 on the unnamed watercourse at crossing RA1-WC-14 (Photos 69 to 72). The crossing was in deep, flat habitat with organic and silt substrates (Photo 69 and 72). The watercourse was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 70 and 71).

The habitat and stream conditions in both the 2020 and 2022 assessments were comparable and there were no notable differences between assessment years or seasons. The surveyed section had a mean wetted width of 3 m, a mean bank-full width of 3.5 m, and a mean water depth of 1.2 m. Within the surveyed section, fish habitat consisted entirely of deep flats. A beaver dam was noted about 70 m downstream from the crossing in each year surveyed but was not expected to be a barrier to fish movement. Substrates consisted mainly of organics (70%) and silt (30%). Cover for fish was provided by water depth and small amounts of woody debris and undercut banks. The riparian area consisted primarily of grasses and small amounts of shrubs up to 25 m from the banks. Both banks were unstable.

The surveyed section had moderate overwintering potential for small-bodied fish species as average water depths were greater than 1 m, and therefore, not likely to freeze to the bottom. Overwintering, however, was considered low for large-bodied species due to the likelihood of low dissolved oxygen concentrations in winter. Rearing habitat was rated moderate for small-bodied fish and nil to low for large-bodied fish. Potential spawning habitat for small-bodied fish species was rated as moderate and nil for all other large-bodied fish due to lack of suitable substrates and aquatic vegetation.

During the field surveys, water temperature ranged from 2.27 to 19.1°C, conductivity ranged from 61.3 to 85.5 µS/cm, and pH ranged from 6.11 to 6.78 (**Table 3-3**). The dissolved oxygen concentration ranged from 4.02 to 10.90 mg/L, which was below the guideline for the protection of aquatic life (6.5 mg/L) (CCME 1999) during some sampling events.

**Table 3-3: Water quality parameters at proposed crossing RA1-WC-14 in 2020 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| October 19, 2020 | 2.27 | 85.5 | 6.60 | 10.90 |
| June 23, 2022 | 18.4 | 61.3 | 6.11 | 5.75 |
| August 22, 2022 | 19.1 | 84.0 | 6.78 | 4.02 |

During the June 2022 assessment, fish were sampled by backpack electrofishing a 150 m reach for 570 seconds and deploying five minnow traps for three hours (15 trap-h effort). During the August 2022 assessment, fish were sampled by backpack electrofishing a 120 m stream section for 599 seconds. No fish were captured or observed by any method (Annex B; Tables B1 to B3).

**Photo 69: An unnamed watercourse at crossing RA1-WC-14 representing the flat habitat at proposed crossing (October 19, 2020).**

**Photo 70: An unnamed watercourse at crossing RA1-WC-14 looking upstream near the proposed crossing (October 19, 2020).**

**Photo 71: An unnamed watercourse at crossing RA1-WC-14 looking downstream near the proposed crossing (June 23, 2022).**

**Photo 72: Aerial imagery at the proposed crossing RA1-WC-14 (Project right-of-way in black, flow direction in blue).**

## 3.3.17 Unnamed Watercourse at Crossing RA1-WC-16

Fish and fish habitat assessments were completed on June 22, 2022 and August 19, 2022 on the unnamed watercourse at crossing RA1-WC-16 (Photos 73 to 76). The crossing was in a wetland area, and the unnamed watercourse consisted of a deep flat, poorly-defined channel with organic and silt substrates (Photo 73 and 76). The watercourse was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 74 and 75).

The fish habitat conditions at the crossing were comparable between seasons. The surveyed section had a mean wetted width that ranged from 50 m in June to 70 m in August, a mean bank-full width in the channelized portion of 6.5 m in June and 7.0 m in August, and a mean water depth of 1.7 m. Within the surveyed section, fish habitat consisted entirely of flats and was flooded during the surveys. No potential barriers to fish movement were observed. Substrates consisted of organics (100%). Cover for fish was provided by water depth and aquatic vegetation. The riparian area up to 25 m away from the banks was grasses and small amounts of shrubs and coniferous trees.

The surveyed section had moderate overwintering potential for small-bodied fish species as average water depths were greater than 1.7 m, and therefore, the watercourse was not likely to freeze to the bottom in winter. However due to the low dissolved oxygen concentrations in summer (i.e., 3.2 mg/L), overwintering potential could be limited for large-bodied fish. Spawning and rearing habitat potential was high for small-bodied fish (e.g., dace) and Northern Pike due to fine substrates, deep water, and the presence of aquatic vegetation, but low to nil for all large-bodied fish that require coarse substrates for spawning.

In June 2022, water temperature was 19.6°C, conductivity was 53.7 µS/cm, and pH was 6.65. The dissolved oxygen concentration was 5.05 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

In August 2022, water temperature was 19.4°C, conductivity was 68 µS/cm, and pH was 6.23. The dissolved oxygen concentration was 3.24 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

Fish sampling was conducted in June by setting five minnow traps for one hour (5 trap-h effort) and in August by setting six minnow traps for two hours (12 trap-h effort). No fish were captured or observed in either season (Annex B; Tables B1 to B3).

**Photo 73: An unnamed watercourse at crossing RA1-WC-16 looking across the crossing location (August 19, 2022).**

**Photo 74: An unnamed watercourse at crossing RA1-WC-17 looking upstream from crossing location (August 19, 2022).**

**Photo 75: An unnamed watercourse at crossing RA1-WC-16 looking downstream from crossing location (June 22, 2022).**

**Photo 76: Aerial imagery at the proposed crossing RA1-WC-16 (Project right-of-way in black, flow direction in blue).**

## 3.3.18 Unnamed Watercourse at Crossing RA1-WC-17

A fish and fish habitat assessment was completed on August 19, 2022 on the unnamed watercourse at crossing RA1-WC-17 (Photos 77 to 80). The crossing was in moderately deep run habitat with gravel, cobble, boulder, sand, organic, and silt substrates (Photo 77 and 80). The watercourse was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 78 and 79).

The surveyed section had a mean wetted width of 9 m, a mean bank-full width of 10 m, and a mean water depth of 0.9 m. Within the surveyed section, fish habitat consisted

entirely of runs. No barriers to fish passage were observed. Substrates were mainly gravel (25%), sand (20%), silt (20%), cobble (15%), boulder (10%), and organics (10%). Cover for fish was provided by water depths, substrate, aquatic vegetation and small amounts of woody debris, undercut banks, and overhanging vegetation. The riparian area up to 25 m from the banks consisted of shrubs and coniferous trees with small amounts of grasses.

The surveyed section had moderate overwintering potential for small-bodied fish species, as average water depths are slightly approximately 1 m, and therefore, the watercourse was not likely to freeze to the bottom in winter. Rearing habitat was rated moderate for small-bodied fish and low for large-bodied fish. Potential spawning habitat for all fish was low to moderate due to suitable coarse substrates, adequate depths, and the presence of aquatic vegetation.

Water temperature was 18.2°C, conductivity was 101 µS/cm, and pH was 7.43. The dissolved oxygen concentration was 6.5 mg/L, which meets the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was completed by setting six minnow traps for 17 hours (102 trap-h total effort), and backpack electrofishing a 100 m section for 1,000 seconds. One Northern Pike, six Longnose Dace (*Rhinichthys cataractae*), and three Johnny Darter (*Etheostoma nigrum*) were captured by electrofishing (CPUE= 1.0 fish per 100 seconds); no fish were captured in minnow traps (Annex B; Tables B1 to B3).

**Photo 77: An unnamed watercourse at crossing RA1-WC-17 looking across the crossing location (August 19, 2022).**

**Photo 78: An unnamed watercourse at crossing RA1-WC-17 looking upstream from crossing location (August 19, 2022).**

**Photo 79: An unnamed watercourse at crossing RA1-WC-17 looking downstream from crossing location (August 19, 2022).**

**Photo 80: Aerial imagery at the proposed crossing RA1-WC-17 (Project right-of-way in black, flow direction in blue).**

## 3.3.19 Unnamed Watercourse at Crossing RA1-WC-22

A fish and fish habitat assessment was completed on August 20, 2022 on the unnamed watercourse at crossing RA1-WC-22 (Photos 81 to 84). The crossing was in a wetland area where the unnamed watercourse consisted of a moderately deep flat, poorly-defined channel with organic and silt substrates (Photo 81 and 84). The watercourse was surveyed 92 m upstream and 148 m downstream of the proposed crossing (Photo 82 and 83).

The surveyed section had a mean wetted width of 50 m, a mean bank-full width of 17 m within the channelized portion, and a mean water depth of 1.0 m. Within the surveyed section, fish habitat consisted of flats (79%) and an impounded section (21%). A beaver dam was observed; however, it was not likely to be a barrier to fish passage during high flows as water was passing through at the time of survey. Substrates were mainly organics (80%) and silt (20%). Cover for fish was provided by water depths and aquatic vegetation, with small amounts of woody debris. The riparian area up to 25 m from banks was composed of grasses and small amounts of shrubs.

The surveyed section has moderate overwintering potential for small-bodied fish species as average water depths were greater than 1 m, and therefore, the watercourse was not likely to freeze to the bottom in winter. However due to the low dissolved oxygen concentrations measured in summer (i.e., 4.15 mg/L), overwintering potential could be limited for large-bodied fish. Rearing habitat was rated high for small-bodied fish, moderate for Northern Pike, and low for other large-bodied fish. Potential spawning habitat for small-bodied fish species was high for fish that spawn in fine substrates, or use aquatic vegetation and woody debris (e.g., Brook Stickleback), moderate for Northern Pike due to presence of aquatic vegetation, but low to nil for all other large-bodied fish.

Water temperature was 19.5°C, conductivity was 114 µS/cm, and pH was 6.28. The dissolved oxygen concentration was 4.15 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

Fish sampling was conducted by deploying six baited minnow traps for approximately 18 hours each (108 trap-h total effort). Six species of fish were captured, including 14 Common Shiner (*Luxilus cornutus*), six Brook Stickleback, 11 Pearl Dace, 38 Finescale Dace, two Fathead Minnow (*Pimephales promelas*), and two White Sucker (CPUE= 0.67 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 81: An unnamed watercourse at crossing RA1-WC-22 looking across at the proposed crossing (August 20, 2022).**

**Photo 82: An unnamed watercourse at crossing RA1-WC-22 looking upstream near proposed crossing (August 20, 2022).**

**Photo 83: An unnamed watercourse at crossing RA1-WC-22 looking downstream near the proposed crossing (August 20, 2022).**

**Photo 84: Aerial imagery at the proposed crossing RA1-WC-22 (Project right-of-way in black, flow direction in blue).**

## 3.3.20 Unnamed Watercourse at Crossing RA1-WC-23

A fish and fish habitat assessment was completed on September 15, 2021 on the unnamed watercourse at crossing RA1-WC-23 (Photos 85 to 88). The crossing is located 380 m upstream from RA4-WC-27 on the same watercourse (Photo 88). The proposed crossing location was in deep run habitat with mixed substrates of organic and silt (Photo 85 and 88). The watercourse was surveyed 120 m upstream (Photo 86) and 120 m downstream of the proposed crossing (Photo 87).

The surveyed section had a mean wetted width of approximately 90 m, a mean bank-full width of approximately 95 m, and a mean water depth of over 2 m. Within the surveyed section, fish habitat consisted almost entirely of deep run habitat. No barriers to fish movement were observed in the surveyed section. Substrates were mainly silt (70%) and organic (30%). Cover for fish was provided by depth and turbulence and some aquatic vegetation. The riparian area within 3 m of the watercourse was primarily shrubs with some coniferous forest. Beyond 3 m, the riparian area was coniferous forest. Both banks were mainly stable.

The surveyed section had moderate to high overwintering potential for most fish species as the average water depths were greater than 1 m. Rearing habitat potential was moderate to high for most small and large-bodied fish species. There was no spawning habitat potential for fish species such as White Sucker (*namebin*), Brook Trout (*masamekos*), and Walleye (okaas)due to lack of coarse substrates (e.g., gravel, cobble). High quality spawning habitat was available for Northern Pike (*najwabe*), and small-bodied

fish species that spawn in aquatic vegetation and/or fine substrates (e.g., Brook Stickleback).

Water temperature was 11.58°C, conductivity was 94 µS/cm, and pH was 6.73. The dissolved oxygen concentration was 6.98 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying two five baited minnow traps, in clusters of three traps and two traps, for approximately 3 hours (15 trap-h effort). No fish were caught (Annex B; Tables B1 to B3).

**Photo 85: An unnamed watercourse at crossing RA1-WC-23 looking across at the proposed crossing (September 15, 2021).**

**Photo 86: An unnamed watercourse at crossing RA1-WC-23 looking upstream near the proposed crossing (September 15, 2021).**

**Photo 87: An unnamed watercourse at crossing RA1-WC-23 looking downstream near the proposed crossing (September 15, 2021).**

**Photo 88: Aerial imagery at the proposed crossing RA1-WC-23 (Project right-of-way in black, flow direction in blue).**

## 3.3.21 Unnamed Watercourse at Crossing RA1-WC-26

A fish habitat assessment was completed on October 20, 2020, on an unnamed watercourse at crossing RA1-WC-26 (Photos 89 to 92). The proposed crossing was in flat habitat with mixed substrates of organics (90%) and silt (10%) (Photo 89 and 92). The watercourse was assessed from approximately 65 m upstream of the proposed crossing (Photo 90) to 80 m downstream of the crossing (Photo 91). The channel was braided with two distinct channels intersecting with the crossing. The unnamed watercourse was also assessed by rapid survey from a helicopter on June 24, 2022, as no suitable landing location was found in spring conditions.

The overall fish habitat conditions were comparable between those observed during the rapid aerial assessment and detailed ground assessment. The proposed crossing was moderately flooded, had a wetted width of approximately 1.25 m, a bank-full width of approximately 2 m, and a mean water depth of approximately 0.15 m deep. Cover for fish was provided by woody debris, overhanging vegetation, and undercut banks. The riparian vegetation was coniferous forest with small amounts of shrubs. Both banks were soft and unstable.

The surveyed section was shallow; therefore, overwintering potential for all species is nil due to the likelihood of the watercourse freezing to bottom in winter. Spawning and rearing habitat potential was low for small-bodied forage species and nil for all other fish species due to shallow depths and fine substrates.

Water temperature was 1.08°C, conductivity was 53.10 µS/cm, and pH was 6.25. The dissolved oxygen concentration was 10.41 mg/L, which was above the guideline for the protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window.

**Photo 89: An unnamed watercourse at crossing RA1-WC-26 looking at the proposed crossing location (October 20, 2020).**

**Photo 90: An unnamed watercourse at crossing RA1-WC-26 looking upstream near the proposed crossing (October 20, 2020).**

**Photo 91: An unnamed watercourse at crossing RA1-WC-26 looking downstream near the proposed crossing (October 20, 2020).**

**Photo 92: Aerial imagery at the proposed crossing RA1-WC-26 (Project right-of-way in black, flow direction in blue).**

## 3.3.22 Albany River at Crossing RA1-WC-27

A fish and fish habitat assessment was completed on October 24, 2020 on the Albany River at crossing RA1-WC-27 (Photos 93 to 96). The proposed crossing was in deep run habitat with boulder and cobble substrates (Photo 93 and 96). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 94) to 120 m downstream of the proposed crossing (Photo 95).

The surveyed reach had a mean wetted width of approximately 180 m and a mean bank-full width of 200 m and a mean water depth exceeding 1 m throughout most of the surveyed section. Habitat in the surveyed section consisted of deep runs (92%) and rapids (8%) and bed substrates were boulder (70%), cobble (25%), and bedrock (5%). No barriers to fish movement were observed. Cover for fish was provided by water depth and boulders. The riparian vegetation within 3 m of the watercourse was primarily shrubs with some coniferous forest. Beyond 3 m, the riparian vegetation was coniferous forest. Both banks were stable.

The surveyed section had high overwintering potential for all fish species as the average water depths were greater than 1 m. Spawning and rearing habitat potential was moderate to high for small and large-bodied fish species, including Lake Sturgeon (*nameh*), which spawn over rocky substrates in fast flowing rapids. An unknown mussel species was found at the crossing.

Water temperature was 2.3°C, and pH was 8.18. The dissolved oxygen concentration was 14.41 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for fish.

The fish community in the Albany River is well documented; therefore, fishing effort for the Project was minimal. Large-bodied fish including Brook Trout *, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Albany River as well as several small-bodied forage fish species (e.g., Lake Chub, Brook Stickleback) (MNRF 2023, Government of Ontario 2015, Golder 2013). Locations for Speckled Trout (i.e., Brook Trout) fishing and Lake Sturgeon spawning were identified in the Albany River within 1 km of the crossing location (MFFN 2019). Brook trout ([*masamekos*]*;* spawning locations were identified above Kagiai Falls and Lake Sturgeon [nameh] spawning below Kagai Falls. Pickerel (i.e., walleye [*okass*]) and Northern Pike [najwabe] also occupy these areas (MFFN 2021).

Fish sampling was conducted in the Albany River at another crossing location (RA4-WC-34) in September 2021 (**Section 3.3.48**). Two sets of minnow traps (one set with three traps and the second set with two traps) for two hours (10 trap-h total effort). No fish were captured (Annex B; Tables B1 to B3).

**Photo 93: The Albany River at crossing RA1-WC-27 representing run habitat at the proposed crossing (October 24, 2020).**

**Photo 94: The Albany River at crossing RA1-WC-27 looking upstream near the proposed crossing (October 24, 2020).**

**Photo 95: The Albany River at crossing RA1-WC-27 looking downstream near the proposed crossing (October 24, 2020).**

**Photo 96: Aerial imagery at the proposed crossing RA1-WC-27 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.23 Unnamed Watercourse at Crossing RA1-WC-28

Fish habitat assessments were completed on October 24, 2020, June 24, and August 21, 2022 on the unnamed watercourse at crossing RA1-WC-28 (Photos 97 to 100). The proposed crossing was in a shallow run habitat, with mixed substrates of organic, boulder, and sand (Photo 97 and 100). The watercourse was assessed from approximately 80 m upstream of the proposed crossing (Photo 98) to approximately 160 m downstream of the crossing (Photo 99).

During the 2020 assessment, the surveyed section had a mean wetted width of 2 m, a mean bank-full width of 2.5 m, and a mean water depth of 0.3 m. Habitat in the surveyed section consisted shallow runs and shallow pools. Substrates consisted of organics (90%), with small amounts of sand (5%) and boulders (5%). Cover for fish was provided by woody debris, overhanding vegetation, and undercut banks. Some old beaver dams were noted but are not considered to be a potential barrier to fish. The riparian area up to 25 m from the banks consisted of grasses and shrubs.

The fish habitat observed in the 2020 and 2022 assessments was similar. However, in 2022, the average water depths were 0.4 m and the habitat was classified as moderately deep run habitat.

The reach had low overwintering potential for most fish species as average water depths were under 1 m and the watercourse is likely to freeze to the bottom in winter. Rearing and spawning habitat potential was moderate for small-bodied fish and low to nil for large-bodied species such as Walleye (*okaas*) or Brook Trout (*masamekos*) due to the absence of suitable coarse substrates and low water depths.

During the field surveys, water temperature ranged from 0.01 to 13.77°C, conductivity ranged from 38.7 to 54.0 µS/cm, and pH ranged from 5.31 to 6.27 (**Table 3-4)**. The dissolved oxygen concentration ranged from 6.65 to 11.20 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

**Table 3-4: Water quality parameters at proposed crossing RA1-WC-28 in 2020 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| October 24, 2020 | 0.01 | 42.6 | 6.27 | 11.20 |
| June 24, 2022 | 10.4 | 38.7 | 5.31 | 7.28 |
| August 21, 2022 | 13.77 | 54.0 | 5.50 | 6.65 |

Fish sampling was completed in June 2022 by backpack electrofishing a 135 m stream section for 460 seconds and setting five minnow traps for two hours (10 trap-h total effort). No fish were captured or observed. Backpack electrofishing was completed in August 2022 over a 200 m section for 627 seconds. No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 97: An unnamed watercourse at crossing RA1-WC-28 looking at the proposed crossing location (October 24, 2020).**

**Photo 98: An unnamed watercourse at crossing RA1-WC-28 looking upstream near the proposed crossing (October 24, 2020).**

**Photo 99: An unnamed watercourse at crossing RA1-WC-28 looking downstream near the proposed crossing (June 24, 2022).**

**Photo 100: Aerial imagery at the proposed crossing RA1-WC-28 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.24 Unnamed Watercourse at Crossing RA1-WC-30

A fish and fish habitat assessment was completed on August 22, 2022 on the unnamed watercourse at crossing RA1-WC-30 (Photos 101 to 104). The unnamed watercourse is a tributary to Saarimaki Lake, located approximately 1.8 km upstream from the crossing. The crossing was in moderately deep flat habitat with organic, sand, and boulder substrates (Photos 101 and 104). The reach was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 102 and 103). The unnamed watercourse was also assessed by rapid aerial survey from a helicopter on October 24, 2020, as the crew was unable to find a suitable, safe landing location.

The overall fish habitat conditions were comparable between the rapid aerial assessment and detailed ground assessment. In August 2022, the surveyed section had a mean flooded wetted width of 40 m, a mean bank-full width of 3.25 m in the channelized portion, and a mean water depth of 0.75 m. The surveyed section was flooded, and fish habitat consisted entirely of flats. No barriers to fish passage were observed in the surveyed section. Substrates consisted of sand (55%) and organics (40%) with small amounts of boulder (5%). Cover for fish was provided by water depths and aquatic vegetation with small amounts of woody debris, boulder, and overhanging vegetation. The riparian area up to 25 m away from the banks consisted of grasses and small amounts of shrubs.

The surveyed section has low to moderate overwintering potential for small-bodied fish species as average water depths were greater than 0.75 m, and therefore, not likely to freeze to the bottom, however, overwintering potential would be low for large-bodied fish. Spawning and rearing habitat potential was moderate to high for small-bodied fish and

Northern Pike due to sandy substrates and aquatic vegetation, but low to nil for all other species that spawn over coarse substrates.

Water temperature was 17.86°C, conductivity was 40 µS/cm, and pH was 5.24. The dissolved oxygen concentration was 9.89 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by setting two clusters of three minnow traps for six hours each set (36 trap-h total effort). One juvenile Northern Pike was captured (CPUE= 0.04 fish per trap-h). Backpack electrofishing was conducting over a 160 m stream section for 808 seconds. No fish were captured or observed by electrofishing (Annex B; Tables B1 to B3).

**Photo 101: An unnamed watercourse at crossing RA1-WC-30 looking across the crossing location (August 22, 2022).**

**Photo 102: An unnamed watercourse at crossing RA1-WC-30 looking upstream from crossing location (August 22, 2022).**

**Photo 103: An unnamed watercourse at crossing RA1-WC-30 looking downstream from crossing location (August 22, 2022).**

**Photo 104: Aerial imagery at the proposed crossing RA1-WC-30 (Project right-of-way in black, flow direction in blue).**

## 3.3.25 Unnamed Watercourse at Crossing RA1-WC-32

Fish and fish habitat assessments were completed on June 25, 2022, and 21 August 2022 at the unnamed watercourse at crossing RA1-WC-32 (Photos 105 to 108). The crossing was in deep, flooded, flat habitat with organic substrates within a wetland (Photo 105 and 108). The reach was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 106 and 107).

The overall fish habitat conditions were comparable between seasons. The surveyed section was flooded, and had a mean wetted width of approximately 90 m in flooded sections, a mean bank-full width of 6.0 m within the channelized portion, and a mean water depth of 1.2 m. Within the surveyed section, fish habitat consisted entirely of flats. No barriers to fish passage were noted in the surveyed reach. Substrates were organics (100%). Cover for fish was provided by water depths and aquatic vegetation with small amounts of woody debris and overhanging vegetation. The riparian area up to 25 m from the bankers were grasses and small amounts of shrubs. Both banks had low stability.

The surveyed section has moderate overwintering potential for small-bodied fish species as average water depths were greater than 1 m throughout the reach but low for large-bodied fish due to low dissolved oxygen concentrations. Spawning and rearing habitat potential was rated moderate for small-bodied fish and Northern Pike due to the presence of aquatic vegetation and suitable depths. Spawning potential for all other large-bodied fish were nil due to lack of coarse substrates.

In August 2022, water temperature was 17.08°C, conductivity was 49 µS/cm, and pH was 5.68. The dissolved oxygen concentration was 4.55 mg/L. In June 2022, water temperature was 16.8°C, conductivity was 31.4 µS/cm, and pH was 5.71. The dissolved oxygen concentration was 3.99 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

Fish sampling was completed in June by setting four minnow traps for two hours (8 trap-h effort). No fish were captured. In August, fishing effort was completed by setting two minnow traps for 2 hours (4 trap-h effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 105: An unnamed watercourse at crossing RA1-WC-32 looking across the crossing location (21 August 2022).**

**Photo 106: An unnamed watercourse at crossing RA1-WC-32 looking upstream from crossing location (21 August 2022).**

**Photo 107: An unnamed watercourse at crossing RA1-WC-32 looking downstream from crossing location (June 25, 2022).**

**Photo 108: Aerial imagery at the proposed crossing RA1-WC-32 (Project right-of-way in black, flow direction in blue).**

## 3.3.26 Unnamed Watercourse at Crossing RA1-WC-41

A fish and fish habitat assessment was completed on August 23, 2022 on Nihgiko' Ziibih (Oji-Cree name)/Otter Creek (local name)/unnamed watercourse at crossing RA1-WC-41 (Photos 109 to 112), a tributary to Gourlie Creek. The proposed crossing location was in a wetland area with a moderately deep flat, moderately-defined channel with organic and sand substrates with small amounts of boulders (Photos 109 and 112). The watercourse was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 110 and 111).

The surveyed section had a mean wetted width of 4.0 m, a mean bank-full width of 4.25 m, and a mean water depth of 1.1 m. Within the surveyed section, fish habitat consisted entirely of flats. No barriers to fish passage were observed at the time of the assessment. Substrates were mainly organics (65%) and silt (30%) with small amounts of boulders (5%). Cover for fish was provided by water depth and aquatic vegetation with small amounts of overhanging vegetation, boulder, and undercut banks. The riparian area up to 25 m from the banks was composed of grasses and small amounts of shrubs within a wetland.

The surveyed section had moderate overwintering potential for small and large-bodied fish species as average water depths were greater than 1 m and therefore not likely to freeze to the bottom. Potential spawning and rearing habitat potential was moderate for small-bodied fish species Northern Pike due to the presence of aquatic vegetation, but low to nil for all other large-bodied species due to a lack of coarse substrates. Locations for Speckled Trout (i.e., Brook Trout) fishing were identified in Gourlie Creek, approximately 960 m downstream from the crossing location (MFFN 2019).

Water temperature was 17.62°C, conductivity was 49 µS/cm, and pH was 6.04. The dissolved oxygen concentration was 8.17 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by setting two clusters of three baited minnow traps for approximately 2 hours (11 trap-h effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 109: An unnamed watercourse at crossing RA1-WC-41 looking across the crossing location (August 23, 2022).**

**Photo 110: An unnamed watercourse at crossing RA1-WC-41 looking upstream from crossing location (August 23, 2022).**

**Photo 111: An unnamed watercourse at crossing RA1-WC-41 looking downstream from crossing location (August 23, 2022).**

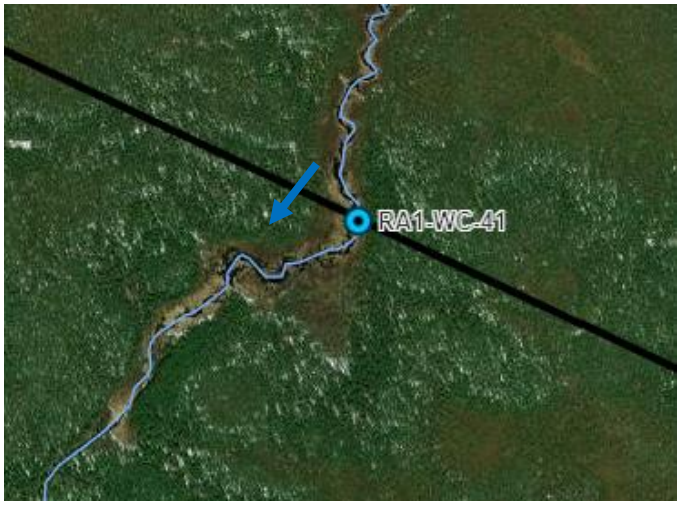


**Photo 112: Aerial imagery at the proposed crossing RA1-WC-41 (Project right-of-way in black, flow direction in blue).**

## 3.3.27 Wabassi River at Crossing RA1-WC-51

A fish and fish habitat assessment was completed on August 26, 2022 on the Wabassi River at crossing RA1-WC-51 (Photos 113 to 116). The crossing was in deep flat habitat. Bed substrates consisted of silts and organics (Photos 113 and 116). The reach was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 114 and 115). The Wabassi River was also assessed by rapid survey from a helicopter on

June 28, 2022, as there was no suitable landing location within 500 m of the crossing in spring conditions.

The overall fish habitat conditions were comparable between the rapid aerial assessment and detailed ground assessment. In August 2022, the surveyed section had a mean wetted width of 60 m, a mean bank-full width of 65 m, and a mean water depth of greater than 1.5 m. Within the surveyed section, fish habitat consisted entirely of flats. No barriers to fish passage were noted at the time of the assessment. Substrates consisted of silt (50%) and organics (50%). Cover for fish was provided by water depth and small amounts of aquatic vegetation. The riparian area was primarily composed of grasses and shrubs within 3 m of the banks, and with coniferous forest greater than 3 m from the watercourse edge.

The surveyed section has moderate to high overwintering potential for all fish species as average water depths were greater than 1 m, and therefore, not likely to freeze to the bottom in winter. Spawning and rearing habitat potential was high for small-bodied fish and Northern Pike due to the presence of fine substrates and aquatic vegetation. Spawning habitat potential for other large-bodied fish species was considered likely to be low, due to the lack of coarse substrate observed. However, the Wabassi River is a large permanent watercourse with heterogenous fish habitat. It is likely to be occupied by Brook Trout (*masamekos*), Northern Pike (*najwabe*), Walleye (*okaas*), sucker species (*namebin*), and a variety of small-bodied forage species near the proposed crossing location.

Water temperature in August was 16.36°C, conductivity was 123 µS/cm, and pH was 6.09. The dissolved oxygen concentration was 8.34 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by setting two clusters of three minnow traps for 2 to 2.5 hours (13.70 trap-h total effort). No fish were observed or captured (Annex B; Tables B1 to B3).

**Photo 113: An unnamed watercourse at crossing RA1-WC-51 (Wabassi River) looking across the crossing location (June 28, 2022).**

**Photo 114: An unnamed watercourse at crossing RA1-WC-51 (Wabassi River) looking upstream from crossing location (August 26, 2022).**

**Photo 115: An unnamed watercourse at crossing RA1-WC-51 (Wabassi River) looking downstream from crossing location (August 26, 2022).**

**Photo 116: Aerial imagery at the proposed crossing RA1-WC-51 (Wabassi River) (Project right-of-way in black, flow direction in blue).**

## 3.3.28 Unnamed Watercourse at Crossing RA1-WC-52

A fish habitat assessment was completed on October 17, 2020 on the unnamed watercourse at crossing RA1-WC-52 (Photos 117 to 120), over approximately 50 m. The surveyed section was within a low-lying wetland with a number of poorly-defined, diffuse flow channels, with sections of impoundments and pools. The channelized portions were in flat habitat with organic substrates (Photo 117 and 120). An aerial rapid fish habitat assessment was also completed on June 28, 2022.

The surveyed section had an estimated mean wetted width of approximately of less than 1 m in the defined portions and 40 m in the impounded sections, with an estimated mean water depth of 0.12 m. Cover for fish was provided by woody debris, overhanging vegetation, and some aquatic vegetation. The riparian area was composed of shrubs and coniferous forest (Photo 118 and 119).

The surveyed section provides no overwintering habitat for fish due to mean water depths below 1 m. There was no potential spawning or rearing habitat for fish species that spawn over coarse substrates (e.g., Walleye [*okaas*] or Brook Trout [*masamekos*]) and but low for Northern Pike due to the presence of aquatic vegetation. Spawning and rearing habitat potential was low to moderate for small-bodied forage fish due to the organic substrates and presence of woody debris.

Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window.

**Photo 117: An unnamed watercourse at RA1-WC-52 crossing looking upstream near the proposed crossing location (June 28, 2022).**

**Photo 118: An unnamed watercourse at crossing RA1-WC-52 looking across at the proposed crossing location (October 17, 2020).**

**Photo 119: An unnamed watercourse at crossing RA1-WC-52 looking downstream near the proposed crossing location (October 17, 2020).**

**Photo 120: Aerial imagery at the proposed crossing RA1-WC-52 (Project right-of-way in black, flow direction in blue).**

## 3.3.29 Unnamed Watercourse at Crossing RA1-WC-57

Fish and fish habitat assessments were completed on September 10, 2019 and October 20, 2020 on the unnamed watercourse at crossing RA1-WC-57 (Photos 121 to 124), a tributary to Oxtoby Lake. The proposed crossing was in flat habitat with mixed substrates of silt (40%), sand (30%), and organics (30%) (Photo 121 and 124). The watercourse was assessed from 100 m upstream of the proposed crossing (Photo 122) to 200 m downstream of the crossing (Photo 123).

During the 2019 assessment, the surveyed section had a mean wetted width of 13.6 m, a mean bank-full width of 31.6 m, and a mean bank-full depth greater than 1.2 m. Within the surveyed section, fish habitat consisted entirely of flat habitat. Bed substrates consisted of silt (40%) and sand (30%) covered by organic matter (30%). Cover for fish was provided by water depth, aquatic vegetation, woody debris, overhanging vegetation, and undercut banks. No barriers to fish movement were observed. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs mixed with shrubs and willows. Beyond 3 m, the riparian vegetation was coniferous forest with some shrubs and willows. Both banks were moderately stable and fully vegetated with grasses and forbs.

The fish habitat conditions observed during the 2020 assessment varied slightly from those of the 2019 assessment. In October 2020, the surveyed section was wider and deeper. The mean wetted width was 22 m, mean bank-full width was 26 m, and mean water depth

was greater than 2.0 m. Bed substrates were similar to 2019 and consisted of organics (80%) and silt (20%).

The surveyed section had moderate overwintering potential for fish as average water depths were greater than 1 m and the watercourse was unlikely to freeze to bottom in winter. The watercourse drains into Oxtoby Lake and is likely used by a variety of fish species for as a corridor for feeding and spawning. Rearing habitat potential was moderate for both small and large-bodied species. Spawning habitat potential was low for species that spawn over coarse substrates (e.g., Walleye [*okaas*], Brook Trout [*masamekos*], and White Sucker [*namebin*]), but high for Northern Pike [najwabe] and small-bodied fish species due to the presence of fine substrates and aquatic vegetation.

Water temperature in 2019 was 10.6°C, conductivity was 54.1 µS/cm, and pH was 7.3. The dissolved oxygen concentration was 7.9 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. No water quality parameters were collected in 2020.

Fish sampling was conducted in September 2019 by deploying three baited minnow traps for approximately two hours (6.8 trap-h total effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 121: An unnamed watercourse at crossing RA1-WC-57 near the proposed crossing (October 20, 2020).**

**Photo 122: An unnamed watercourse at crossing RA1-WC-57 looking upstream near the proposed crossing (September 10, 2019).**

**Photo 123: An unnamed watercourse at crossing RA1-WC-57 looking downstream near the proposed crossing (October 20, 2020).**

**Photo 124: Aerial imagery at the proposed crossing RA1-WC-57 (Project right-of-way in black and flow direction arrow in blue). Oxtoby Lake is located to the southeast of the crossing.**

## 3.3.30 Unnamed Watercourse at Crossing RA1-WC-66

Fish and fish habitat assessments were completed on October 20, 2020 and June 30, 2022 at an unnamed watercourse at crossing RA1-WC-66 (Photos 125 to 130), a tributary to the Wabassi River. The proposed crossing was in moderately deep flat habitat with organic and silt substrates (Photo 125 and 130). The watercourse was assessed from 130 m upstream of the proposed crossing (Photo 126) to 120 m downstream of the crossing (Photo 127 and 129).

During the 2020 assessment, the surveyed section had a mean wetted width of 9 m, a mean bank-full width of 17 m, and a mean depth of 0.8 m. Within the surveyed section, habitat consisted of flat habitat with bed substrates composed of silt (90%) and organics (10%). Cover for fish was provided by aquatic vegetation, woody debris, and overhanging vegetation. A beaver dam was observed 90 m upstream from the proposed crossing and posed a potential barrier to fish passage. The dam was 50 m long, 0.6 m wide, and approximately 3.4 m high (Photo 128). The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs mixed with shrubs. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some shrubs and grasses.

During the 2022 assessment, the mean wetted width at the crossing location was 105 m, the mean bank-full width was 5 m, and the mean depth was 1.1 m. The difference in wetted width was due to the watercourse being flooded at the time of survey in spring 2022, as well as the presence of an additional three beaver dams throughout the surveyed

section. Bottom substrates were organics (100%). All other parameters were similar between assessment years.

The surveyed section had low overwintering potential for large-bodied species and moderate for small-bodied species due to water depths and vegetation throughout. There was high spawning and rearing habitat potential for Northern Pike due to the presence of aquatic vegetation and for small-bodied fish species, but none for large-bodied species that require coarse substrates.

Water temperature in October 2020 was 0.5°C, conductivity was 25.6 µS/cm, and pH was 6.33. The dissolved oxygen concentration was 10.28 mg/L. In June 2022, water temperature was 13.9°C, conductivity was 35.0 µS/cm, and pH was 6.27. The dissolved oxygen concentration was 2.48 mg/L which is below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999). The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was completed in June 2022 by setting 10 minnow traps throughout the section for three hours (30 trap-h effort). Six Brook Stickleback and one Finescale Dace were captured (CPUE= 0.23 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 125: An unnamed watercourse at crossing RA1-WC-66 looking across at the proposed crossing (October 20, 2020).**

**Photo 126: An unnamed watercourse at crossing RA1-WC-66 looking upstream near the proposed crossing (October 20, 2020).**

**Photo 127: An unnamed watercourse at crossing RA1-WC-66 looking downstream near the proposed crossing (October 20, 2020).**

**Photo 128: An unnamed watercourse at crossing RA1-WC-66 looking across at a beaver dam 90 m upstream from the proposed crossing RA1-WC-66 (October 20, 2020).**

**Photo 129: An unnamed watercourse at crossing RA1-WC-66 looking downstream near the proposed crossing (June 30, 2022).**

**Photo 130: Aerial imagery at the proposed crossing RA1-WC-66 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.31 Unnamed Watercourse at Crossing RA1-WC-67

Fish and fish habitat assessments were completed on September 18, 2021 and June 30, 2022 at the unnamed watercourse at crossing RA1-WC-67 (Photos 131 to 134). The proposed crossing was in moderately deep habitat with silt substrates (Photo 131 and 134). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 132) to 120 m downstream of the crossing (Photo 133).

During the 2021 assessment, the surveyed section had a mean wetted width of 18 m, a mean bank-full width of 22 m, and a mean water depth of 1.1 m. Within the surveyed section, fish habitat consisted entirely of flat habitat with silt substrates (100%). Cover for fish was provided by depth, aquatic vegetation, woody debris, and overhanging vegetation. No barriers to fish movement were observed. The riparian vegetation within 3 m of the watercourse consisted of shrubs and coniferous forest. Beyond 3 m, the riparian vegetation was primarily coniferous forest. Both banks were stable. The fish habitat conditions were comparable between the 2021 and 2022 assessments.

The surveyed section had moderate overwintering potential for most large and small-bodied species due to water depth greater than 1 m and potential for adequate dissolved oxygen concentrations. Spawning habitat was nil for most large-bodied species except for Northern Pike, due to the presence of aquatic vegetation but lack of coarse substrates. Spawning and rearing was high for small-bodied forage species that spawn in organic substrates and woody debris (e.g., Brook Stickleback, Finescale Dace).

Water temperature in September 2021 was 11.70°C, conductivity was 51 µS/cm, and pH was 6.57. The dissolved oxygen concentration was 6.91 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. No water quality parameters were collected in 2022.

Fish sampling was completed in June 2022 by setting 10 minnow traps for three hours (30 trap-h total effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 131: An unnamed watercourse at crossing RA1-WC-67 looking across at the proposed crossing location (June 30, 2022).**

**Photo 132: An unnamed watercourse at crossing RA1-WC-67 looking upstream from the proposed crossing (September 18, 2021).**

**Photo 133: An unnamed watercourse at crossing RA1-WC-67 looking downstream from the proposed crossing (September 18, 2021).**

**Photo 134: Aerial imagery at the proposed crossing RA1-WC-67 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.32 Unnamed Watercourse at Crossing RA4-WC-00

Fish and fish habitat assessments were completed on June 24, 2022, and August 25, 2022, on the unnamed watercourse at crossing RA4-WC-00 (Photos 135 to 138). The proposed crossing location was in flat habitat with organic and silt substrates (Photo 135 and 138). The watercourse flows into Crony Lake, approximately 3.7 km downstream from the crossing. The watercourse was surveyed 45 m upstream and 190 m downstream of the proposed crossing (Photo 136 and 137).

The surveyed section had a mean wetted width of 3.5 m, a mean bank-full width of 4.0 m, and a mean water depth of 0.8 m. Within the surveyed section, fish habitat consisted of runs (66%), impoundment (26%), and pools (8%). No barriers to fish passage were observed. Substrates consisted of organics (80%) and silt (20%); however, in the pool areas, substrates were organic (30%), silt (30%), sand (20%), and gravel (20%). Cover for fish was provided by woody debris, aquatic vegetation, and depth. The riparian area consisted of bog wetland with grasses and shrubs, with some coniferous forest up to 25 m away.

The downstream impoundment, where average water depths were 2.5 m, had moderate overwintering potential for small-bodied, low-oxygen tolerant fish species (e.g., Brook Stickleback), but low oxygen concentrations could preclude the impoundment from overwintering large-bodied fish. Spawning and rearing habitat potential was moderate for small-bodied fish and low for Northern Pike due to presence of organic substrates, aquatic vegetation, and deeper water. Spawning was nil for other large-bodied fish due to limited suitable coarse substrates.

Water temperature in June was 14.8°C, conductivity was 71.3 µS/cm, and pH was 6.73. The dissolved oxygen concentration was 2.47 mg/L which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999). In August, water temperature was 12.1°C, conductivity was 101 µS/cm, and pH was 6.68. The dissolved oxygen concentration was 8.21 mg/L which was ranged above the guideline (CCME 1999).

Fish sampling in June 2022 was conducted by setting five minnow traps approximately 1.5 hours (7.3 trap-h total effort) and backpack electrofishing a 120 m section for 532 seconds. Six Brook Stickleback were captured in minnow traps (CPUE = 0.82 fish per trap-h) and two Brook Stickleback by electrofishing (CPUE = 0.38 fish per 100 seconds).

In August 2022, fish sampling was conducted by setting six minnow traps for approximately four hours (26.7 trap-h total effort) and backpack electrofishing a 125 m section for 769 seconds. One Brook Stickleback and two Iowa Darters (*Etheostoma exile*) were captured in minnow traps (CPUE = 0.11 fish per trap-h) and 61 Brook Stickleback and six Iowa Darters were captured by electrofishing (CPUE = 8.71 fish per 100 seconds) (Annex B; Tables B1 to B3).

**Photo 135: An unnamed watercourse at crossing RA4-WC-00 looking across at the proposed crossing location (June 24, 2022).**

**Photo 136: An unnamed watercourse at crossing RA4-WC-00 looking upstream from the proposed crossing location (June 24, 2022).**

**Photo 137: An unnamed watercourse at crossing RA4-WC-00 looking downstream from the proposed crossing (August 25, 2022).**

**Photo 138: Aerial imagery at the proposed crossing RA4-WC-00 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.33 Ogoki River at Crossing RA4B-WC-01

A fish habitat assessment was completed on October 15, 2020 on the Ogoki River at crossing RA4B-WC-01 (Photos 139 to 142). The proposed crossing was in a high quality, deep run habitat with cobble, boulder, gravel, sand, and silt substrates (Photo 139 and 142). The watercourse was assessed from 110 m upstream of the proposed crossing (Photo 140) to 110 m downstream of the proposed crossing (Photo 141).

The surveyed section had a mean wetted width of 80 m and a mean bank-full width of 110 m. Water depth exceeded 2 m throughout most of the section. Habitat consisted entirely of runs (100%) and bed substrates were cobble (40%), boulder (30%), gravel (10%), sand (10%), and silt (10%). Cover for fish was provided by water depth and aquatic vegetation. No barriers to fish movement were observed. The riparian vegetation within 3 m of the watercourse was primarily grasses and forbs. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some grasses and shrubs. Both banks were stable.

The surveyed section had high overwintering potential for all species as the average water depths were greater than 1 m. Rearing and spawning habitat potential was high for all species due presence of suitable substrates, high dissolved oxygen concentrations, presence of aquatic vegetation, and suitable water depths.

Water temperature was -2°C, conductivity was 65 µS/cm, and pH was 5.93. The dissolved oxygen concentration was 11.75 mg/L, which was above the guideline for protection of

aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window. However, the fish community in the Ogoki River is well documented. Large-bodied fish including Brook Trout [*masamekos*], Northern Pike [*najwabe*], Walleye [*okaas*], Lake Sturgeon [*nameh*], and Lake Whitefish [*atikameg*] have all been documented in the Ogoki River, as well as several small-bodied forage fish species (e.g., Lake Chub) (MNRF 2023, Government of Ontario 2015, Golder 2013). Lake Sturgeon have also been targeted by local Indigenous communities in the Ogoki River. Net set locations (likely those for Lake Sturgeon) were identified in Patience Lake, a lentic section of the Ogoki River, approximately 3.5 km east of the crossing (MFFN 2019, 2021).

Fish sampling was conducted in the Ogoki River at another crossing location (RA1-WC-11) in June and August 2022 (**Section 3.3.15**). Three Northern Pike, three Burbot, an unknown dace species, and one Mottled Sculpin were captured. Another juvenile Northern Pike and multiple unknown dace species were observed (Annex B; Tables B1 to B3).

**Photo 139: The Ogoki River at crossing RA4B-WC-01 looking across at proposed crossing (October 15, 2020).**

**Photo 140: The Ogoki River at crossing RA4B-WC-01 looking upstream near the proposed crossing (October 15, 2020).**

**Photo 141: The Ogoki River at crossing RA4B-WC-01 looking downstream near the proposed crossing (October 15, 2020).**

**Photo 142: Aerial imagery at the proposed crossing RA4B-WC-01 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.34 Unnamed Watercourse at Crossing RA4B-WC-02

A fish and fish habitat assessment was completed on August 23, 2022 on the unnamed watercourse at crossing RA4B-WC-02 (Photos 143 to 146). The proposed crossing was in moderately deep flat habitat with organic substrates (Photo 143 and 146). The watercourse flows into McCaw Lake to the north. The watercourse was assessed from the proposed crossing location (Photo 144) to 240 m downstream of the proposed crossing (Photo 145). The unnamed watercourse was also assessed by rapid survey from a helicopter on June 25, 2022, as there was no suitable landing location within 500 m of the crossing in spring conditions.

The overall fish habitat conditions were comparable between the rapid aerial assessment and detailed ground assessment. In August 2022, the surveyed section had a mean wetted width of 2.2 m, a mean bank-full width of 2.4 m, and a mean water depth of 0.6 m. Habitat in the surveyed section consisted entirely of flats (90%) and impoundments (10%) with bed substrates of organics (100%). A beaver dam that was approximately 1.2 m wide was observed downstream from the crossing location; however, this was not likely a barrier to fish passage. Cover for fish was provided by water depth, aquatic vegetation, and woody debris with some overhanging vegetation and undercut banks scattered throughout. The riparian vegetation within 3 m of the watercourse was primarily grasses and forbs with shrubs. Beyond 3 m, the riparian vegetation was primarily shrubs with some grasses and coniferous forest.

The surveyed section had no overwintering potential for all species as the average water depth was less than 1 m and the channel is likely to freeze to bottom. Spawning and

rearing habitat potential was low for small-bodied fish, Yellow Perch (*oji-cree name*; ajaawes) (due to woody organic debris and substrates), and Northern Pike (*oji-cree name*: najwabe) (due to presence of aquatic vegetation), but nil for all other fish species due to lack of coarse substrates.

Water temperature was 17.1 °C, conductivity was 38 µS/cm, and pH was 6.69. The dissolved oxygen concentration was 8.58 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was conducted by setting six minnow traps for approximately 1.5 hours (9.45 trap-h effort) and by backpack by electrofishing a 100 m reach for 278 seconds. No fish were captured or observed by either method (Annex B; Tables B1 to B3).

**Photo 143: An unnamed watercourse at crossing RA4B-WC-02 looking across at the proposed crossing (August 23, 2022).**

**Photo 144: An unnamed watercourse at crossing RA4B-WC-02 looking upstream near the proposed crossing (August 23, 2022).**

**Photo 145: An unnamed watercourse at crossing RA4B-WC-02 looking downstream from the proposed crossing (August 23, 2022).**

**Photo 146: Aerial imagery at the proposed crossing RA4B-WC-02 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.35 Colpitts Creek at Crossing RA4-WC-02

A fish and fish habitat assessment was completed on September 17, 2021 on Colpitts Creek at the proposed crossing location for RA4-WC-02 (Photos 147 to 150). The proposed crossing was in moderately deep flat habitat with mixed silt and boulder substrates (Photo 147 and 150). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 148) to 120 m downstream of the crossing (Photo 149). However, the preferred route right-of-way was re-routed (i.e., Rev03) after the field survey was completed on September 17, 2021, and the crossing location was moved 155 m downstream of the surveyed location. The updated crossing location for RA4-WC-02 was assessed on June 21, 2022 (Photos 151-154). The new proposed crossing location was in deep flat habitat with organic, silt, and boulder substrates (151 and 154). The watercourse was assessed for 250 m downstream of the new crossing location (Photo 152 and 153) and was not assessed upstream due to overlap with the 2021 assessment.

During the 2021 assessment, the surveyed section (approximately 155 m upstream of the currently proposed crossing location) had a mean wetted width of 12 m, a mean bank-full width of 13 m, and a mean water depth of 1.0 m. Fish habitat consisted entirely of a flat habitat. Bed substrates consisted of silt (95%) and boulders (5%). Cover for fish was provided by aquatic vegetation, woody debris, substrates, water depth and turbulence, undercut banks, and overhanging vegetation. No barriers to fish movement were observed in the surveyed section. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs mixed with shrubs. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some shrubs. Bot banks were stable.

During the 2022 assessment, the fish and fish habitat was generally similar to the originally surveyed section, but with deeper water. The watercourse had a mean wetted width of 10 m, a mean bank-full width of 11 m, and a mean water depth of 2.0 m. Within the surveyed section, fish habitat consisted of flat (90%) and run habitat (10%). Bed substrates consisted of organics (50%), silt (40%), and boulders (10%). No barriers to fish movement were observed. Cover for fish was provided by depth/turbulence, some boulders, woody debris, and overhanging vegetation. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs mixed with shrubs. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some shrubs.

The surveyed sections had high overwintering potential for all species as mean water depth was between 1 and 2 m and dissolved oxygen would likely support fish in the winter. Rearing and spawning potential was moderate to high for small-bodied species and Yellow Perch (*oji-cree name*; ajaawes) (due to woody organic debris and substrates), and Northern Pike (due to presence of aquatic vegetation), but nil for other large-bodied species due to lack of coarse substrates suitable for spawning.

Water temperature in September 2021 was 13.58°C, conductivity was 93 µS/cm, and pH was 6.06. The dissolved oxygen concentration was 10.14 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for fish. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999). Water temperature in June 2022 was 21.9°C, conductivity was 72.4 µS/cm, and pH was 6.64. The dissolved oxygen concentration was 5.75 mg/L, which was slightly below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for some fish species.

Fish sampling was conducted in June 2022 by setting five minnow traps for two hours (10 trap-h total effort). Two juvenile Yellow Perch (*oji-cree name*; ajaawes) were captured (CPUE = 0.18 fish per trap-h). A juvenile Northern Pike and a North American river otter (*Lontra canadensis*) were observed at the former crossing location (now upstream of current crossing) in September 2021, as well as an unknown mussel species (Annex B; Tables B1 to B3).

**Photo 147: Colpitts Creek at former crossing RA4-WC-02 looking across (September 17, 2021).**

**Photo 148: Upstream view of Colpitts Creek near former crossing RA4-WC-02 (September 17, 2021).**

**Photo 149: Colpitts Creek near former crossing RA4-WC-02 looking downstream (September 17, 2021).**

**Photo 150: Aerial imagery of the former crossing location for RA4-WC-02 (ROW in orange and flow direction arrow in blue)**

**Photo 151: Colpitts Creek at new crossing RA4-WC-02 looking across at the proposed crossing location (June 21, 2022).**

**Photo 152: Colpitts Creek at new crossing RA4-WC-02 looking upstream near proposed crossing (June 21, 2022).**

**Photo 153: Colpitts Creek at new crossing RA4-WC-02 looking downstream near proposed crossing (June 21, 2022).**

**Photo 154: Aerial imagery at the proposed crossing RA4-WC-02 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.36 Unnamed Watercourse at Crossing RA4-WC-05

A fish and fish habitat assessment was completed on June 26, 2022 on the unnamed watercourse at crossing RA4-WC-05 (Photos 155 to 158). The crossing was in deep, flat habitat with organic and silt substrates (Photo 155 and 158). The watercourse was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 156 and 157).

The surveyed section had a mean wetted width of 10 m, a mean bank-full width of 11 m, and a mean water depth of 1.3 m. Within the surveyed section, fish habitat consisted entirely of deep flats. Substrates were mainly organics (80%) and silt (20%). No potential barriers to fish passage were noted within the surveyed section. Cover for fish was provided by water depth and aquatic vegetation with small amounts of woody debris and undercut banks. The riparian area up to 25 m from the banks was composed of grasses, shrubs, and coniferous forest.

The surveyed section had moderate to high overwintering potential for small-bodied fish and moderate for large-bodied fish species as average water depths were greater than 1 m and the watercourse is not likely to freeze to the bottom in winter. Spawning habitat potential was moderate for small-bodied fish, Yellow Perch (*oji-cree name*; ajaawes), and Northern Pike due to the presence of organic substrates, woody debris, and aquatic vegetation, but was rated as nil for all other species that spawn in coarse substrates. Rearing habitat potential was moderate for all fish.

No water quality measurements were collected due to an incoming weather system causing crew to leave site suddenly.

Fish sampling was conducted by setting five minnow traps for approximately one hour (5.78 trap-h total effort). No fish were observed or captured (Annex B; Tables B1 to B3).

**Photo 155: Colpitts Creek at crossing RA4-WC-05 looking across at proposed crossing (June 26, 2022).**

**Photo 156: Colpitts Creek at crossing RA4-WC-05 looking upstream near proposed crossing (June 26, 2022).**

**Photo 157: Colpitts Creek at crossing RA4-WC-05 looking downstream near proposed crossing (June 26, 2022).**

**Photo 158: Aerial imagery at the proposed crossing RA4-WC-05 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.37 Unnamed Watercourse at Crossing RA4-WC-12

A fish and fish habitat assessment was completed on September 9, 2019 at an unnamed watercourse at crossing RA4-WC-12 (Photos 159 to 162). The proposed crossing was in a flooded watercourse with poorly defined banks with moderate quality flat habitat with organic substrates within a wetland area (Photo 159 and 162). The watercourse was assessed from 100 m upstream of the proposed crossing (Photo 160) to 120 m downstream of the crossing (Photo 161).

The surveyed section had a mean wetted width of 8.4 m, a mean bank-full width of approximately 10 m within the channelized sections, and a mean water depth of 0.6 m. Fish habitat within the surveyed section consisted entirely of flat habitat with 100% organic bed substrates. No barriers to fish movement were observed. Cover for fish was provided mostly by aquatic vegetation with some undercut banks, overhanging vegetation, water depth, and woody debris. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs. Beyond 3 m, the riparian vegetation was a mix of coniferous forest, shrubs, willows, grasses, and forbs.

The surveyed section had low potential for overwintering habitat, with water depths generally less than 1 m deep and the watercourse likely will freeze to, or close to, the bottom in winter. There was no potential spawning habitat for fish species that spawn over coarse substrates such as Brook Trout, Walleye, and White Sucker. However, suitable spawning habitat was present for Northern Pike and some small-bodied fish species that

use aquatic vegetation. Rearing habitat potential was moderate to high for small-bodied fish species, as well as Walleye and Northern Pike.

Water temperature was 11.9°C, conductivity was 28.9 µS/cm, and pH was 6.4. The dissolved oxygen concentration was 9.1 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was conducted by deploying three baited minnow traps for approximately 1.5 hours each (4.4 trap-h total effort). No fish were captured (Annex B; Tables B1 to B3).

**Photo 159: An unnamed watercourse at crossing RA4-WC-12 looking at proposed crossing location (September 9, 2019).**

**Photo 160: An unnamed watercourse at crossing RA4-WC-12 looking upstream from the proposed crossing location (September 9, 2019).**

**Photo 161: An unnamed watercourse at crossing RA4-WC-12 looking downstream near proposed crossing location (September 9, 2019).**

**Photo 162: Aerial imagery at the proposed crossing RA4-WC-12 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.38 Unnamed Watercourse at Crossing RA4-WC-17

A fish and fish habitat assessment was completed on June 28, 2022 on the unnamed watercourse at crossing RA4-WC-17 (Photos 163 to 166). The crossing was within a wetland area where the unnamed watercourse consisted of flooded, poorly defined banks, with deep flat habitat with organic and silt substrates (Photo 163 and 166). The watercourse was surveyed 110 m upstream and 128 m downstream of the proposed crossing (Photo 164 and 165).

The surveyed section had a wetted width of 80 m in the flooded sections, a mean channel bank-full width of approximately 8 m within the channelized section, and a mean water depth of greater than 1.5 m. Fish habitat consisted of flats (87%) with an impoundment section (13%). Substrates were mainly organics (80%) and silt (20%). Two beaver dams were noted within the surveyed section; both were less than 2.0 m wide and likely did not cause fish passage issues. Cover for fish was provided by water depth, aquatic vegetation, and small amounts of woody debris. The riparian area up to 25 m from the banks were bog and grasses with small amounts of shrubs.

The surveyed section had high overwintering potential for small-bodied fish and moderate for most large-bodied fish, as average water depths were greater than 1.5 m. Potential spawning habitat was rated high for small-bodied fish, moderate for Northern Pike due to the presence of aquatic vegetation, but nil to low for large-bodied fish that require coarse substrates. Rearing habitat was moderate for all fish species.

Water temperature was 16.2°C, conductivity was 61.1 µS/cm, and pH was 6.25. The dissolved oxygen concentration was 8.15 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying four minnow traps between two to four hours (11.32 trap-h effort). A total of 49 Northern Redbelly Dace, 49 Finescale Dace, 15 Pearl Dace, four Brook Stickleback, two Fathead Minnow, and one Iowa Darter were captured (CPUE = 10.69 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 163: An unnamed watercourse at crossing RA4-WC-17 looking across at the proposed crossing location (June 28, 2022).**

**Photo 164: An unnamed watercourse at crossing RA4-WC-17 looking upstream from the proposed crossing location (June 28, 2022).**

**Photo 164: An unnamed watercourse at crossing RA4-WC-17 looking downstream from the proposed crossing location (June 28, 2022).**

**Photo 165: Aerial imagery at the proposed crossing RA4-WC-17 (Project right-of-way in black and flow direction arrow in blue).**

### 3.3.39 Rock Beaver Creek at Crossing RA4-WC-18

Fish and fish habitat assessments were completed on September 7, 2019 and October 15, 2020 at Rock Beaver Creek at crossing RA4-WC-18 (Photos 166 to 169). The proposed crossing was in riffle habitat with mostly cobble substrate (70%), with some gravel (20%) and boulder (10%) (Photo 166 and 169). The watercourse was assessed from 100 m upstream of the proposed crossing (Photo 167) to 175 m downstream of the crossing (Photo 168).

The fish habitat conditions were similar between the 2019 and 2020 assessments. During the 2019 assessment, the surveyed section had a mean wetted and bank-full width of 18.2 m, and a maximum bank-full depth of 3.2 m. Habitat in the surveyed section consisted of moderate quality flat (52%), moderate quality run (41%), and riffle (7%) habitat. One beaver dam (25 m long and 0.3 m high) was present immediately downstream from the proposed crossing, which could be a barrier to fish movement (Photo 166). Cover for fish was provided by aquatic vegetation, substrate (boulders), water depth/turbulence, woody debris, overhanging vegetation, and undercut banks. The riparian vegetation within 3 m of the watercourse was a mix of shrubs and willows and grasses and forbs. Beyond 3 m, the riparian vegetation was a mix of coniferous forest and shrubs and willows. Both banks had some undercutting but were mainly stable.

The surveyed section had some areas of deep water (i.e., greater than 1 m), which would provide moderate overwintering potential for fish. The riffle habitat at the proposed crossing had high potential for spawning for fish that spawn over coarse substrates (e.g., Walleye, White Sucker, Brook Trout). Areas in the surveyed section with aquatic vegetation had high spawning potential for Northern Pike. Rearing habitat potential was high for small-bodied fish and Northern Pike and moderate for Brook Trout and sucker species.

Water temperature in 2019 was 14.8°C, conductivity was 82.1 µS/cm, and pH was 7.9. The dissolved oxygen concentration was 9.9 mg/L, which was above the guideline for the protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. Water quality measurements were not collected in 2020, due to timing constraints.

Fish sampling was conducted in September 2019 by deploying four baited minnow traps for approximately three hours each (12.4 trap-h total effort). No fish were captured, but one unidentified fish (approximately 200 mm in length) was observed (Annex B; Tables B1 to B3).

**Photo 166: Rock Beaver Creek at crossing RA4-WC-18 looking across at the proposed crossing location (October 15, 2020).**

**Photo 167: Rock Beaver Creek at crossing RA4-WC-18 looking upstream near the proposed crossing (October 15, 2020).**

**Photo 168: Rock Beaver Creek at crossing RA4-WC-18 looking downstream near the proposed crossing (October 15, 2020).**

**Photo 169: Aerial imagery at the proposed crossing RA4-WC-18 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.40 Unnamed Watercourse at Crossing RA4-WC-19

A fish and fish habitat assessment was completed on August 22, 2022 on the unnamed watercourse at crossing RA1-WC-19 (Photos 170 to 173). The watercourse flows between Byford Lake (approximately 1.6 km upstream from crossing) and Glaze Lake (approximately 1 km downstream from crossing). The crossing was in a wetland area where the unnamed watercourse had poorly defined, flooded banks in moderately deep flat habitat with organic, sand, and silt substrates (Photo 170 and 173). The section was

surveyed 125 m upstream and 120 m downstream of the proposed crossing (Photo 171 and 172).

The surveyed section had a mean wetted width of 2.8 m, a mean bank-full width of 2.8 m, in the channelized portion, and a mean water depth of 1.1 m. Within the surveyed section, fish habitat consisted of flats (59%), runs (32%), and impoundments (9%). Two beaver dams were noted, both less than 2 m wide. A beaver dam was observed approximately 70 m downstream from the crossing but was not expected to be a barrier to fish movement. Substrates were mainly sand (50%), organics (20%), and silt (10%). Cover for fish was provided by water depth, aquatic vegetation, and woody debris. The riparian area up to 25 m from the banks were grasses and small amounts of shrubs.

The surveyed section has moderate overwintering potential for small-bodied fish species and nil to low for large-bodied fish as water was over 1 m deep; however, dissolved oxygen concentration in late summer was below guidelines suggesting that under-ice dissolved oxygen would be limiting. Spawning habitat potential was moderate to high for small-bodied fish, Northern Pike, and Yellow Perch (*oji-cree name*; *ajaawes*) due to the presence of aquatic vegetation presence and organic and sand substrates and nil to low to other large-bodied fish due to a lack of coarse bed substrates. Rearing habitat was moderate for all fish.

Water temperature was 19.2°C, conductivity was 65 µS/cm, and pH was 6.75. The dissolved oxygen concentration was 3.96 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

Fish sampling was conducted by deploying six minnow traps for two hours (12 trap-h effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 170: View of the unnamed watercourse at proposed crossing RA4-WC-19 (August 22, 2022).**

**Photo 171: Upstream view of the unnamed watercourse near proposed crossing RA4-WC-19 (August 22, 2022).**

**Photo 172: Downstream view of the unnamed watercourse near proposed crossing RA4-WC-19 (August 22, 2022).**

**Photo 173: Aerial imagery at the proposed crossing RA4-WC-19 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.41 Unnamed Watercourse at Crossing RA4-WC-21

Fish and fish habitat assessments were completed on September 18, 2021, June 27, 2022, and August 24, 2022 at the unnamed watercourse at crossing RA4-WC-21 (Photos 174 to 177). The crossing was in deep flat habitat with mixed substrates of organics and silt (Photo 174 and 177). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 175) to 120 m downstream of the crossing (Photo 176).

During the 2021 assessment, the surveyed section had a mean wetted width of 12.5 m, a mean bank-full width of 8 m, and a mean water depth of greater than 1.5 m. Within the surveyed section, fish habitat consisted entirely of flat. Bed substrates consisted of organics (80%) and silt (20%). No barriers to fish movement were observed in the surveyed section. Cover for fish was provided by water depth, aquatic vegetation, and overhanging vegetation. The riparian vegetation within 3 m of the watercourse consisted entirely of grasses. Beyond 3 m, the riparian vegetation was primarily grasses with some small amounts of shrubs.

During the 2022 assessments, the surveyed section was flooded, resulting in a mean wetted width of 45 m and a mean bank-full width of 8 m. All other habitat features (i.e., habitat type, bed substrates, cover) were comparable to those observed in 2021.

The surveyed section had low overwintering potential for large-bodied species, and moderate potential for small-bodied species that are tolerant of low oxygen concentrations. Spawning and rearing habitat potential was low for large-bodied fish that spawn in coarse substrates (e.g., Walleye, Brook Trout), moderate for Northern Pike and Yellow Perch (*ajaawes*) due to the presence of aquatic vegetation, and small-bodied forage species due to organic and fine substrates.

During the field surveys, water temperature ranged from 14.8 to 16.8°C, conductivity ranged from 60 to 86 µS/cm, and pH ranged from 5.53 to 6.81 (**Table 3-5**). The dissolved oxygen concentration ranged from 1.93 to 6.59 mg/L, which was generally below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for most fish species.

**Table 3-5: Water quality parameters at proposed crossing RA4-WC-21 in 2021 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| September 18, 2021 | 15.5 | 86 | 6.54 | 5.45 |
| June 27, 2022 | 14.8 | 60 | 5.53 | 1.93 |
| August 24, 2022 | 16.8 | 81 | 6.81 | 6.59 |

In June 2022, fish sampling was conducted by setting five minnow traps for one to two hours (7.0 trap-h total effort). Three Brook Stickleback were captured (CPUE = 0.43 fish per trap-h), and one unknown minnow species was observed (Annex B; Tables B1 to B3).

In August 2022, fish sampling was conducted by setting six minnow traps for one to two hours (8.9 trap-h total effort). No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 174: An unnamed watercourse at crossing RA4-WC-21 looking across at the proposed crossing location (September 18, 2021).**

**Photo 175: An unnamed watercourse at crossing RA4-WC-21 looking upstream near the proposed crossing location (June 27, 2022).**

**Photo 176: An unnamed watercourse at crossing RA4-WC-21 looking downstream near proposed crossing (August 24, 2022).**

**Photo 177: Aerial imagery at the proposed crossing RA4-WC-21 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.42 Unnamed Watercourse at Crossing RA4-WC-22

Fish and fish habitat assessments were completed on October 25, 2020, June 22, 2022, and August 24, 2022 on the unnamed watercourse at crossing RA4-WC-22 (Photos 178 to 181). The proposed crossing was in deep run habitat with boulder and cobble substrates (Photo 178 and 181). The watercourse was assessed from 115 m upstream of the proposed crossing (Photo 179) to 105 m downstream of the proposed crossing (Photo 180).

During the 2020 assessment, the surveyed section had a mean wetted width of 9 m and a mean bank-full width of 9.2 m. Water depth at the crossing was 0.4 m but ranged from 0.4 to 1.5 m throughout the section. Habitat types in the surveyed section consisted of runs, pools, flats, riffles, and bedrock chute. Bed substrates were bedrock (80%), boulder (5%), cobble (5%), gravel (5%), and sand (5%). Cover for fish was provided by water depth, boulders, woody debris, and overhanging vegetation. No barriers to fish movement were observed. The riparian vegetation within 3 m of the watercourse was primarily grasses and shrubs. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some shrubs. Both banks were unstable throughout most of the surveyed section.

The survey results varied slightly between survey years, with mean wetted width and bank-full widths of 7 m in 2022 likely due to natural annual variability. All other habitat features (i.e., habitat type, bed substrates, cover) were comparable to those observed in 2020.

The surveyed section had low overwintering potential for all species as the water depths ranged from less than 1 m to over 1 m, which could result in the watercourse being partially frozen to bottom in the winter. Spawning habitat potential was high for fish that spawn in riffles or rapids with coarse substrates (e.g., Brook Trout, Walleye, White Sucker, potentially Lake Sturgeon), and low for small-bodied forage species that spawn over fine substrates. Spawning habitat potential was low to nil for Northern Pike due to the lack of aquatic vegetation.

During the field surveys, water temperature ranged from 0.15 to 18.8°C, conductivity ranged from 80.4 to 108.0 µS/cm, and pH ranged from 6.52 to 7.57 (**Table 3-6**). The dissolved oxygen concentration ranged from 6.00 to 14.47 mg/L, which was generally above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

**Table 3-6: Water quality parameters at proposed crossing RA4-WC-22 in 2020 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| October 25, 2020 | 0.15 | 96.8 | 7.57 | 14.47 |
| June 22, 2022 | 18.8 | 80.4 | 6.52 | 6.00 |
| August 24, 2022 | 17.9 | 108.0 | 6.54 | 9.87 |

Fish sampling was completed in June 2022 by electrofishing 105 m for 340 seconds. One Yellow Perch (*oji-cree name*; ajaawes), three Johnny Darter, one Longnose Dace, one Blacknose Shiner (*Notropis heterolepis*) were captured (CPUE = 1.76 fish per 100 seconds). Two unknown darters were observed, and many unknown fry were observed. Five minnow traps were also set for approximately 2 hours (11.3 trap-h total effort). No fish were captured in the minnow traps.

Fish sampling was completed in August 2022 by electrofishing 115 m for 1,389 seconds. One Northern Pike, one Burbot, six Johnny Darter, three Longnose Dace, one Common

Shiner, one Lake Chub, and one undetermined Dace species were captured (CPUE = 1.0 fish per 100 seconds. Six minnow traps were set for approximately one hour (6.0 trap-h total effort). No fish were captured in the minnow traps (Annex B; Tables B1 to B3).

**Photo 178: an unnamed watercourse at crossing RA4-WC-22 looking across at the proposed crossing location (June 22, 2022).**

**Photo 179: An unnamed watercourse at crossing RA4-WC-22 looking upstream near the proposed crossing (October 25, 2020).**

**Photo 180: An unnamed watercourse at crossing RA4-WC-22 looking downstream at the proposed crossing (June 22, 2022).**

**Photo 181: Aerial imagery at the proposed crossing RA4 WC 22 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.43 Unnamed Watercourse at Crossing RA4-WC-24

A fish and fish habitat assessment was completed on June 27, 2022 on the unnamed watercourse at crossing RA4-WC-24 (Photos 182 to 185). The proposed crossing location was in shallow, flat habitat with organic substrates (Photos 182 and 185). The watercourse

was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 183 and 184).

The surveyed section had a mean wetted width of 1.0 m, a mean bank-full width of 0.6 m, and a mean water depth of 0.5 m. Within the surveyed section, fish habitat consisted entirely of flats. Substrates were made up entirely of organics (100%). No potential barriers to fish passage were observed. Cover for fish was provided by aquatic vegetation with some undercut banks. The riparian area up to 25 m from the banks was composed of bog, grasses, shrubs, and coniferous forest.

The surveyed section has low to no overwintering potential for fish due to shallow water depths (i.e., less than 1 m deep), which would likely freeze to bottom in winter. Potential rearing and spawning habitat was moderate to high for small-bodied fish and nil for all large-bodied species due to shallow water depth, unsuitable fine substrates, and limited aquatic vegetation. The watercourse connects two unnamed lakes/ponds (Photo 185) and could be used as a movement corridor during high flows (i.e., spring) for both small and large-bodied fish.

Water temperature was 16.1°C, conductivity was 50 µS/cm, and pH was 5.76. The dissolved oxygen concentration was 5.53 mg/L, which was below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for some fish species.

Fish sampling was conducted by electrofishing a 105 m section for 425 seconds. One Brook Stickleback and 19 Finescale Dace were captured (CPUE = 4.71 fish per 100 seconds) (Annex B; Tables B1 to B3).

**Photo 182: An unnamed watercourse at crossing RA4-WC-24 looking across at the proposed crossing (June 27, 2022).**

**Photo 183: An unnamed watercourse at crossing RA4-WC-24 looking upstream near proposed crossing (June 27, 2022).**

**Photo 184: An unnamed watercourse at crossing RA4-WC-24 looking downstream near proposed crossing (June 27, 2022).**

**Photo 185: Aerial imagery at the proposed crossing RA4-WC-24 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.44 Unnamed Watercourse at Crossing RA4-WC-25

A fish and fish habitat assessment was completed on September 6, 2019 on an unnamed watercourse at crossing RA4-WC-25 (Photos 186 to 189). The proposed crossing was in riffle habitat with mixed substrates of boulder (40%), cobble (30%), sand (20%), and gravel (10%) (Photo 186 and 189). The watercourse was assessed from 85 m upstream of the proposed crossing (Photo 187) to 175 m downstream of the crossing (Photo 188). The unnamed watercourse was also assessed by rapid survey from a helicopter on 24 October 2020, as there was no suitable landing location within 500 m of the crossing location.

The overall fish habitat conditions were comparable between the rapid aerial assessment and detailed ground assessment between years and seasons. In September 2019, the surveyed section had a mean wetted width of 6.8 m, a mean bank-full width of 7.5 m, and a maximum bank-full depth of 3.0 m. Habitat in the surveyed section consisted of moderate quality flats (88%) and riffles (12%). Substrates were a mix of boulders (30%), sand (25%), gravel (22%), cobble (17%), and silt (6%). Cover for fish was provided by woody debris, substrate, aquatic vegetation, undercut banks, depth/turbulence, and overhanging vegetation. One beaver dam was observed in the surveyed section. The riparian vegetation within 3 m of the watercourse was a combination of shrubs, willows, grasses, and forbs. Beyond 3 m, the riparian vegetation was coniferous forest and shrubs and willows. Both banks were mainly unstable and subject to undercutting.

The surveyed section had moderate overwintering potential for most fish species, as water depths were greater than 1 m. Spawning habitat potential was moderate to high for large-

bodied fish (e.g., Brook Trout, White Sucker) and small-bodied fish (e.g., Northern Redbelly Dace) that spawn in coarse substrates and moderate for Northern Pike due to the presence of some aquatic vegetation. Rearing habitat potential was high for small-bodied fish and moderate for most large-bodied fish species.

Water temperature was 12.9°C, conductivity was 90.1 µS/cm, and pH was 7.8. The dissolved oxygen concentration was 10.5 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying five baited minnow traps for approximately 1.5 hours each (7.25 trap-h total effort). A total of 78 fish were captured: two Brook Stickleback, 20 Common Shiner, 10 Finescale Dace, two Iowa Darter,10 Pearl Dace, and eight White Sucker (CPUE = 10.75 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 186: An unnamed watercourse at crossing RA4-WC-25 looking at the proposed crossing location (September 6, 2019).**

**Photo 187: An unnamed watercourse at crossing RA4-WC-25 looking upstream near proposed crossing location towards a beaver dam (September 6, 2019).**

**Photo 188: Aerial view of proposed crossing location RA4-WC-25 (24 October 2020).**

**Photo 189: Aerial imagery at proposed crossing RA4-WC-25 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.45 Unnamed Watercourse at Crossing RA4-WC-26

A fish and fish habitat assessment was completed on September 13, 2021 on the unnamed watercourse at crossing RA4-WC-26 (Photos 190 to 194). The watercourse was split into two channels at the intersection with the right-of-way, a north and south channel; these were assessed separately. The north channel crossing was in a pool habitat with mixed substrates of organic, silt, boulder, sand, gravel, and cobble (Photo 190 and 194). The south channel crossing was in a run habitat with mixed substrates of cobble, boulder, organics, and silt (Photo 191). The channels were surveyed 100 m upstream and 200 m downstream of the proposed crossings (Photo 192 and 193).

The north channel and rest of the surveyed section had a wetted and bank-full width of 5.5 m, and a mean depth of 0.8 m. Within the surveyed section, fish habitat consisted of impoundments (84%), pool (13%), and run (3%). Substrates were mainly organic (30%), silt (30%), boulder (25%), sand (5%), gravel (5%), and cobble (5%). Cover for fish was provided by substrate (boulders), overhanging vegetation, woody debris, and small amounts of aquatic vegetation. The riparian area up to 25 m of the banks was primarily composed of shrubs with some grasses.

The south channel crossing had a mean wetted and bank-full width of 2.3 m, and a mean depth of 0.4 m. Habitat in the surveyed section consisted entirely of shallow runs. Substrates consisted of boulders (50%), cobbles (30%), silt (10%), and organics (10%). Cover was provided by aquatic vegetation, substrates (boulders), woody debris, overhanging vegetation, and undercut banks.

The surveyed section had no overwintering potential for all fish species as a large portion of the surveyed reach had an average water depth less than 1 m. Spawning and rearing habitat was rated as moderate for all fish species due to the variety of habitat types (e.g., riffles, runs), bed substrates (e.g., organics, cobbles, boulders) and cover (e.g., woody debris, aquatic vegetation) available.

Water temperature was 12.82°C, conductivity was 112.0 µS/cm, and pH was 6.65. The dissolved oxygen concentration was 10.49 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by backpack electrofishing for 695 seconds over 60 m. Five Finescale Dace, three Iowa Darters, two Pearl Dace, and 35 Common Shiners were captured (CPUE = 6.47 fish per 100 seconds). Three minnow traps in clusters of two or three traps were set for approximately one hour (29.0 trap-h total effort). A total of 14 Pearl Dace, four Brook Stickleback, 29 Finescale Dace, one Iowa Darter, two White Sucker, and one Blacknose Shiner were captured (CPUE = 1.76 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 190: An unnamed watercourse at crossing RA4-WC-26 looking at the north channel proposed crossing (September 13, 2021).**

**Photo 191: An unnamed watercourse at crossing RA4-WC-26 looking at the south channel proposed crossing (September 13, 2021).**

**Photo 192: An unnamed watercourse at crossing RA4-WC-26 looking upstream near the proposed crossing (September 13, 2021).**

**Photo 193: An unnamed watercourse at crossing RA4-WC-26 looking downstream near the proposed crossing (September 13, 2021).**

**Photo 194: Aerial imagery at the proposed crossing RA4-WC-26 (Project right-of-way in black, flow direction in blue).**

## 3.3.46 Unnamed Watercourse at Crossing RA4-WC-27

Fish and fish habitat assessments were completed on September 7, 2019, and September 15, 2021 on an unnamed watercourse at crossing RA4-WC-27 (Photos 195 to 198). The proposed crossing was in deep, flat habitat with organic substrates and an approximate bank-full width of 90 m (Photo 195 and 198). The watercourse was assessed from 100 m upstream of the proposed crossing (Photo 196) to 200 m downstream of the proposed crossing (Photo 197).

The overall habitat conditions were comparable between the detailed assessments in 2019 and 2021. During the 2019 assessment, the surveyed section had a mean wetted width of 53 m and a mean bank-full width of 178 m. Water depth exceeded 1 m throughout most of the section. Habitat in the surveyed reach consisted entirely of flats (100%) and bed substrates were organic material (100%). Cover for fish was provided by water depth, aquatic vegetation, and woody debris. No barriers to fish movement were observed. The riparian vegetation within 3 m of the watercourse was entirely grasses and forbs. Beyond 3 m, the riparian vegetation was a mix of shrubs and willows, grasses, and forbs, and coniferous forest.

The surveyed section had moderate to high overwintering potential for most fish species as the average water depths were greater than 1 m. Rearing habitat potential was moderate to high for most small and large-bodied fish species. There was no spawning habitat potential for fish species such as White Sucker, Brook Trout, and Walleye due to lack of coarse substrates (e.g., gravel, cobble). High quality spawning habitat was available for Northern Pike, and certain small-bodied species that spawn in aquatic vegetation and/or fine substrates.

Water temperature was 15.4°C, conductivity was 89.5 µS/cm, and pH was 7.7. The dissolved oxygen concentration was 10.4 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling in 2019 was conducted by deploying four baited minnow traps for approximately two hours each (7.3 trap-h total effort). No fish were captured or observed.

**Photo 195: An unnamed watercourse at crossing RA4-WC-27 looking across at the proposed crossing location (September 6, 2019).**

**Photo 196: An unnamed watercourse at crossing RA4-WC-27 looking upstream near the proposed crossing (September 6, 2019).**

**Photo 197: An unnamed watercourse at crossing RA4-WC-27 looking downstream near proposed crossing (September 6, 2019).**

**Photo 198: Aerial imagery at the proposed crossing RA4-WC-27 (Project right-of-way in black and flow direction arrow in blue).**

## 3.3.47 Unnamed Watercourse at Crossing RA4-WC-31

A fish habitat assessment was completed on October 18, 2020, on the unnamed watercourse at crossing RA4-WC-31 (Photos 199 to 202). The proposed crossing was in a shallow run habitat with mixed substrates of sand, cobble, boulder, and gravel (Photo 199 and 202). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 200) to 120 m downstream of the crossing (Photo 201). The unnamed watercourse

was also assessed by rapid survey from a helicopter on July 1, 2022, as there was no suitable landing location within 500 m of the crossing.

The overall fish habitat conditions were reasonably similar between rapid aerial assessment and detailed ground assessment between years and seasons. In October 2020, the surveyed section had a mean wetted width of 2.5 m, a mean bank-full width of 3 m, and a mean water depth was 0.4 m. Fish habitat consisted of a shallow run (71%) and flat habitat (29%). Bed substrates consisted of sand (35%), cobble (35%), boulder (20%), and gravel (10%). Cover for fish was provided by woody debris, overhanging vegetation, and substrate. No barriers to fish movement were observed in the surveyed section. The riparian vegetation within 3 m of the watercourse consisted of shrubs with some grasses and forbs. Beyond 3 m, the riparian vegetation was coniferous forest. Both banks were stable and fully vegetated with grasses and forbs.

The surveyed section had no overwintering habitat potential for fish as water depths were less 0.5 m and the watercourse would likely freeze to the bottom in winter. Spawning and rearing habitat potential was nil to low for fish that spawn in coarse substrates (e.g., Brook Trout, White Sucker), because although suitable spawning substrates were observed, the watercourse is expected to freeze to bottom, thus not being suitable for overwintering eggs. Spawning potential is low to moderate for small-bodied forage fish species that spawn over sand or cobbles, but low for Northern Pike due to a lack of aquatic vegetation.

Water temperature was 3.84°C, conductivity was 33.15 µS/cm, and pH was 5.97. The dissolved oxygen concentration was 12.15 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window.

**Photo 199: An unnamed watercourse at crossing RA4-WC-31 looking at the proposed crossing location (October 18, 2020).**

**Photo 200: An unnamed watercourse at crossing RA4-WC-31 looking upstream near the proposed crossing (October 18, 2020).**

**Photo 201: An unnamed watercourse at crossing RA4-WC-31 looking downstream near the proposed crossing (October 18, 2020).**

**Photo 202: Aerial imagery at the proposed crossing RA4-WC-31 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.48 Albany River at Crossing RA4-WC-34

Fish and fish habitat assessments were completed on September 6, 2019, October 26, 2020, and September 15, 2021 on the Albany River at crossing RA4-WC-34 (Photos 203 to 206). The proposed crossing was in deep run habitat (Photo 203 and 206). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 204) to 120 m downstream of the crossing (Photo 205).

During the 2019 assessment, the surveyed section had a mean wetted width of 50m and a mean bank-full width of 70 m. Water depth was greater than 2 m. Habitat in the surveyed section consisted entirely of runs (100%). Substrates consisted of boulders (46%), sand (26%), cobble (17%), and gravel (11%). Cover for fish was provided by water depth and substrate (boulders). No barriers to fish movement were observed. The riparian vegetation was a mix of shrubs and willows, coniferous forest, deciduous forest, and grasses and forbs. Both banks were stable.

The fish habitat conditions in the surveyed section were comparable between 2020 and 2021 but differed from 2019 in that the mean wetted width was 70 m and the mean bank-full width was 77 m. All other fish habitat parameters were similar between all three years.

The surveyed section had high overwintering potential for most fish species as average water depths were over 1 m and it is expected that the Albany River would have flow and suitable dissolved oxygen levels under-ice. Spawning and rearing habitat potential was moderate to high for small and large-bodied fish species, including Lake Sturgeon, which spawn over rocky substrates in fast flowing rapids. Locations for Pickerel (i.e., Walleye) spawning, Lake Sturgeon fish harvesting, and general fish spawning areas/beds were identified in the Albany River between 130 m and 2 km of the crossing location (MFFN 2019). Brook trout spawning locations have been identified near sand bars in the vicinity of the crossing (MFFN 2021).

During the field surveys, water temperature ranged from 0.82 to 14.38°C, conductivity ranged from 84.6 to 163.0 µS/cm, and pH ranged from 7.19 to 8.23 (**Table 3-7**). The dissolved oxygen concentration ranged from 10.3 to 11.1 mg/L, which was generally below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

**Table 3-7: Water quality parameters at proposed crossing RA4-WC-34 in 2019 to 2021.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| September 6, 2019 | 14.2 | 84.6 | 8.1 | 10.3 |
| October 26, 2020 | 0.82 | 163 | 8.23 | 11.12 |
| September 15, 2021 | 14.38 | 115 | 7.19 | 11.11 |

The fish community in the Albany River is well documented; therefore, fishing effort for the Project was minimal. Large-bodied fish including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, and Lake Whitefish have all been documented in the Albany River as well as several small-bodied forage fish species (e.g., Lake Chub, Brook Stickleback) (MNRF 2023, Government of Ontario 2015, Golder 2013)

Fish sampling was conducted in 2021 by deploying two sets of minnow traps (one set with three traps and the second set with two traps) for two hours (11.2 trap-h total effort). No fish were captured (Annex B; Tables B1 to B3).

**Photo 203: The Albany River at crossing RA4-WC-34 looking across at the proposed crossing location (October 26, 2020).**

**Photo 204: The Albany River at crossing RA4-WC-34 looking upstream near proposed crossing (September 6, 2019).**

**Photo 205: The Albany River at crossing RA4-WC-34 looking downstream near proposed crossing (October 26, 2020).**

**Photo 206: Aerial imagery at the proposed crossing RA4-WC-34 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.49 Unnamed Watercourse at Crossing RA4-WC-35

A fish habitat assessment was completed on October 19, 2020, on the unnamed watercourse at crossing RA4-WC-35 (Photos 207 to 210), a tributary to the Albany River. The proposed crossing was in shallow, run habitat (Photo 207 and 210). The watercourse was assessed from 100 m upstream of the proposed crossing (Photo 208) to 100 m downstream of the crossing (Photo 209).

The surveyed section had a mean wetted width of 1.3 m, a mean bank-full width of 1.7 m, and a mean water depth of 0.3 m. Habitat in the surveyed section consisted entirely of run (100%). Substrate consisted of gravel (25%), silt (25%), sand (25%), and organics (25%). Cover for fish was provided by woody debris and undercut banks. No barriers to fish movement were observed. The riparian vegetation was a mix of shrubs and willows, coniferous forest, deciduous forest, and grasses and forbs. Both banks were stable.

The surveyed section had no overwintering potential for most fish species as average water depths were under 1 m and the watercourse is likely to freeze to bottom in winter. Rearing and spawning habitat potential was low to moderate for large-bodied species such as Brook Trout and Walleye with the presence gravel substrates; however, water depths were low. Spawning and rearing habitat potential for Northern Pike was low due to the absence of aquatic vegetation.

Water quality parameters were not collected due to time constraints.

Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window.

**Photo 207: An unnamed watercourse at crossing RA4-WC-35 looking across at the proposed crossing location (October 19, 2020).**

**Photo 208: An unnamed watercourse at crossing RA4-WC-35 looking upstream (October 19, 2020).**

**Photo 209: An unnamed watercourse at crossing RA4-WC-35 looking downstream (October 19, 2020).**

**Photo 210: Aerial imagery at the proposed crossing RA4-WC-35 (Project right-of-way in black, flow direction in blue).**

## 3.3.50 Unnamed Watercourse at Crossing RA4-WC-37

A fish and fish habitat assessment was completed on September 12, 2021 on the unnamed watercourse at crossing RA4-WC-37 (Photos 211 to 214). The crossing was in deep, flat habitat with mixed substrates of organic and silt (Photo 211 and 214). The watercourse was surveyed 120 m upstream (Photo 212) and 120 m downstream of the proposed crossing (Photo 213).

The surveyed section had a mean wetted width of approximately 9 m, a mean bank-full width of 6 m, and a mean water depth greater than 1.5 m. Within the surveyed section, fish habitat consisted entirely of flat. Substrates were mainly organics (80%) and silts (20%). No barriers to fish movement were observed in the surveyed section. Cover for fish was provided by water depth, overhanging vegetation, and small amounts of aquatic vegetation. The riparian area up to 25 m of the banks were shrubs and grasses.

The surveyed section had low moderate overwintering potential for all fish due to mean water depth over 1.5 m and adequate dissolved oxygen concentrations in fall. Spawning and rearing potential for small-bodied fish and Northern Pike was moderate due to the presence of fine substrates and aquatic vegetation. Spawning habitat potential was nil for all large-bodied species such as sucker species, Brook Trout, and Walleye due to lack of suitable coarse substrates. Rearing habitat was low to moderate for other large-bodied species.

Water temperature was 12.21°C, conductivity was 55.0 µS/cm, and pH was 5.86. The dissolved oxygen concentration was 6.40 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was conducted by backpack electrofishing 120 m for 510 seconds and by setting five baited minnow traps for between two and four hours (17.8 trap-h total effort). No fish were captured by either method (Annex B; Tables B1 to B3).

**Photo 211: An unnamed watercourse at crossing RA4-WC-37 looking across at the proposed crossing location (September 12, 2021).**

**Photo 212: An unnamed watercourse at crossing RA4-WC-37 looking upstream near proposed crossing (September 12, 2021).**

**Photo 213: An unnamed watercourse at crossing RA4-WC-37 looking downstream near proposed crossing (September 12, 2021).**

**Photo 214: Aerial imagery at the proposed crossing RA4-WC-37 (Project right-of-way in black, flow direction in blue).**

### 3.3.51 Gourlie Creek at Crossing RA4-WC-41

A fish and fish habitat assessment was completed on June 25, 2022 on Onagwabiihkan'iih' Ziibih (Oji-Cree name)/ Evening Hunting River (local name)/ Gourlie Creek at crossing RA4-WC-41 (Photos 215 to 218). The proposed crossing location was in deep run habitat (Photo 217 and 218). The watercourse was surveyed 120 m upstream and 120 m downstream of the proposed crossing (Photo 215 and 216).

The surveyed section had a mean wetted width of 31 m, a mean bank-full width of 34 m, and a mean water depth greater than 1.5 m. Within the surveyed section, fish habitat consisted entirely of deep run (100%). No potential barriers to fish passage were observed. Substrates could not be determined throughout as the channel was too deep and wide; however, bank substrates were sand (60%) and silt (40%). Cover for fish was provided by water depth. The riparian area up to 25 m from the banks entirely consisted of coniferous forest, shrubs, and grasses.

The surveyed section had high overwintering potential for all species as average water depths were greater than 1 m, and therefore, the watercourse was not likely to freeze to the bottom in winter. Rearing and spawning habitat potential was considered moderate for all fish, assuming heterogeneity in bed substrates, and considering the size and depth of the watercourse. A fish harvest netting site was identified on Gourlie Creek approximately 680 m from the crossing location (MFFN 2019).

Water temperature was 17.6°C, conductivity was 47.6 µS/cm, and pH was 7.26. The dissolved oxygen concentration was 7.50 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

Fish sampling was conducted by deploying six minnow traps overnight for 26 hours (156 trap-hour effort), catching two Trout Perch (*Percopsis omiscomaycus*) and one Johnny Darter (CPUE = 0.02 fish per trap-h) (Annex B; Tables B1 to B3).

**Photo 215: Gourlie Creek at crossing RA4-WC-41 looking downstream near the proposed crossing location (June 25, 2022).**

**Photo 216: Gourlie Creek at crossing RA4-WC-41 looking upstream near the proposed crossing location (June 25, 2022).**

**Photo 217: Gourlie Creek at crossing RA4-WC-41 looking across at the proposed crossing location (June 25, 2022).**

**Photo 218: Aerial imagery of Gourlie Creek at the proposed crossing RA4-WC-41 (Project right-of-way in black, flow direction in blue).**

## 3.3.52 Unnamed Watercourse at Crossing RA4-WC-42

A fish habitat assessment was completed on October 19, 2020 on the unnamed watercourse at crossing RA4-WC-42 (Photos 219 to 223). The proposed crossing was in a wetland, with a channelized section with poorly defined banks, moderately deep flat habitat, and mixed substrates of organics and silt (Photo 219 and 220). The watercourse

was assessed from 120 m upstream of the proposed crossing (Photo 221) to 120 m downstream of the crossing (Photo 222).

The surveyed section had a mean wetted width of 4 m, a mean bank-full width of 6 m in the channelized portions, and a mean water depth was 0.9 m. Within the surveyed section, fish habitat consisted entirely of flat habitat. Bed substrates consisted of organics (90%) and silt (10%). Cover for fish was provided by aquatic vegetation, woody debris, and overhanging vegetation. Two beaver dams were observed, which could both be potential barriers to fish passage. One beaver dam was located a few metres upstream from the crossing, and diverted water around the crossing, creating a “side channel” where the water flows around the beaver dam (Photo 220). The dam was 5.5 m long, 0.7 m wide, and 0.4 m high. The second dam was located 65 m upstream from the crossing and was 2 m long, 1 m wide, and 0.4 m high. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs within the wetland. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some shrubs.

The surveyed section had low to moderate overwintering potential for all fish species since the watercourse may freeze to, or close to, the bottom with mean water depths of 0.9 m measured in the fall. Spawning habitat potential was nil for large-bodied species, except for Northern Pike due to the presence of aquatic vegetation and high for small-bodied species that spawn over organic substrates and woody debris (e.g., Brook Stickleback, Finescale Dace). Rearing habitat potential was high for Northern Pike and small-bodied fish species.

No water quality measurements were collected due to time constraints. Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window.

**Photo 219: An unnamed watercourse at crossing RA4-WC-42 looking across at the “main channel” proposed crossing (October 19, 2020).**

**Photo 220: An unnamed watercourse at crossing RA4-WC-42 view of “side channel” created by a beaver dam on the at proposed crossing (October 19, 2020).**

**Photo 221: An unnamed watercourse at crossing RA4-WC-42 looking upstream near the proposed crossing (October 19, 2020).**

**Photo 222: An unnamed watercourse at crossing RA4-WC-42 looking downstream near proposed crossing (October 19, 2020).**

**Photo 223: Aerial imagery at the proposed crossing RA4-WC-42 (ROW in orange and flow direction arrow in blue)**

## 3.3.53 Unnamed Watercourse at Crossing RA4-WC-45

Fish and fish habitat assessments were completed on October 18, 2020, June 27, 2022, and August 20, 2022 on the unnamed watercourse at crossing RA4-WC-45 (Photos 224 to 227). The proposed crossing was in a wetland with a channelized section with poorly defined banks, in moderately deep flat habitat with mixed substrates of organics and silt (Photo 224 and 227). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 225) to 120 m downstream of the crossing (Photo 226).

During the 2020 assessment, the surveyed section had a mean wetted width of 7 m, a mean bank-full width of 10 m in the channelized portion, and a mean water depth of 1.1 m. Within the surveyed section, fish habitat consisted entirely of flat (100%). Bed substrate consisted of silt (80%) and organics (20%). Cover for fish was provided by woody debris. No barriers to fish movement were observed in the surveyed section. The riparian vegetation within 3 m of the watercourse consisted of muskeg and grasses and forbs mixed with shrubs. Beyond 3 m, the riparian vegetation was primarily coniferous forest with some muskeg, grasses, and shrubs.

The fish and fish habitat conditions in the surveyed section was comparable between the 2020 and the two 2022 assessments. However, in 2022, wetted width was not measured.

The surveyed section had low to moderate overwintering potential for most species and moderate to high for small-bodied species due to water depth being greater than 1 m, which would not likely freeze to bottom in winter. Spawning and rearing habitat potential was high for small-bodied species that spawn over organic substrates and woody debris (e.g., Brook Stickleback, Finescale Dace) and nil for large-bodied species due to the absence of coarse bed substrates, but moderate for Northern Pike due to the presence of flooded vegetation.

During the field surveys, water temperature ranged from 2.3 to 15.8°C, conductivity ranged from 29.5 to 60 µS/cm, and pH ranged from 5.7 to 6.79 (**Table 3-8)**. The dissolved oxygen concentration ranged from 4.58 to 10.7 mg/L, with the two readings in 2022 generally below the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and unsuitable for fish species except for those tolerant of lower dissolved oxygen levels.

**Table 3-8: Water quality parameters at proposed crossing RA4-WC-45 in 2020 and 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| October 18, 2020 | 2.3 | 32 | 5.7 | 10.7 |
| June 27, 2022 | 15.2 | 29.5 | 6.79 | 4.64 |
| August 20, 2022 | 15.8 | 60 | 5.74 | 4.58 |

Fish sampling was conducted in in June 2022 by deploying six minnow traps for three hours (18 trap-h total effort) and in August 2022 by deploying three minnow traps for approximately two hours (5.6 trap-h total effort). No fish were captured or observed in either season (Annex B; Tables B1 to B3).

**Photo 224: An unnamed watercourse at crossing RA4-WC-45 looking across at the proposed crossing location (October 18, 2020).**

**Photo 225: An unnamed watercourse at crossing RA4-WC-45 looking upstream near the proposed crossing (October 18, 2020).**

**Photo 226: An unnamed watercourse at crossing RA4-WC-45 looking downstream at proposed crossing (June 29, 2022).**

**Photo 227: Aerial imagery at the proposed crossing RA4-WC-45 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.54 Wabassi River at Crossing RA4-WC-55

Fish and fish habitat assessments were completed on October 20, 2020, September 16, 2021, and June 27, 2022 on Wabassi River at crossing RA4-WC-55 (Photos 228 to 231). The proposed crossing was in moderately deep run habitat with mixed substrates of sand, cobble, gravel, and boulder (Photo 228 and 231). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 229) to 120 m downstream of the crossing (Photo 230).

During the 2020 assessment, the surveyed section had a mean wetted width of 45 m, a mean bank-full width of 50 m, and a mean water depth of 1.2 m. Fish habitat consisted entirely of runs. Bed substrates consisted of sand (35%), cobble (30%), gravel (25%), and boulder (10%). Cover for fish was provided by water depth, aquatic vegetation, substrate, and undercut banks. No barriers to fish movement were observed in the surveyed section. The riparian vegetation within 3 m of the watercourse consisted of grasses and forbs mixed with shrubs. Beyond 3 m, the riparian vegetation was primarily shrubs with some coniferous forest. Both banks were primarily stable.

The fish habitat conditions were comparable between all assessment years and seasons.

The surveyed section had moderate to high overwintering potential for all fish species due to mean water depths greater than 1 m and likelihood for under-ice water flow and suitable dissolved oxygen levels. Due to the presence of fine and coarse substrates, woody debris and aquatic vegetation, spawning and rearing habitat potential was moderate to high for both small-bodied (e.g., Brook Stickleback, Lake Chub) and large-bodied fish species (e.g., Brook Trout, Northern Pike, Walleye, sucker species). Trout species, walleye, and Jackfish (i.e., Northern Pike) are all present in the Wabassi River at RA4-WC-55 (MFFN 2021). During the field surveys, water temperature ranged from 1.05 to 14.7°C, conductivity ranged from 49.6 to 72 µS/cm, and pH ranged from 6.77 to 7.91 (**Table 3-9**). The dissolved oxygen concentration ranged from 7.89 to 14.44 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

**Table 3-9: Water quality parameters at proposed crossing RA4-WC-55 in 2020 to 2022.**

| Date | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved oxygen concentration (mg/L) |
|---|---|---|---|---|
| October 22, 2020 | 1.05 | 64.3 | 7.91 | 14.44 |
| September 16, 2021 | 11.9 | 72 | 6.77 | 11.25 |
| June 27, 2022 | 14.7 | 49.6 | 7.25 | 7.89 |

Fish sampling was conducted in June 2022 by setting six minnow traps; however, the pull times were not recorded. No fish were captured or observed (Annex B; Tables B1 to B3).

**Photo 228: The Wabassi River at crossing RA4-WC-55 looking across at the proposed crossing location (October 20, 2020).**

**Photo 229: The Wabassi River at crossing RA4-WC-55 looking upstream near proposed crossing (June 27, 2022).**

**Photo 230: The Wabassi River at crossing RA4-WC-55 looking downstream near proposed crossing (October 20, 2020).**

**Photo 231: Aerial imagery at the proposed crossing RA4-WC-55 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.55 Unnamed Watercourse at Crossing RA4-WC-57

A fish and fish habitat assessment was completed on September 16, 2021 on the unnamed watercourse RA4-WC-57 (Photos 232 to 235). The proposed crossing was in shallow flat habitat with mixed substrates of organics, silt, sand, and boulder (Photo 232 and 235). The watercourse was assessed from 110 m upstream of the proposed crossing (Photo 233) to 110 m downstream of the crossing (Photo 234).

The surveyed section had a mean wetted width of 2.0 m, a mean bank-full width of 2.0 m, and a mean water depth of 0.5 m. Within the surveyed section, fish habitat consisted entirely of flat. Bed substrates consisted of organic (75%), silt (15%), sand (5%), and boulder (5%). Cover for fish was provided by woody debris, aquatic vegetation, overhanging vegetation, and undercut banks. No barriers to fish movement were observed in the surveyed section. The riparian vegetation up to 25 m from the banks was composed of grasses and shrubs.

The surveyed section had low overwintering potential for all fish species due to mean water depths being less than 1 m and the watercourse would likely freeze to bottom in winter. Rearing and spawning habitat potential was low to nil for large-bodied fish due to shallow water depths and lack of suitable coarse substrates. There was some potential spawning habitat for Northern Pike (low potential) with the presence of aquatic vegetation. Spawning and rearing habitat potential was moderate for small-bodied fish due to the presence of organic substrates, woody debris, and aquatic vegetation.

Water temperature was 12.23°C, conductivity was 43 µS/cm, and pH was 6.00. The dissolved oxygen concentration was 7.07 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species.

No fish sampling was conducted due to the conditions outlined in the Licence to Collect Fish for Scientific Purposes not to fish past September 15 (two weeks into the restricted activity timing window).

**Photo 232: An unnamed watercourse at crossing RA4-WC-57 looking across at the proposed crossing (September 16, 2021).**

**Photo 233: An unnamed watercourse at crossing RA4-WC-57 looking upstream from the proposed crossing (September 16, 2021).**

**Photo 234: An unnamed watercourse at crossing RA4-WC-57 looking downstream at the proposed crossing (September 16, 2021).**

**Photo 235: Aerial imagery at the proposed crossing RA4-WC-57 (Project right-of-way in black and flow direction arrow in blue)**

## 3.3.56 Unnamed Watercourse at Crossing RA4-WC-58

A fish habitat assessment was completed on October 18, 2020 on the unnamed watercourse at crossing RA4-WC-58 (Photos 236 to 239). The proposed crossing was in a wetland with the unnamed watercourse consisting of channelized sections with poorly defined banks, moderately deep flat habitat, and mixed organic substrates (Photo 236 and 239). The watercourse was assessed from 120 m upstream of the proposed crossing (Photo 237) to 120 m downstream of the crossing (Photo 238).

The surveyed section had a mean wetted width of 5 m, a mean bank-full width of 15 m in the channelized sections, and a mean water depth of 0.8 m. Within the surveyed section, fish habitat consisted entirely of flat. Bed substrates consisted of organics (100%). Cover for fish was provided by aquatic vegetation, woody debris, and overhanging vegetation. No barriers to fish movement were observed in the surveyed section. The riparian vegetation within 3 m of the watercourse consisted of muskeg/peatlands, grasses and forbs mixed with shrubs. Beyond 3 m, the riparian vegetation was primarily coniferous forest.

The reach had no overwintering potential for most fish species since water depths were less 1 m and the watercourse was likely to freeze to bottom in winter. Rearing and spawning habitat was nil for most large-bodied fish species, except low for Northern Pike due to the presence of aquatic vegetation. Rearing and spawning habitat potential was moderate to high for small-bodied fish due to the organic substrates and woody debris.

Water temperature was 1.9°C, conductivity was 29.7 µS/cm, and pH was 5.65. The dissolved oxygen concentration was 10.81 mg/L, which was above the guideline for protection of aquatic life (6.5 mg/L) (CCME 1999) and suitable for most fish species. The pH was slightly below the range for the protection of aquatic life (range 6.5 to 9.0) (CCME 1999).

Fish sampling was not completed in October 2020 due to overlap with the fall restricted activity timing window.

**Photo 236: An unnamed watercourse at crossing RA4-WC-58 looking across at the proposed crossing location (October 18, 2020).**

**Photo 237: An unnamed watercourse at crossing RA4-WC-58 looking upstream near the proposed crossing location (October 18, 2020).**

**Photo 238: An unnamed watercourse at crossing RA4-WC-58 looking downstream near the proposed crossing location (October 18, 2020).**

**Photo 239: Aerial imagery at the proposed crossing RA4-WC-58 (Project right-of-way in black and flow direction arrow in blue)**

# 3.4 Rapid Fish Habitat Assessments

## 3.4.1 Unnamed Watercourse at Crossing RA1-4-WC-09B

A rapid fish habitat assessment was completed on September 12, 2021, on the unnamed watercourse at crossing RA1-4-WC-09B (Photos 240 to 242), over approximately 200 m. The watercourse had a defined channel that was observed from the air. The surveyed section (including at the proposed crossing location) consisted of flat habitat (Photo 242) with organic, silt, and sand substrates. The surveyed section had an estimated mean wetted width of approximately 3 m, an estimated mean bank-full width of approximately 3 m, and an estimated mean water depth of 3 m. No barriers to fish passage were observed. The riparian area was composed of shrubs and coniferous forest (Photo 240 and 241).

The surveyed section may provide overwintering habitat for large and small-bodied fish, with water depths estimated to be greater than 1 m deep. There was no potential spawning habitat observed for fish species that spawn over coarse substrates such as Brook Trout, Walleye, and White Sucker. However, suitable spawning habitat was present for small-bodied fish species that spawn in organic substrates (e.g., Brook Stickleback). Rearing habitat may be present but may only be available for small-bodied fish species.

**Photo 240: Aerial view of the unnamed watercourse at crossing RA1-4-WC-09B looking upstream (September 12, 2021).**

**Photo 241: Aerial view of the unnamed watercourse at crossing RA1-4-WC-09B, looking downstream (September12, 2021).**

**Photo 242: Aerial imagery at the proposed crossing RA1-4-WC-09B (Project right-of-way in black, flow direction in blue).**

### 3.4.2 Unnamed Watercourse at Crossing RA1-4-WC-27

A rapid fish habitat assessment was completed on October 16, 2020, on Biitakweya Wih Ziibih (Oji-Cree name)/the unnamed watercourse at crossing RA1-4-WC-27 (Photos 243 to 246). The watercourse had a defined channel. The surveyed section (including at the proposed crossing location) consisted of flat habitat with organic substrates (Photo 243 and 246). The surveyed section had an estimated mean wetted width of approximately 4 m, an estimated mean bank-full width of approximately 4 m, and an estimated mean water depth of 0.75 to 1 m. No fish passage barriers were observed. The riparian area was composed of shrubs and coniferous forest (Photo 244 and 245).

The surveyed section may provide limited overwintering habitat for small-bodied fish, with water depths estimated to be between 0.75 to 1 m deep. There was no potential spawning habitat observed for fish species that spawn over coarse substrates such as Brook Trout, Walleye, and White Sucker. However, suitable spawning and rearing habitat may be present for small-bodied fish species that spawn in organic substrates (e.g., Brook Stickleback).

**Photo 243: An unnamed watercourse at crossing RA1-4-WC-27 looking at the proposed crossing location (October 16, 2020).**

**Photo 244: An unnamed watercourse at crossing RA1-4-WC-27 looking upstream (October 16, 2020).**

**Photo 245: View of the unnamed watercourse at crossing RA1-4-WC-27 looking at downstream (October 16, 2020).**

**Photo 246: Aerial imagery at the proposed crossing RA1-4-WC-27 (Project right-of-way in black, flow direction in blue).**

### 3.4.3 Buffaloskin River at Crossing RA1-4-WC-31

A rapid fish habitat assessment was completed on August 19, 2022 on Buffaloskin River at crossing RA1-4-WC-31 (Photos 247 to 250), over approximately 200 m. The watercourse had a permanent flow regime and a defined channel. The surveyed section (including at the proposed crossing location) consisted of flat habitat (Photo 247 and 250) with organic substrates. The surveyed section had an estimated mean wetted width of approximately 7 m, an estimated mean bank-full width of approximately 8 m, and an estimated mean water depth of 0.75 m. Fish cover was provided by woody debris. No fish passage barriers were observed. The riparian area was composed of shrubs and coniferous forest (Photo 248 and 249).

The surveyed section may provide overwintering habitat for small-bodied fish, with water depths estimated to be greater than 0.75 m. There was no potential spawning habitat observed for fish species that spawn over coarse substrates such as Brook Trout, Walleye, and White Sucker. However, suitable spawning habitat could be present for small-bodied fish species that spawn in organic substrates (e.g., Brook Stickleback). Rearing habitat potential may also be present for small-bodied fish.

**Photo 247: The Buffaloskin River looking at the proposed crossing location on RA1-4-WC-31 (August 19, 2022).**

**Photo 248: The Buffaloskin River at crossing RA1-4-WC-31 looking upstream (August 19, 2022).**

**Photo 249: The Buffaloskin River at crossing RA1-4-WC-31 looking downstream (August 19, 2022).**

**Photo 250: Aerial imagery at the proposed crossing RA1-4-WC-31 (ROW in yellow, flow direction in blue).**

### 3.4.4 Unnamed Watercourse at Crossing RA1-WC-13

A rapid fish habitat assessment was completed on June 28, 2022 on the unnamed watercourse at crossing RA1-WC-13 (Photos 251 to 254). The watercourse had a permanent flow regime and a defined channel. The surveyed section (including at the proposed crossing location) consisted of riffle and run habitat (Photo 251 and 254) with some observed boulders. Due to presence of riffles, other coarse substrates such as cobbles are likely present. The surveyed section had an estimated mean wetted width of approximately 9 m, an estimated mean bank-full width of approximately 9 m; the mean water depth could not be estimated from the air. Fish cover was provided by substrates (i.e., boulder). No fish passage barriers were observed. The riparian area was composed of shrubs and grasses (Photo 252 and 253).

The surveyed section has limited overwintering potential for all fish as water depths are estimated to be less than 1 m. Coarse substrates were observed from the air; therefore, there may be potential spawning habitat for fish species that spawn over coarse substrates. However, the composition of the coarse substrate could not be determined from the air. Spawning and rearing habitat could be present for small-bodied fish species.

**Photo 251: An unnamed watercourse at crossing RA1-WC-13 looking at the proposed crossing location (June 28, 2022).**

**Photo 252: An unnamed watercourse at RA1-WC-13 looking upstream (June 28, 2022).**

**Photo 253: An unnamed watercourse at crossing RA1-WC-13 looking downstream (June 28, 2022).**

**Photo 254: Aerial imagery at the proposed crossing RA1-WC-13 (Project right-of-way in black, flow direction in blue).**

## 3.4.5 Unnamed Watercourse at Crossing RA1-WC-15

A rapid fish habitat assessment was completed on June 29, 2022 on the unnamed watercourse at crossing RA1-WC-15 (Photos 255 to 258). The watercourse had a defined channel and flows into Brundrit Lake, approximately 1.5 km downstream. The surveyed section (including at the proposed crossing location) consisted of flat habitat (Photo 255 and 258) with organic substrates. The surveyed reach was flooded at the time of assessment and had an estimated mean wetted width of approximately 22 m, an estimated mean bank-full width of approximately 4 m; the mean water depth could not be estimated from the air. Cover for fish was provided by aquatic vegetation. No fish passage barriers were observed. The riparian area was composed of grasses, shrubs, and coniferous forest (Photo 256 and 257).

The surveyed section likely provides overwintering habitat for large and small-bodied fish due to the proximity to a large waterbody and likely will not freeze to bottom. Aquatic vegetation was observed from the air; therefore, there may be potential spawning habitat for Northern Pike. Spawning and rearing habitat could also be present for small-bodied fish species.

**Photo 255: An unnamed watercourse at crossing RA1-WC-15 looking at the proposed crossing location (June 29, 2022).**

**Photo 256: An unnamed watercourse at crossing RA1-WC-15 looking upstream (June 29, 2022).**

**Photo 257: An unnamed watercourse at crossing RA1-WC-15 looking downstream (June 29, 2022).**

**Photo 258: Aerial imagery at the proposed crossing RA1-WC-15 (Project right-of-way in black, flow direction in blue).**

### 3.4.6 Unnamed Watercourse at Crossing RA1-WC-19

A rapid fish habitat assessment was completed on October 20, 2020 on the unnamed watercourse at crossing RA1-WC-19 (Photos 259 to 262). The watercourse had a defined channel. The surveyed section consisted in flat habitat with organic and silt substrates and was flooded at the time of survey (including at the proposed crossing location) (Photo 261 and 262) with. The surveyed section was flooded at the time of the assessment and had an estimated mean wetted width of approximately 20 m, an estimated mean bank-full width of approximately 2 m, and an estimated mean water depth of 0.5 to 1 m. Fish cover was unable to be determined from the air. Some old beaver dams were present; however, these were not considered to be likely barriers to fish passage. The riparian area was composed of grasses (Photo 259 and 260).

The surveyed section does not provide overwintering habitat for large and small-bodied fish, with water depths estimated to be less than 1 m deep. Coarse substrates and aquatic vegetation were not observed from the air; therefore, there was likely no potential spawning habitat for Brook Trout or Northern Pike. However, suitable spawning and rearing habitat could be present for small-bodied fish species that spawn in organic substrates (e.g., Brook Stickleback).

**Photo 259: An unnamed watercourse at crossing RA1-WC-19 looking upstream (October 20, 2020).**

**Photo 260: An unnamed watercourse at crossing RA1-WC-19 looking downstream (October 20, 2020).**

**Photo 261: An unnamed watercourse at crossing RA1-WC-19 looking at the proposed crossing location (October 20, 2020).**

**Photo 262: Aerial imagery at the proposed crossing RA1-WC-19 (Project right-of-way in black, flow direction in blue).**

## 3.4.7 Unnamed Watercourse at Crossing RA1-WC-19B

A rapid fish habitat assessment was completed on both June 25 and August 19, 2022 on the unnamed watercourse at crossing RA1-WC-19B (Photos 263 to 266). The original route alignment (prior to Rev03 reroute of September 2022), crossed the unnamed watercourse at RA1-WC-19B. With the Rev03 alignment revision, the route no longer crosses at RA1-WC-19B, and now crosses the watercourse only at RA1-WC-20. However, since the Rev03 route alignment it is within 150 m of the original RA1-WC-19B crossing, the results of the assessments are still provided.

The watercourse had a defined channel. The surveyed section (including at the proposed crossing location) was in run habitat (Photo 263 and 266) with organic substrates. The surveyed section had an estimated mean wetted width of approximately 1.5 m, an estimated mean bank-full width of approximately 2 m; the mean water depth could not be estimated from the air. Fish cover was unable to be determined from the air. No fish passage barriers were observed. The riparian area was composed of shrubs and alders (Photo 264 and 265).

Due to dense alder cover, habitat potential for large or small-bodied fish could not be determined from the air. Small-bodied fish habitat may be present, but habitat for large-bodied species is unlikely to be present.

**Photo 263: An unnamed watercourse at crossing RA1-WC-19B looking at the proposed crossing (June 25, 2022).**

**Photo 264: An unnamed watercourse at crossing RA1-WC-19B looking upstream (June 25, 2022).**

**Photo 265: An unnamed watercourse at crossing RA1-WC-19B looking downstream (June 25, 2022).**

**Photo 266: Aerial imagery at the proposed crossing RA1-WC-19B (Project right-of-way in black, flow direction in blue).**

## 3.4.8 Unnamed Watercourse at Crossing RA1-WC-20

A rapid fish habitat assessment was completed on June 25, 2022 on the unnamed watercourse at crossing RA1-WC-20 (Photos 267 to 270). The watercourse had a poorly defined channel. The surveyed section (including at the proposed crossing location) consisted of flat and impounded habitat (Photo 267 and 270) with organic substrates. The surveyed section had an estimated mean wetted width of approximately 2 m, an estimated mean bank-full width of approximately 2 m, and an estimated mean water depth of less than 1 m. Cover for fish was unable to be determined from the air. Some old beaver dams were present, but they were considered unlikely to be a barrier to fish passage. The riparian area was composed of grasses, shrubs, and coniferous forest (Photo 268 and 269).

Small-bodied fish habitat may be present, but due to the presence of impoundments and lack of connectivity, habitat for large-bodied species is limited.

**Photo 267: An unnamed watercourse at crossing RA1-WC-20 looking at the proposed crossing (June 25, 2022).**

**Photo 268: An unnamed watercourse at crossing RA1-WC-20 looking upstream (June 25, 2022).**

**Photo 269: An unnamed watercourse at crossing RA1-WC-20 looking downstream (June 25, 2022).**

**Photo 270: Aerial imagery at the proposed crossing RA1-WC-20 (Project right-of-way in black, flow direction in blue).**

## 3.4.9 NUnnamed Watercourse at Crossing RA1-WC-25

A rapid fish habitat assessment was completed on June 25, 2022 at the site of the unnamed watercourse at crossing RA1-WC-25 (Photos 271 to 273). The watercourse was mapped on the Ontario Hydro Network data layer (MNRF 2011), but upon field verification, was not found to be a watercourse; no bed or banks were present and no signs of bed scour. The site was located in thick alder and coniferous forest. There is the potential that the unnamed drainage provides a hydrological connection between two unnamed ponds (~650 m apart) (Photo 273) during periods of snowmelt; however, due to the lack of bed and banks, the drainage would not be expected to provide habitat for fish.

**Photo 271: View of the unnamed drainage at crossing RA1-WC-25 (June 27, 2022).**

**Photo 272: View of the unnamed drainage at crossing RA1-WC-25 (June 27, 2022).**

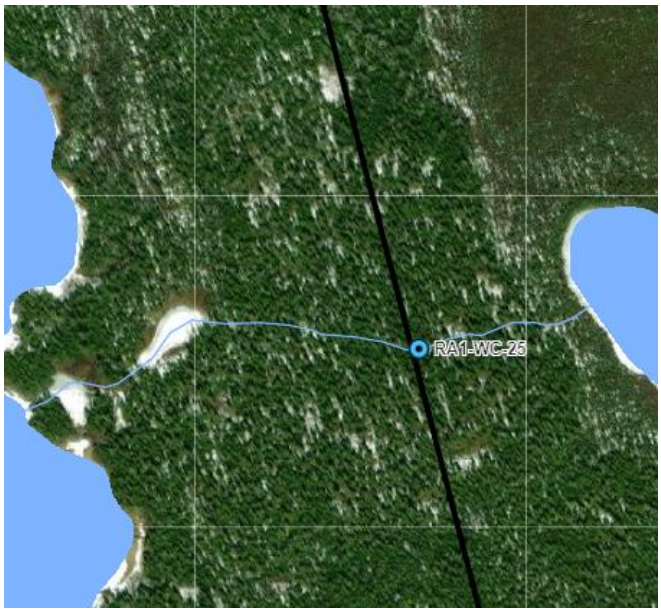


**Photo 273: Aerial imagery at the proposed crossing RA1-WC-25 (Project right-of-way in black).**

## 3.4.10 Unnamed Watercourse at Crossing RA1-WC-31

A rapid fish habitat assessment was completed on July 1, 2022 at the site of the unnamed watercourse at crossing RA1-WC-31 (Photos 274 to 277). Upon field verification, the site was not found to be a watercourse; no bed or banks were present and no signs of bed scour. The surveyed section was in thick alder and coniferous forest. There is potential that the unnamed drainage provides a hydrological connection to a watercourse to the south during periods of snowmelt; however, due to the lack of bed and banks, the drainage would not be expected to provide habitat for fish.

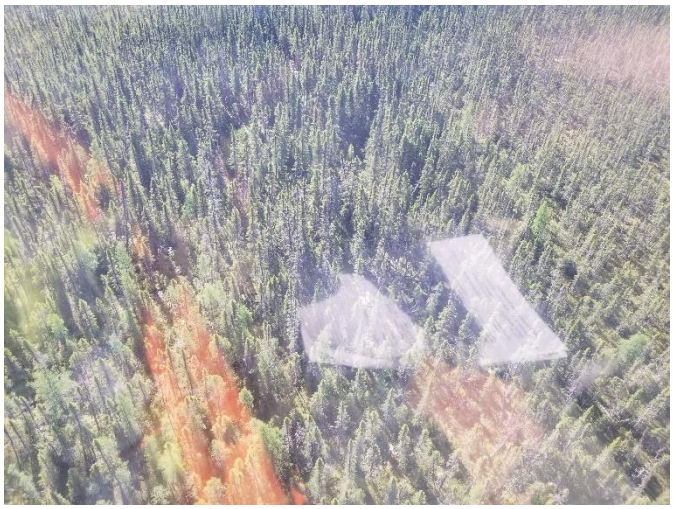

**Photo 274: An unnamed watercourse at crossing RA1-WC-31 (July 1, 2022).**

**Photo 275: An unnamed watercourse at crossing RA1-WC-31 (July 1, 2022).**

**Photo 276: An unnamed watercourse at crossing RA1-WC-31 (July 1, 2022).**

**Photo 277: Aerial imagery at the proposed crossing RA1-WC-31 (Project right-of-way in black).**

## 3.4.11 Unnamed Watercourse at Crossing RA1-WC-33

A rapid fish habitat assessment was completed on June 24, 2022 at the site of the unnamed watercourse at crossing RA1-WC-33 (Photos 278 to 280). The watercourse was mapped on the Ontario Hydro Network (OHN) data layer (MNRF 2011), but upon field verification, was not found to be a watercourse; no bed or banks were present and no signs of bed scour. The surveyed section was in thick alder and coniferous forest. There is the potential that the unnamed drainage provides a hydrological connection to a large watercourse to the north (~250 m downstream) (Photo 280), during periods of snowmelt; however, due to the lack of bed and banks, the drainage would not be expected to provide habitat for fish.

**Photo 278: An unnamed drainage at crossing RA1-WC-33 looking at the proposed crossing location (June 24, 2022).**

**Photo 279: An unnamed drainage at crossing RA1-WC-33 looking upslope (i.e., south) (September 12, 2021).**

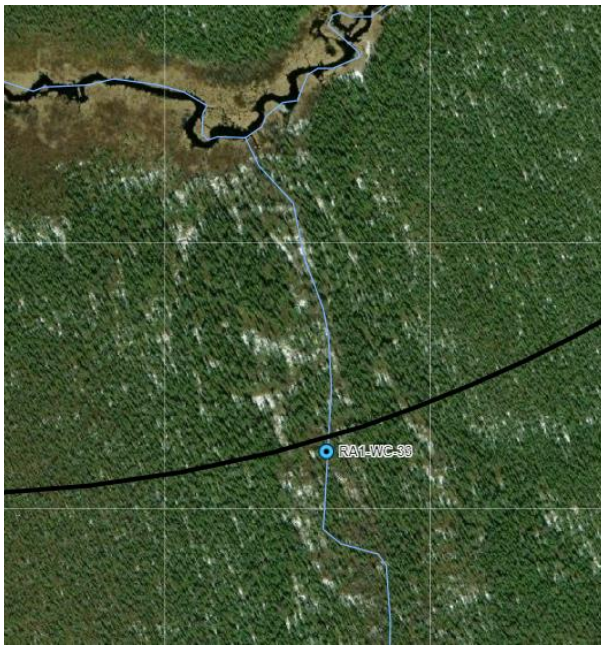


**Photo 280: Aerial imagery at the proposed crossing RA1-WC-33 (Project right-of-way in black).**

## 3.4.12 Unnamed Watercourse at Crossing RA1-WC-38

A rapid fish habitat assessment was completed on October 17, 2020 on the unnamed watercourse at crossing RA1-WC-38 (Photos 281 to 284). The watercourse was surveyed over a 200 m section. A poorly defined channel was observed. The crossing location had standing areas of water in a poorly defined channel with organic substrates. The surveyed section had an estimated wetted width of 1.5 m in the channelized area. Mean water depth was estimated to be under 1 m. No barriers to fish passage were observed. Overhanging vegetation and woody debris were observed. The riparian area was composed of shrubs and coniferous forest.

The surveyed section does not provide overwintering habitat for large and small-bodied fish, due to shallow water depths and lack of connectivity. Small-bodied fish habitat may be present, but due to the isolated sections of standing water (i.e., and lack of connectivity) and shallow water depths, habitat for large-bodied species is limited.

**Photo 281: An unnamed watercourse at crossing RA1-WC-38 looking at the proposed crossing location on (October 17, 2022).**

**Photo 282: An unnamed watercourse at proposed crossing RA1-WC-38 looking upstream. Ponded/standing water and poorly defined channel observed (red arrow) (October 17, 2022).**

**Photo 283: An unnamed watercourse at crossing RA1-WC-38 (October 17, 2022).**

**Photo 284: Aerial imagery at the proposed crossing RA1-WC-38 (Project right-of-way in black, direction of flow in blue arrow).**

## 3.4.13 Unnamed Watercourse at Crossing RA1-WC-39

A rapid fish habitat assessment was completed on October 17, 2020 on the unnamed watercourse at crossing RA1-WC-39 (Photos 285 to 288). The watercourse was surveyed over a 200 m section. A poorly defined channel was observed that flowed into Gourlie Creek, a fish-bearing watercourse, approximately 230 m downstream. The crossing location had standing areas of water in a poorly defined channel with organic substrates. The surveyed section had an estimated wetted width of 2 m in the channelized areas. Mean water depth was estimated to be under 1 m. Intermittent dry spots/low flow in the channelized areas may be a potential barrier to fish passage. Overhanging vegetation and woody debris were observed. The riparian area was composed of shrubs and coniferous forest.

The surveyed section does not provide overwintering habitat for large and small-bodied fish, due to shallow water depths and lack of connectivity. Small-bodied fish habitat may be present, but due to the isolated sections of standing water (i.e., and lack of connectivity) and shallow water depths, habitat for large-bodied species is limited.

**Photo 285: An unnamed watercourse at crossing RA1-WC-39 looking at the proposed crossing location on (October 17, 2022).**

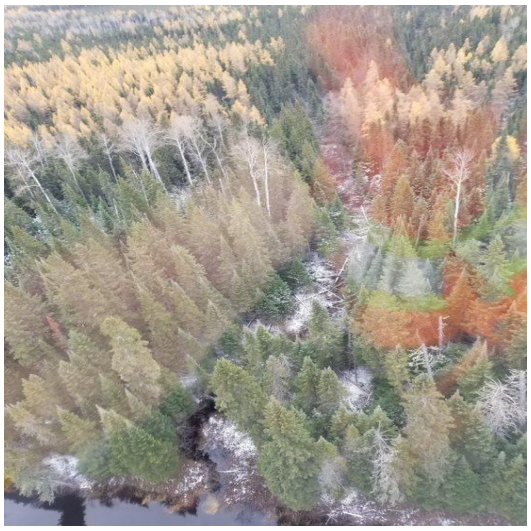

**Photo 286: An unnamed watercourse at crossing RA1-WC-39 looking upstream (October 17, 2022).**

**Photo 287: Outflow to Gourlie Creek downstream of proposed crossing RA1-WC-39 (October 17, 2022).**

**Photo 288: Aerial imagery at the proposed crossing RA1-WC-39 (Project right-of-way in black, flow direction with blue arrow).**

## 3.4.14 Gourlie Creek at Crossing RA1-WC-40

A rapid fish habitat assessment was completed on August 24, 2022 on Onagwabiihkan'iih' Ziibih (Oji-Cree name)/ Evening Hunting River (local name)/ Gourlie Creek at crossing RA1-WC-40 (Photos 288 to 291), over approximately 600 m. The watercourse had a permanent flow regime and a defined channel. The surveyed section (including at the proposed crossing location) consisted of flat habitat (Photo 288 and 291), but bed substrates could not be observed from the air. The surveyed section had an estimated mean wetted width of approximately 14 m, an estimated mean bank-full width of approximately 17 m, and an estimated mean water depth greater than 1 m. Fish cover was unable to be determined from the air. No fish passage barriers were observed. The riparian area was composed of shrubs and coniferous forest (Photo 289 and 290).

The surveyed section may provide overwintering and rearing habitat for large and small-bodied fish, with water depths estimated to be greater than 1 m deep. Since bed substrates and the aquatic vegetation could not be observed from the air, spawning potential could not be determined from the air. However, due to its large width and depth, and connectivity to the Albany River, Gourlie Creek is suitable for both small and large-bodied fish species.

**Photo 288: Gourlie Creek at crossing RA1-WC-40 looking at the proposed crossing (August 24, 2022).**

**Photo 289: Gourlie Creek at crossing RA1-WC-40 looking upstream (August 24, 2022).**

**Photo 290: Gourlie Creek at crossing RA1-WC-40 looking downstream (August 24, 2022).**

**Photo 291: Aerial imagery at the proposed crossing RA1-WC-40 (Project right-of-way in black, flow direction in blue).**

## 3.4.15 Unnamed Watercourse at Crossing RA1-WC-53

A rapid fish habitat assessment was completed on June 28, 2022 on the unnamed watercourse at crossing RA1-WC-53 (Photos 292 to 296). The watercourse had a mostly defined channel, with some sections of poor definition due to ponding in the bog/wetland area. The surveyed section (including at the proposed crossing location) consisted of flat habitat (Photo 292 and 295) with organic and silt substrates. The surveyed section had an estimated mean wetted width of approximately 68 m, an estimated mean bank-full width of approximately 68 m, and an estimated mean water depth of approximately 0.75 m. Cover for fish was unable to be determined from the air. No barriers to fish passage were observed at the time of the survey; however, an old beaver dam was present in the section that may be a barrier during low flows. The riparian area was composed of bog/wetland, shrubs and coniferous forest (Photo 293 and 294).

The surveyed section has limited overwintering potential for fish as water depths are estimated to be less than 1 m. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

**Photo 292: An unnamed watercourse at crossing RA1-WC-53 looking across at the proposed crossing location (June 28, 2022).**

**Photo 293: An unnamed watercourse at crossing RA1-WC-53 looking upstream (June 28, 2022).**

**Photo 294: An unnamed watercourse at crossing RA1-WC-53 looking downstream (June 28, 2022).**

**Photo 295: Aerial imagery at the proposed crossing RA1-WC-53 (Project right-of-way in black, flow direction in blue).**

## 3.4.16 Unnamed Watercourse at Crossing RA1-WC-54

A rapid fish habitat assessment was completed on June 28, 2022 on the unnamed watercourse at crossing RA1-WC-54 (Photos 296 to 299). The watercourse had a mostly defined channel, with some sections of poor definition due to ponding in the bog/wetland area. The surveyed section (including at the proposed crossing location) was in a ponded area of a bog/wetland and consisted of flat habitat with organic substrates in the channelized sections (Photo 296 and 299). The surveyed section had an estimated mean wetted width of approximately 35 to 40 m, and an estimated mean water depth of less than 1 m. Cover for fish was not able to be determined from the air, but likely consisted of instream vegetation. No barriers to fish passage were observed; some old beaver dams were present, but they did not block passage. The riparian area was composed of bog/wetland, shrubs, and coniferous forest (Photo 297 and 298).

The surveyed section has limited overwintering potential for all fish as water depths are estimated to be less than 1 m. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

**Photo 296: An unnamed watercourse at crossing RA1-WC-54 looking at proposed crossing location (June 28, 2022).**

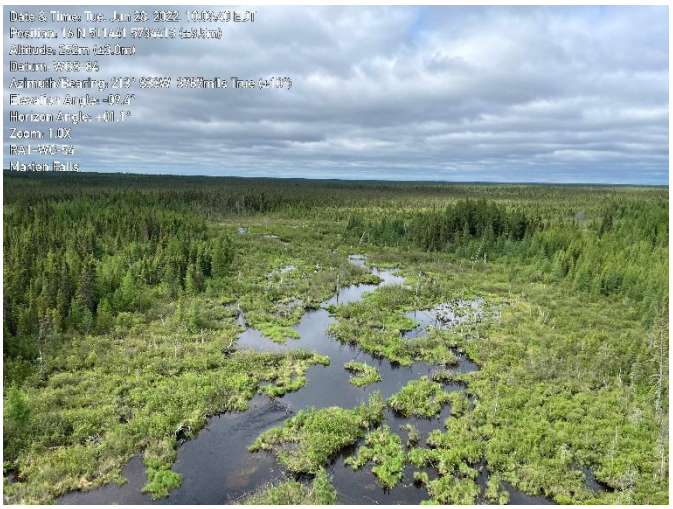

**Photo 297: An unnamed watercourse at crossing RA1-WC-54 looking upstream (June 28, 2022).**

**Photo 298: An unnamed watercourse at crossing RA1-WC-54 looking downstream (June 28, 2022).**

**Photo 299: Aerial imagery at the proposed crossing RA1-WC-54 (Project right-of-way in black, flow direction in blue).**

## 3.4.17 Unnamed Watercourse at Crossing RA1-WC-56

Rapid fish habitat assessments were completed on October 22, 2020 and June 30, 2022 on the unnamed watercourse at crossing RA1-WC-56 (Photos 300 to 303), over approximately 250 m. The watercourse had a poorly defined channel in a flooded, impounded area. The surveyed section (including at the proposed crossing location) was in a wetland with flat habitat with organic substrates in the channelized sections (Photo 300 and 303). The surveyed section had an estimated mean wetted width of approximately 50 m, an estimated mean bank-full width of approximately 0.5 m, and an estimated mean water depth of less than 0.5 m in the channelized sections. Cover for fish was unable to be determined from the air. Barriers to fish passage may be present due to the lack of connectivity between some of the ponded areas. The riparian area was composed of wetland/bog, grasses, and coniferous forest (Photo 301 and 302).

The surveyed section has limited overwintering potential for all fish as water depths are estimated to be less than 0.5 m. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than potentially for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

**Photo 300: An unnamed watercourse at crossing RA1-WC-56 looking at the proposed crossing location (June 30, 2022).**

**Photo 301: An unnamed watercourse at crossing RA1-WC-56 looking upstream (June 30, 2022).**

**Photo 302: An unnamed watercourse at crossing RA1-WC-56 looking downstream (June 30, 2022).**

**Photo 303: Aerial imagery at the proposed crossing RA1-WC-56 (Project right-of-way in black).**

## 3.4.18 Unnamed Watercourse at Crossing RA4B-WC-03

A rapid fish habitat assessment was completed on June 25, 2022 on the unnamed watercourse at crossing RA4B-WC-03 (Photos 304 to 307). A poorly defined channel was present, with sections of ponding and standing water with an estimated wetted width of less than 5 m in flat habitat. The watercourse flows into McCaw Lake to the northeast. Bed substrates and were unable to be determined from the air due to dense alder and conifer cover.

Due to the dense tree cover, habitat potential for large or small-bodied fish could not be determined from the air. Small-bodied fish habitat may be present, but habitat for large-bodied species is unlikely to be present.

**Photo 304: An unnamed watercourse at crossing RA4B-WC-03 near the proposed crossing (June 25, 2022). Note channel visible among alders (red arrows).**

**Photo 305: An unnamed watercourse at crossing RA4B-WC-03 near the proposed crossing (June 25, 2022).**

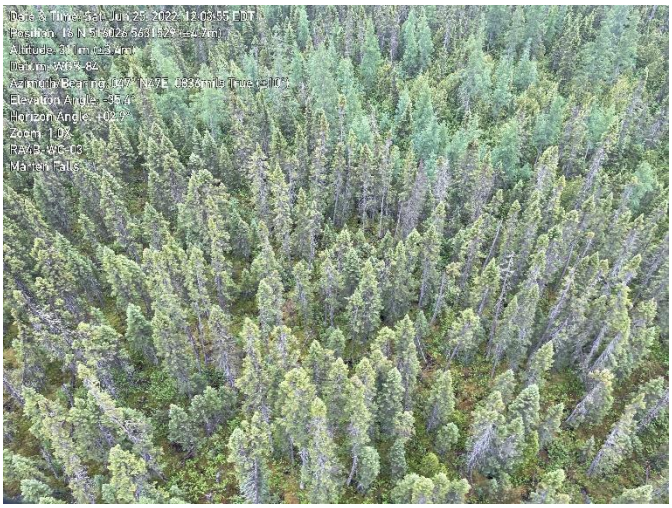

**Photo 306: An unnamed watercourse at crossing RA4B-WC-03 near the proposed crossing (June 25, 2022).**

**Photo 307: Aerial imagery at the proposed crossing RA4B-WC-03 (Project right-of-way in black, flow direction in blue).**

## 3.4.19 Unnamed Watercourse at Crossing RA4B-WC-04

A rapid fish habitat assessment was completed on June 28, 2022 on the unnamed watercourse at crossing RA4B-WC-04 (Photos 308 to 311). A poorly defined channel was present, with sections of ponding and standing water with an estimated wetted width of less than 5 m in flat habitat. The watercourse flows into an unnamed lake to the northeast (Photo 311). Bed substrates and were unable to be determined from the air due to dense alder and conifer cover.

Due to the dense tree cover, habitat potential for large or small-bodied fish could not be determined from the air. Small-bodied fish habitat may be present, but habitat for large-bodied species is unlikely to be present.

**Photo 308: An unnamed watercourse at crossing RA4B-WC-04 near the proposed crossing location (June 28, 2022).**

**Photo 309: An unnamed watercourse at crossing RA4B-WC-04 near the proposed crossing location (June 28, 2022). Note ponded water visible among alders (red arrows).**

**Photo 310: View of the unnamed watercourse near the proposed crossing location RA4B-WC-04 (June 28, 2022).**

**Photo 311: Aerial imagery at the proposed crossing RA4B-WC-04 (Project right-of-way in black, flow direction indicated by blue arrow).**

## 3.4.20 Unnamed Watercourses at Crossings RA4-WC-06, RA4-WC-07, RA4-WC-08, RA4-WC-09, RA4-WC-10, and RA4-WC-11

Rapid fish habitat assessments were completed on June 26, 2022 at the unnamed potential watercourses at crossings RA4-WC-06, RA4-WC-07, RA4-WC-08, RA4-WC-09, RA4-WC-10, and RA4-WC-11 (Photos 312 to 315). All six crossings were identified on the watercourse mapping layer, but the rapid assessment indicates that they are located in a wetland complex with multiple flow paths throughout (Photo 312 and 315). The drainage paths would convey water throughout the wetland, but no defined watercourses were present. Fish passage in the drainage paths is unlikely.

The drainage paths do provide hydrological connections within the wetland complex; however, due to their lack of bed and banks, and the likelihood of drying up in the summer, the drainages would not be expected to provide habitat for fish.

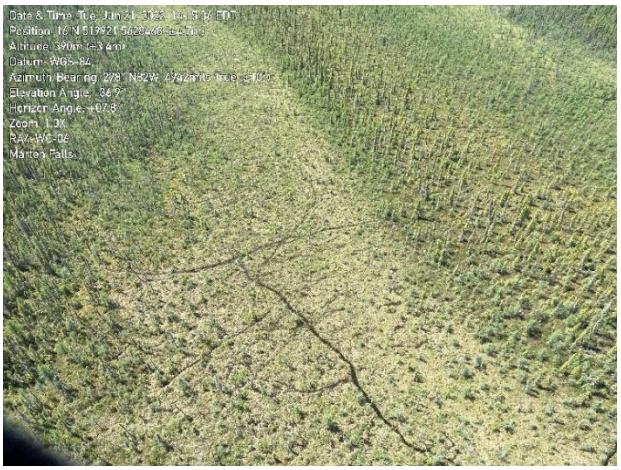


**Photo 312: View of the drainage paths in the wetland complex looking at the proposed crossing location RA4-WC-06 (June 26, 2022).**

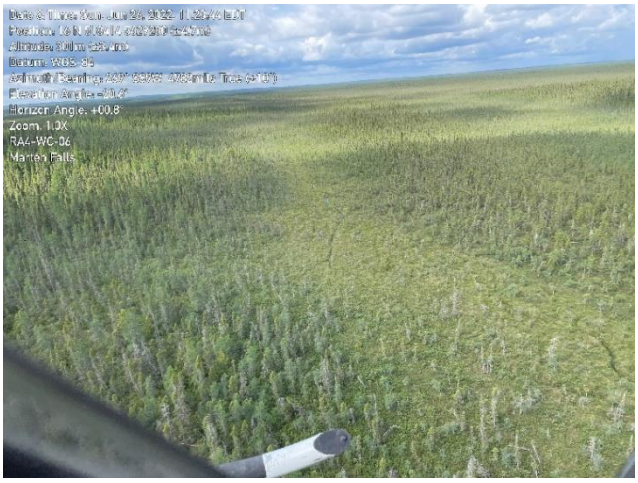


**Photo 313: View of the drainage paths in the wetland complex looking upstream RA4-WC-06 (June 26, 2022).**

**Photo 314: View of the drainage paths in the wetland complex looking downstream RA4-WC-06 (June 26, 2022).**

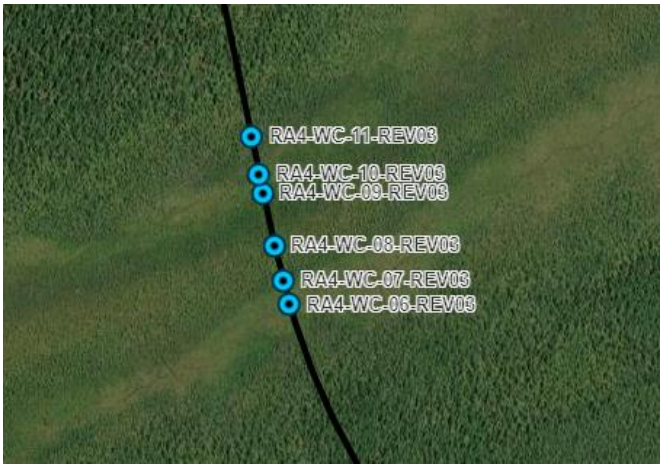


**Photo 315: Aerial imagery at the proposed crossings RA4-WC-06 to 11 in the wetland complex (Project right-of-way in black).**

## 3.4.21 Unnamed Watercourse at Crossing RA4-WC-23

A rapid fish habitat assessment was completed on September 13, 2021 on the unnamed watercourse at crossing RA4-WC-23 (Photos 316 to 319), over approximately 200 m. A poorly defined channel was present but was a flooded/impounded flow path through the wetland without any defined bed or banks. The surveyed section (including at the proposed crossing location) was in a flooded impoundment with organic substrates (Photo 316 and 319). The surveyed section had an estimated mean wetted width of approximately 60 m, an estimated mean bank-full width of approximately 3.5 m in the channelized section, and an estimated mean water depth less than 0.75 m. Fish cover was not able to be determined from the air. Fish passage may be impeded by a lack of connectivity in the wetland. The riparian area was composed of bog/wetland, shrubs, and standing tree snags (Photo 317 and 318).

The surveyed section has limited overwintering potential for all fish as water depths are estimated to be less than 0.75 m. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than potentially for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

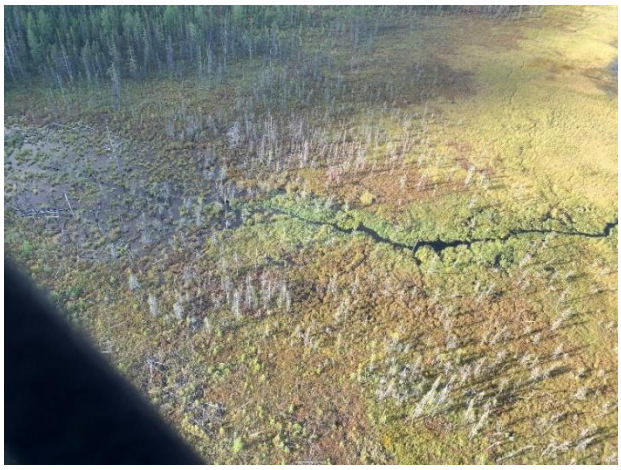

**Photo 316: An unnamed watercourse at crossing RA4-WC-23 looking at the proposed crossing location (September 13, 2021).**

**Photo 317: An unnamed watercourse at crossing RA4-WC-23 looking downstream (September 13, 2021).**

**Photo 318: An unnamed watercourse at crossing RA4-WC-23 looking upstream (September 13, 2021).**

**Photo 319: Aerial imagery at the proposed crossing RA4-WC-23 (Project right-of-way in black, flow direction in blue).**

## 3.4.22 Unnamed Watercourse at Crossing RA4-WC-29

A rapid fish habitat assessment was completed on June 27, 2022 on the unnamed watercourse at crossing RA4-WC-29 (Photos 320 to 323), over approximately 200 m. A poorly defined channel was present but was located in a wetland with sections of ponding and standing water. The channelized area of the surveyed section (including the proposed crossing location) was in run habitat with organic substrates (Photo 320 and 323) and had an estimated mean wetted width of approximately 8 m, an estimated mean bank-full width of approximately 8 m, and an estimated mean water depth of less than 1 m. Fish cover was not able to be determined from the air. No barriers to fish passage were observed. The riparian area was composed of bog/wetland, shrubs, and coniferous forest (Photo 321 and 322).

The surveyed section has no overwintering potential for all fish due to shallow water depths and limited connectivity. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than potentially for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

**Photo 320: An unnamed watercourse at crossing RA4-WC-29 looking at the proposed crossing (June 27, 2022).**

**Photo 321: An unnamed watercourse at crossing RA4-WC-29 looking upstream (June 27, 2022).**

**Photo 322: An unnamed watercourse at crossing RA4-WC-29 looking downstream (June 27, 2022).**

**Photo 323: Aerial imagery at the proposed crossing RA1-WC-29 (Project right-of-way in black, flow direction in blue).**

## 3.4.23 Unnamed Watercourse at Crossing RA4-WC-32

A rapid fish habitat assessment was completed on July 1, 2022 on the unnamed watercourse at crossing RA4-WC-32 (Photos 324 to 327), over approximately 250 m. A poorly defined channel was present but was a flooded/impounded flow path through a wetland without any defined bed or banks. The surveyed section (including at the proposed crossing location) was composed of flat and impounded habitat with organic substrates (Photo 324 and 327) in the channelized sections. The surveyed section had an estimated mean wetted width of approximately 50 m, an estimated mean bank-full width of approximately 3 m in the channelized sections, and an estimated mean water depth of less than 1 m. Cover for fish was unable to be determined from the air but likely consisted of instream aquatic vegetation. A large beaver dam was noted downstream of the crossing, which may be a barrier to fish passage. Fish passage may also be impeded by ponding, multiple flow paths, and a lack of connectivity in the wetland. The riparian area was composed of bog/wetland, shrubs, and coniferous forest (Photo 325 and 326).

The surveyed section has no overwintering potential for all fish due to shallow water depths and limited connectivity. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than potentially for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

**Photo 324: An unnamed watercourse at crossing RA4-WC-32 looking at the proposed crossing location (July 1, 2022).**

**Photo 325: An unnamed watercourse at crossing RA4-WC-32 looking upstream (July 1, 2022).**

**Photo 326: An unnamed watercourse at crossing RA4-WC-32 looking downstream (July 1, 2022).**

**Photo 327: Aerial imagery at the proposed crossing RA4-WC-32 (Project right-of-way in black, flow direction in blue).**

## 3.4.24 Unnamed Watercourse at Crossing RA4-WC-43

A rapid fish habitat assessment was completed on October 17, 2020 on the unnamed watercourse at crossing RA4-WC-43 (Photos 328 to 331), over approximately 200 m. A poorly defined channel was present but was a flooded/impounded flow path through a wetland without any defined bed or banks. The surveyed section (including at the proposed crossing location) was in impounded habitat with organic substrates (Photo 328 and 331). The drainage flows into an unnamed lake to the northeast. Wetted width was estimated to be 25 m, with mean water depths less than 0.75 m. Cover for fish was not able to be determined from the air. A beaver dam was observed which may cause a barrier to fish passage during low flows. Fish passage may also be impeded by wetland ponding, and areas that would dry up in summer months. The riparian area was composed of bog/wetland, shrubs, and coniferous forest (Photo 329 and 330).

The surveyed section has no overwintering potential for all fish due to shallow water depths and limited connectivity. Small-bodied fish spawning and rearing habitat may be present, but habitat for large-bodied species is unlikely to be present, other than potentially for Northern Pike with the presence of aquatic vegetation in the bog/wetland.

**Photo 328: An unnamed watercourse at crossing RA4-WC-43 looking downstream (October 17, 2020).**

**Photo 329: An unnamed watercourse at crossing RA4-WC-43 looking upstream (October 17, 2020).**

**Photo 330: An unnamed watercourse at crossing RA4-WC-43 looking at the proposed crossing location (October 17, 2020).**

**Photo 331: Aerial imagery at the proposed crossing RA4-WC-43 (Project right-of-way in black, flow direction in blue).**

# 4. Summary and Conclusions

## 4.1 Fish Habitat

A total of 168 waterbodies were identified to potentially be crossed by Route Alternatives 1 and 4 for the Project. Aerial reconnaissance was completed at 164 waterbody crossings from which 107 were determined to be watercourses with defined bed and banks. Fish habitat field surveys were completed between 2019 and 2022 at 85 potential waterbody crossings by either a low-level rapid habitat assessment, or by detailed fish and fish habitat assessment (**Table 4-1**).

Based on the results of the field surveys and taking a conservative approach, fish habitat potential was present at 91 of the crossings. A total of 73 potential crossings were on drainage paths that did not have bed and banks, and thus determined not to be waterbodies, and found to have no fish habitat. These crossings have been classified as drainages/undefined crossings, removed from the waterbody crossing list, and not considered to have fish or fish habitat for the effects assessment.

**Table 4-1: Fish Habitat Potential in Waterbody Crossings Surveyed by Rapid or Detailed Habitat Assessments from 2019 to 2022.**

| Waterbody Crossing ID | Waterbody Name | Fish Habitat Potential | Rationale |
|---|---|---|---|
| RA1-4-WC-01 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-02 | Dusey River | Y | Fish observed; variety of habitat units and mixed substrates is suitable for a range of small and large-bodied fish species. Overwintering habitat present. |
| RA1-4-WC-07 | Unnamed | Y | No fish captured; habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-09B | Unnamed | Y | No fish captured; habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-10 | Unnamed | Y | No fish captured; habitat present for small-bodied fish species adapted to waterbodies with fine substrates. |
| RA1-4-WC-19 | Unnamed | Y | No fish captured; habitat present for fish species adapted to waterbodies with fine substrates and abundant vegetation. |
| RA1-4-WC-21 | Unnamed | Y | Fish observed; habitat present for fish species adapted to fine substrates and abundant vegetation. |
| RA1-4-WC-27 | Unnamed | Y | No fish captured; habitat present for fish species adapted to waterbodies with fine substrates. |
| RA1-4-WC-31 | Unnamed | Y | No fish sampling completed; suitable habitat present for fish adapted to fine substrates. |
| RA1-4-WC-33 | Unnamed | Y | No fish sampling completed; suitable habitat present for small-bodied fish adapted to fine substrates. |
| RA1-4-WC-35 | Unnamed | Y | No fish captured; suitable habitat present for small-bodied fish. Overwintering habitat present. |
| RA1-4-WC-36 | Unnamed | Y | No fish captured; suitable habitat present for fish adapted to fine substrates. Overwintering habitat present. |
| RA1-4-WC-37 | Unnamed | Y | No fish captured; habitat suitable for species adapted to fine substrates. |

| Waterbody Crossing ID | Waterbody Name | Fish Habitat Potential | Rationale |
|---|---|---|---|
| RA1-WC-01 | Unnamed | Y | No fish captured; variety of habitat units and mixed substrates is suitable for a range of small and large-bodied fish species. Overwintering habitat present. |
| RA1-WC-02 | Unnamed | Y | No fish captured; habitat suitable for a range of small and large-bodied fish due to depths and mixed substrates. Overwintering habitat present. |
| RA1-WC-05 | Ogoki River | Y | No fish captured; large and small-bodied fish historically documented. Habitat suitable for a range of fish due to depths and mixed substrates. Overwintering habitat present. |
| RA1-WC-09 | Unnamed | Y | Fish captured; habitat suitable for small-bodied fish species. |
| RA1-WC-11 | Ogoki River | Y | Fish captured; habitat suitable for a range of fish due to depths and mixed substrates. Large and small-bodied fish historically documented. Overwintering habitat present. |
| RA1-WC-13 | Unnamed | Y | No fish sampling completed; habitat suitable for small-bodied fish and Northern Pike. |
| RA1-WC-14 | Unnamed | Y | No fish captured; habitat suitable for small-bodied fish species adapted to fine substrates and low dissolved oxygen. |
| RA1-WC-15 | Unnamed | Y | No fish sampling completed; habitat suitable for small-bodied fish and Northern Pike. |
| RA1-WC-16 | Unnamed | Y | No fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-17 | Unnamed | Y | Fish captured; habitat present for small and large-bodied fish. Overwintering habitat present. |
| RA1-WC-19 | Unnamed | Y | No fish sampling was completed; habitat is suitable for small-bodied fish adapted to fine substrates. |
| RA1-WC-19B | Unnamed | Y | No fish sampling was completed; suitable habitat may be present for small-bodied fish. |
| RA1-WC-20 | Unnamed | Y | No fish sampling was completed; habitat suitable for small-bodied fish species adapted to organic substrates. |
| RA1-WC-22 | Unnamed | Y | Fish captured; habitat suitable for small and large-bodied fish. Limited overwintering habitat |
| RA1-WC-23 | Unnamed | Y | No fish captured; suitable habitat for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-25 | Unnamed | N | Not a watercourse. No bed or banks present, no signs of bed scour. Unnamed drainage that provides a hydrological connection between two waterbodies. No fish habitat. |
| RA1-WC-26 | Unnamed | Y | No fish captured; low habitat potential to for small-bodied fish. |
| RA1-WC-27 | Albany River | Y | No fish sampling completed; large and small-bodied fish historically documented. Habitat suitable for a wide range of fish. Overwintering habitat present. |
| RA1-WC-28 | Unnamed | Y | No fish captured; habitat suitable for small-bodied fish. |
| RA1-WC-30 | Unnamed | Y | Fish captured; habitat suitable for both large and small-bodied fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-31 | Unnamed | N | Not a watercourse. No bed or banks present, no signs of bed scour. Unnamed drainage that provides a hydrological connection to a watercourse. No fish habitat. |
| RA1-WC-32 | Unnamed | Y | No fish captured; habitat suitable for both large and small-bodied fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-33 | Unnamed | N | Not a watercourse. No bed or banks present, no signs of bed scour. Unnamed drainage that provides a hydrological connection to a watercourse. No fish habitat. |

| Waterbody Crossing ID | Waterbody Name | Fish Habitat Potential | Rationale |
|---|---|---|---|
| RA1-WC-38 | Unnamed | Y | No fish sampling was completed; habitat may be suitable for small-bodied fish species adapted to fine substrates. Isolated sections of standing water. |
| RA1-WC-39 | Unnamed | Y | No fish sampling was completed; habitat may be suitable for small-bodied fish species adapted to fine substrates. Isolated sections of standing water. |
| RA1-WC-40 | Gourlie Creek | Y | No fish sampling was completed; the deep, wide, flat habitat likely provides overwintering and spawning habitat. |
| RA1-WC-41 | Unnamed | Y | Fish captured; habitat suitable for both large and small-bodied fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA1-WC-51 | Wabassi River | Y | No fish captured; habitat suitable for both large and small-bodied fish. Overwintering habitat present. |
| RA1-WC-52 | Unnamed | Y | No fish captured; habitat suitable for fish species adapted to fine/organic substrates and aquatic vegetation. |
| RA1-WC-53 | Unnamed | Y | No fish sampling was completed; habitat may be present for small-bodied fish species adapted to fine substrates and Northern Pike. |
| RA1-WC-54 | Unnamed | Y | No fish sampling was completed. Habitat may be present for small-bodied fish species adapted to fine substrates and Northern Pike. |
| RA1-WC-56 | Unnamed | Y | No fish sampling was completed; habitat may be present for small-bodied fish species adapted to fine substrates and Northern Pike. |
| RA1-WC-57 | Unnamed | Y | No fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. |
| RA1-WC-66 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present for small-bodied fish. |
| RA1-WC-67 | Unnamed | Y | No fish captured; habitat suitable for species adapted to fine substrates. Overwintering habitat present. |
| RA4-WC-00 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. |
| RA4B-WC-01 | Ogoki River | Y | No fish sampling completed, habitat suitable for a range of fish due to depths and mixed substrates. Large and small-bodied fish historically documented. Overwintering habitat present. |
| RA4B-WC-02 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to organic substrates and aquatic vegetation. |
| RA4B-WC-03 | Unnamed | Y | No fish sampling was completed; poorly defined channel with sections of ponded water that flows into McCaw Lake. Habitat may be present for small-bodied fish species. |
| RA4B-WC-04 | Unnamed | Y | No fish sampling was completed; poorly defined channel with sections of ponded water that flows into an unnamed lake. Habitat may be present for small-bodied fish species. |
| RA4-WC-02 | Colpitts Creek | Y | Fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-05 | Unnamed | Y | No fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |

| Waterbody Crossing ID | Waterbody Name | Fish Habitat Potential | Rationale |
|---|---|---|---|
| RA4-WC-06 | Unnamed | N | Not watercourses. No bed or banks present, no signs of bed scour. Six drainage pathways in a wetland complex with multiple flow paths throughout. No fish habitat. |
| RA4-WC-07 | | | |
| RA4-WC-08 | | | |
| RA4-WC-09 | | | |
| RA4-WC-10 | | | |
| RA4-WC-11 | | | |
| RA4-WC-12 | Unnamed | Y | No fish captured; habitat suitable for fish species adapted to fine substrates and aquatic vegetation. |
| RA4-WC-17 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to organic/fine substrates and aquatic vegetation. |
| RA4-WC-18 | Rock Beaver Creek | Y | Fish observed; habitat suitable for a range of small and large-bodied fish species. Overwintering habitat present. |
| RA4-WC-19 | Unnamed | Y | No fish captured; habitat present for fish species adapted to fine substrates and aquatic vegetation. |
| RA4-WC-21 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to organic/fine substrates and aquatic vegetation. |
| RA4-WC-22 | Unnamed | Y | Fish captured; habitat suitable for fish that spawn in riffles or rapids with course substrates. |
| RA4-WC-23 | Unnamed | Y | No fish sampling was completed; poorly defined channel/flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. |
| RA4-WC-24 | Unnamed | Y | Fish captured; habitat suitable for fish species adapted to fine/organic substrates. The watercourse connects two unnamed lakes/ponds. |
| RA4-WC-25 | Unnamed | Y | Fish captured; habitat suitable for spawners over coarse substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-26 | Unnamed | Y | Fish captured; habitat suitable for a range of fish due to depths and mixed substrates. |
| RA4-WC-27 | Unnamed | Y | No fish captured; but habitat present for fish species adapted to fine substrates and aquatic vegetation. Overwintering habitat present. |
| RA4-WC-29 | Unnamed | Y | No fish sampling was completed; poorly defined channel in a wetland with sections of ponded water. Habitat may be present for small-bodied fish species. |
| RA4-WC-31 | Unnamed | Y | No fish captured; habitat suitable for fish that are adapted to fine/organic substrates. |
| RA4-WC-32 | Unnamed | Y | No fish sampling was completed; poorly defined channel/flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. |
| RA4-WC-34 | Albany River | Y | No fish sampling completed; large and small-bodied fish historically documented. Habitat suitable for a wide range of fish. Overwintering habitat present. |
| RA4-WC-35 | Unnamed | Y | No fish sampling was completed. Habitat suitable for fish that are adapted to fine/organic substrates. |
| RA4-WC-37 | Unnamed | Y | No fish captured; habitat suitable for fish that are adapted to fine/organic substrates and aquatic vegetation. |
| RA4-WC-41 | Gourlie Creek | Y | No fish captured, the deep, wide, flat habitat likely provides overwintering and spawning habitat. |
| RA4-WC-42 | Unnamed | Y | No fish captured; habitat suitable for fish that are adapted to fine/organic substrates, aquatic vegetation and woody debris. |

| Waterbody Crossing ID | Waterbody Name | Fish Habitat Potential | Rationale |
|---|---|---|---|
| RA4-WC-43 | Unnamed | Y | No fish sampling was completed. Poorly defined channel/flow path through a wetland. Habitat may be present for small-bodied fish species and Northern Pike. |
| RA4-WC-45 | Unnamed | Y | No fish captured; habitat suitable for fish that are adapted to fine/organic substrates, flooded vegetation and woody debris. |
| RA4-WC-55 | Wabassi River | Y | No fish captured, habitat suitable for all fish due to wide variety of substrates available. Overwintering habitat present. |
| RA4-WC-57 | Unnamed | Y | No fish sampling completed; habitat suitable for fish that are adapted to fine/organic substrates and aquatic vegetation. |
| RA4-WC-58 | Unnamed | Y | No fish sampling completed; habitat suitable for fish that are adapted to fine/organic substrates and woody debris. |

## 4.2 Fish Community

Fish were captured or observed at 16 of the 46 sites sampled. A total of 910 fish and 17 fish species were captured during the field programs completed between 2019 and 2022:

- three sportfish species (4 Burbot, 6 Northern Pike [*oji-cree name*; najwabe], and 3 Yellow Perch [*oji-cree name*; ajaawes])
- one non-sport large-bodied species (12 White Sucker)
- thirteen small-bodied forage species (2 Blacknose Shiner, 158 Brook Stickleback, 70 Common Shiner, 255 Finescale Dace, 4 Fathead Minnow, 15 Iowa Darter, 13 Johnny Darter, 1 Lake Chub, 10 Longnose Dace, 1 Mottled Sculpin, 134 Northern Redbelly Dace, 218 Pearl Dace, and 2 Trout Perch).

Small-bodied forage fish species, in particular Finescale Dace, were the dominant fish captured during the field surveys.

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# Annex A

**Table A-1: Aerial Reconnaissance 2019**

| Waterbody Crossing ID | Waterbody Type | Route | UTM 16U NAD 83 | | Habitat Unit | Estimate of wetted width (m) | Bed/Banks Description | Additional Notes from Aerial Reconnaissance |
|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | |
| **RA1-4-WC-01** | Watercourse | Alternative-1-and-Alternative-4 | 519622 | 5666913 | F2 | 3 | Poorly-defined bed and banks | The section is made up of entirely flats. |
| **RA1-4-WC-02** | Watercourse | Alternative-1-and-Alternative-4 | 520105 | 5676979 | F1 | 31 | Well-defined bed and banks | Riffle sequences upstream. Potential gravel bar downstream from crossing location. Flats and runs. |
| **RA1-4-WC-07** | Watercourse | Alternative-1-and-Alternative-4 | 519091 | 5682476 | F1 | 6 | Moderately-defined bed and banks | Wetted width may stretch the floodplain at certain points. Banks are poorly defined. Sedge dominated wetted area. |
| **RA1-4-WC-09B** | Watercourse | Alternative-1-and-Alternative-4 | 525332 | 5714194 | F1 | 3 | Poorly-defined bed and banks | Impoundment upstream of crossing location. Watercourse not defined downstream of impoundment. Same location as RA4-WC-39. |
| **RA1-4-WC-10** | Watercourse | Alternative-1-and-Alternative-4 | 540829 | 5740602 | F2 | 4 | Poorly-defined bed and banks | Water present within floodplain area. Watercourse surrounded by potential wetted area. Woody debris barrier present downstream from crossing. |
| **RA1-4-WC-19** | Watercourse | Alternative-1-and-Alternative-4 | 546802 | 5742739 | R2/R1 | 8 | Moderately-defined bed and banks | Riffle sequences and coarse bars upstream and downstream of crossing. |
| **RA1-4-WC-21** | Watercourse | Alternative-1-and-Alternative-4 | 551025 | 5740733 | F1 | 7 | Poorly-defined bed and banks | Connected to larger watercourse downstream. Water is present along bankfull sections at downstream of crossing. Channel becomes more defined farther away from crossing. Muskeg. |
| **RA1-4-WC-27** | Watercourse | Alternative-1-and-Alternative-4 | 559549 | 5738052 | F2/RF | 7 | Moderately-defined bed and banks | Riffle sequences upstream and downstream of crossing and throughout section. |
| **RA1-4-WC-31** | Watercourse | Alternative-1-and-Alternative-4 | 566883 | 5731970 | F2 | 8 | Well-defined bed and banks | Area of fish cover provided by downed wood |
| **RA1-4-WC-33** | Watercourse | Alternative-1-and-Alternative-4 | 569502 | 5733028 | F2 | <2 | Poorly-defined bed and banks | - |
| **RA1-4-WC-34** | Watercourse | Alternative-1-and-Alternative-4 | 571650 | 5733977 | F2 | 3 | Well-defined bed and banks | - |
| **RA1-4-WC-35** | Watercourse | Alternative-1-and-Alternative-4 | 573750 | 5732816 | F1/F2 | 2 | Moderately-defined bed and banks | - |
| **RA1-4-WC-36** | Watercourse | Alternative-1-and-Alternative-4 | 577681 | 5726015 | F2 | 6 | Moderately-defined bed and banks | Banks are only moderately defined. Might have undercutting. |
| **RA1-4-WC-37** | Watercourse | Alternative-1-and-Alternative-4 | 577418 | 5725568 | F1 | <10 | Poorly-defined bed and banks | Watercourse not visible at crossing location. Becomes visible approximately downstream of crossing location. Roadway appears to be holding back flow. |
| **RA1-WC-01** | Watercourse | Alternative-1 | 530918 | 5629153 | F2/RF | 6 | Moderately-defined bed and banks | Crossing appears to be on an existing path/roadway. Potentially an ATV trail. Watercourse appears to be disconnected at crossing location and reconnects northeast of crossing. Impoundment and beaver dam NE of crossing location. |
| **RA1-WC-02** | Watercourse | Alternative-1 | 532383 | 5632976 | F2/RF | 10 | Well-defined bed and banks | CO/GR bar downstream of crossing suggests coarse substrate around crossing area. |
| **RA1-WC-05** | Watercourse | Alternative-1 | 534175 | 5637960 | F1 | 40 | Well-defined bed and banks | Riffle habitat located upstream and downstream of crossing. R1/RF present in surveyed reach. |
| **RA1-WC-09** | Watercourse | Alternative-1 | 532606 | 5644605 | F2 | 5 | Poorly-defined bed and banks | Upstream of crossing and beaver dam is a potential low-lying area (i.e., wetted area) surrounding the watercourse |
| **RA1-WC-11** | Watercourse | Alternative-1 | 534983 | 5649288 | F1 | 55 | Well-defined bed and banks | Connected to watercourse |
| **RA1-WC-13** | Watercourse | Alternative-1 | 530495 | 5654590 | F1 | 10 | Well-defined bed and banks | Crossing on riffle sequence. Riffle sequences continue upstream of the crossing |
| **RA1-WC-14** | Watercourse | Alternative-1 | 529515 | 5656013 | F1 | 4 | moderately-defined bed and banks | Branching present along watercourse. Connected to waterbody upstream and downstream of crossing. |
| **RA1-WC-15** | Watercourse | Alternative-1 | 528799 | 5657136 | F1 | 6 | moderately-defined bed and banks | Branching present along watercourse. Watercourse fed by waterbody upstream. |
| **RA1-WC-16** | Watercourse | Alternative-1 | 526864 | 5658007 | F1 | 8 | Moderately-defined bed and banks | Branching present along watercourse. Riffle sequences located upstream of crossing. Beaver dam upstream of crossing. |
| **RA1-WC-17** | Watercourse | Alternative-1 | 525296 | 5659102 | F1 | 7 | Moderately-defined bed and banks | Branching present along watercourse. Riffle sequence located upstream and downstream of crossing. |
| **RA1-WC-19** | Watercourse | Alternative-1 | 522734 | 5662540 | P | 2 | Poorly-defined bed and banks | Branching present along watercourse. Impoundment upstream and downstream of crossing location. Area flooded at time of survey |

| Waterbody Crossing ID | Waterbody Type | Route | UTM 16U NAD 83 | | Habitat Unit | Estimate of wetted width (m) | Bed/Banks Description | Additional Notes from Aerial Reconnaissance |
|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | |
| **RA1-WC-19B** | Watercourse | Alternative-1 | 522500 | 5662725 | Added to list in 2020. Not surveyed by aerial reconnaissance. | | | - |
| **RA1-WC-20** | Watercourse | Alternative-1 | 522442 | 5662774 | P | 3 | Poorly-defined bed and banks | Branching present along watercourse. Low-lying region. Watercourse becomes disconnected. |
| **RA1-WC-22** | Watercourse | Alternative-1 | 521713 | 5663417 | F1 | 10 | Moderately-defined bed and banks | Branching present along watercourse. Historical beaver dam present - is passable by fish. |
| **RA1-WC-23** | Lake | Alternative-1 | 521732 | 5691515 | F1 | 53 | Well-defined bed and banks | - |
| **RA1-WC-26** | Watercourse | Alternative-1 | 519376 | 5700621 | Unknown | U | Potentially undefined, needs verification | - |
| **RA1-WC-27** | Watercourse | Alternative-1 | 519244 | 5702193 | F1 | 160 | Defined bed and banks | - |
| **RA1-WC-28** | Watercourse | Alternative-1 | 520172 | 5703819 | Unknown | U | Unknown | - |
| **RA1-WC-29** | Watercourse | Alternative-1 | 520833 | 5703964 | F | 3 | Defined bed and banks | - |
| **RA1-WC-30** | Watercourse | Alternative-1 | 520534 | 5709379 | F2 | 2 | Defined bed and banks | - |
| **RA1-WC-32** | Watercourse | Alternative-1 | 522111 | 5711797 | F1 | 3 | Defined bed and banks | - |
| **RA1-WC-38** | Watercourse | Alternative-1 | 525639 | 5715632 | Undefined | 0 | Potentially undefined, needs verification | Pockets of water observed during survey with a poorly defined channel |
| **RA1-WC-39** | Watercourse | Alternative-1 | 525659 | 5718840 | R3/RF | 3 | Poorly-defined bed and banks | Areas of standing water, with some channelized sections. Connected to Gourlie Creek. |
| **RA1-WC-40** | Watercourse | Alternative-1 | 525513 | 5719057 | F1 | 35 | Well-defined bed and banks | - |
| **RA1-WC-41** | Watercourse | Alternative-1 | 521635 | 5720108 | R3/RF | 3 | Moderately-defined bed and banks | Branching present along watercourse. |
| **RA1-WC-42** | Watercourse | Alternative-1 | 519909 | 5721171 | F1 | 3 | Poorly-defined bed and banks | Branching present along watercourse. Watercourse appears disconnected as area appears to be part wetland. fed by large impoundment |
| **RA1-WC-44** | Watercourse | Alternative-1 | 516855 | 5724132 | F1 | 3 | Poorly-defined bed and banks | Watercourse not very visible. Blocked by surrounding forested area. |
| **RA1-WC-45** | Watercourse | Alternative-1 | 516705 | 5724282 | F1 | 3 | Moderately-defined bed and banks | Impoundment downstream |
| **RA1-WC-46** | Watercourse | Alternative-1 | 516705 | 5724282 | F1 | 3 | Moderately-defined bed and banks | - |
| **RA1-WC-47** | Watercourse | Alternative-1 | 516705 | 5724282 | F1 | 3 | Moderately-defined bed and banks | - |
| **RA1-WC-48** | Watercourse | Alternative-1 | 516705 | 5724282 | F1 | 3 | Moderately-defined bed and banks | - |
| **RA1-WC-49** | Watercourse | Alternative-1 | 516705 | 5724282 | F1 | 3 | Moderately-defined bed and banks | - |
| **RA1-WC-50** | Watercourse | Alternative-1 | 516705 | 5724282 | F1 | 3 | Moderately-defined bed and banks | - |
| **RA1-WC-51** | Watercourse | Alternative-1 | 510970 | 5732829 | F1/RF | 50 | Well-defined bed and banks | - |
| **RA1-WC-52** | Watercourse | Alternative-1 | 510968 | 5733080 | Unknown | U | Unknown | - |
| **RA1-WC-53** | Watercourse | Alternative-1 | 511307 | 5734190 | Unknown | 4 | Poorly-defined bed and banks | Impoundment upstream and downstream of crossing location. Multiple impoundments are found further upstream and downstream. |
| **RA1-WC-54** | Watercourse | Alternative-1 | 511339 | 5734297 | P | 4 | Poorly-defined bed and banks | Impoundment upstream and downstream of crossing location. Multiple impoundments are found further upstream and downstream. |
| **RA1-WC-56** | Watercourse | Alternative-1 | 513924 | 5740981 | F3 | 1 | Poorly-defined bed and banks | Channel within low-lying wetted area. Some small channelization, however is a wetland/bog area. |
| **RA1-WC-57** | Watercourse | Alternative-1 | 518320 | 5743418 | F1 | 13 | Well-defined bed and banks | Wetted area or marshland. |
| **RA1-WC-58** | Watercourse | Alternative-1 | 519149 | 5743642 | F2 | 2 | Poorly-defined bed and banks | Appears to be a low-lying depression (i.e., wetted area). Channelized further downstream from crossing location - assume that watercourse continues under treed area |
| **RA1-WC-60** | Watercourse | Alternative-1 | 523117 | 5742644 | R | 1 | Poorly-defined bed and banks | Area of channelized flow present within low-lying depression (i.e., wetted area). |

| Waterbody Crossing ID | Waterbody Type | Route | UTM 16U NAD 83 | | Habitat Unit | Estimate of wetted width (m) | Bed/Banks Description | Additional Notes from Aerial Reconnaissance |
|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | |
| **RA1-WC-66** | Watercourse | Alternative-1 | 527414 | 5740047 | F1 | 4 | Poorly-defined bed and banks | Flooding is present at crossing location. Branching present along watercourse. |
| **RA1-WC-67** | Watercourse | Alternative-1 | 531917 | 5741009 | F1 | 6 | Well-defined bed and banks | - |
| **RA1-WC-68** | Watercourse | Alternative-1 | 533421 | 5740556 | F1 | 1 | Poorly-defined channel | Appears to be a low-lying depression (i.e., potential wetted area). Potential for poorly defined channel. |
| **RA4B-WC-01** | Watercourse | Alternative-4 | 512247 | 5636612 | Added to list in 2020. Not surveyed by aerial reconnaissance. | | | - |
| **RA4B-WC-02** | Watercourse | Alternative-4 | 517166 | 5631036 | Added to list in 2020. Not surveyed by aerial reconnaissance. | | | - |
| **RA4B-WC-03** | Watercourse | Alternative-4 | 516056 | 5631437 | Added to list in 2020. Not surveyed by aerial reconnaissance. | | | - |
| **RA4B-WC-04** | Watercourse | Alternative-4 | 511308 | 5638417 | Added to list in 2020. Not surveyed by aerial reconnaissance. | | | - |
| **RA4-WC-00** | Watercourse | Alternative-4 | 524202 | 5620008 | Added to list in 2020. Not surveyed by aerial reconnaissance. | | | - |
| **RA4-WC-02** | Watercourse | Alternative-4 | 521688 | 5624119 | F1 | 5 | Moderately-defined bed and banks | - |
| **RA4-WC-05** | Lake | Alternative-4 | 519747 | 5628176 | F1 | 10 | Moderately-defined bed and banks | - |
| **RA4-WC-12** | Watercourse | Alternative-4 | 518647 | 5635591 | F1 | 8 | Moderately-defined bed and banks | Appears to be a wetted area. Marshland with hummocks. |
| **RA4-WC-13** | Watercourse | Alternative-4 | 517166 | 5636864 | N | 1 | Likely undefined | - |
| **RA4-WC-14** | Lake | Alternative-4 | 517473 | 5637479 | F1 | 10 | Poorly-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-15** | Lake | Alternative-4 | 517655 | 5638092 | F1 | 240 | Well-defined bed and banks | - |
| **RA4-WC-16** | Watercourse | Alternative-4 | 519010 | 5642518 | Unknown | 1 | Poorly-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-17** | Watercourse | Alternative-4 | 522159 | 5646017 | F2 | 3 | Poorly-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-18** | Lake | Alternative-4 | 521894 | 5647392 | F2 | 9 | Moderately-defined bed and banks | RF/F1/F2 present |
| **RA4-WC-19** | Watercourse | Alternative-4 | 523071 | 5649798 | F1 | 3 | Moderately-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-20** | Watercourse | Alternative-4 | 520992 | 5654446 | F2 | 2 | Poorly-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-21** | Watercourse | Alternative-4 | 521131 | 5656047 | F1 | 7 | Moderately-defined bed and banks | Beaver dam present upstream and downstream of crossing location. |
| **RA4-WC-22** | Watercourse | Alternative-4 | 520890 | 5657391 | RF | 4 | Well-defined bed and banks | - |
| **RA4-WC-23** | Watercourse | Alternative-4 | 519751 | 5658577 | F1 | 1 | Poorly-defined bed and banks | Poorly defined channel with flooded/impounded flow path through a wetland area. Fish passage may be impeded by a lack of connectivity to wetland |
| **RA4-WC-24** | Watercourse | Alternative-4 | 519967 | 5659797 | F2 | 1 | Poorly-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-25** | Watercourse | Alternative-4 | 519870 | 5662127 | F2 | 3 | Poorly-defined bed and banks | Appears to be a wetted area. |
| **RA4-WC-26** | Watercourse | Alternative-4 | 519974 | 5663183 | F2 | 6 | Poorly-defined bed and banks | Flooding is present at crossing location. Branching present along watercourse. |
| **RA4-WC-27** | Lake | Alternative-4 | 522053 | 5691380 | F1 | 53 | Well-defined bed and banks | Lake/Wetland |
| **RA4-WC-29** | Watercourse | Alternative-4 | 523148 | 5695934 | F1 | 2 | Moderately-defined bed and banks | - |
| **RA4-WC-31** | Watercourse | Alternative-4 | 523972 | 5698738 | Unknown | U | Poorly-defined bed and banks | Watercourse obscured by overhead vegetation. |
| **RA4-WC-32** | Watercourse | Alternative-4 | 524169 | 5702612 | Unknown | U | Poorly-defined bed and banks | Area appears to be flooded and within a sequence of impoundment resulting in a wetted area habitat. Multiple beaver dams upstream and downstream of crossing location. |
| **RA4-WC-34** | Watercourse | Alternative-4 | 525100 | 5705282 | R1/F1 | 50 | Well-defined bed and banks | Riffle sequence at, US and DS crossing location. R1/F1 habitat observed. |
| **RA4-WC-35** | Watercourse | Alternative-4 | 524970 | 5705565 | Unknown | U | Unknown | - |
| **RA4-WC-37** | Watercourse | Alternative-4 | 524697 | 5708581 | F1 | 6 | Moderately-defined bed and banks | Area appears to be flooded and impounded. Multiple beaver dams upstream and downstream of crossing location. |
| **RA4-WC-41** | Watercourse | Alternative-4 | 526665 | 5715963 | F1 | 25 | Well-defined bed and banks | - |

| Waterbody Crossing ID | Waterbody Type | Route | UTM 16U NAD 83 | | Habitat Unit | Estimate of wetted width (m) | Bed/Banks Description | Additional Notes from Aerial Reconnaissance |
|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | |
| **RA4-WC-42** | Watercourse | Alternative-4 | 527995 | 5717404 | F2 | 1 | Moderately-defined bed and banks | Branching of channels. Area appears to have flooding. Potential wetted area. Multiple beaver dams upstream and downstream of crossing location. Impacted by beaver dams. |
| **RA4-WC-43** | Watercourse | Alternative-4 | 528554 | 5718881 | Unknown | | | Poorly defined flooded channel. Fish passage may be impeded by wetland ponding and areas drying up in summer months. Low-lying flooded wetland area |
| **RA4-WC-45** | Watercourse | Alternative-4 | 530801 | 5722972 | F2 | 2 | Poorly-defined bed and banks | Area flooded at crossing location. Multiple beaver dams upstream and downstream of crossing location. Historical breached BD present US of crossing - likely passable by fish. Woody debris DS causing riffles appear passable by fish |
| **RA4-WC-55** | Watercourse | Alternative-4 | 539004 | 5735928 | R2/RF | 40 | Well-defined bed and banks | - |
| **RA4-WC-57** | Watercourse | Alternative-4 | 539258 | 5736888 | F2 | 2 | Poorly-defined bed and banks | Area has flooding potential |
| **RA4-WC-58** | Watercourse | Alternative-4 | 539324 | 5737051 | F2 | 2 | Poorly-defined bed and banks | Flooding is present at crossing location. Branching present along watercourse. |
| **RA1-4-WC-03** | Undefined | Alternative-1-and-Alternative-4 | 520000 | 5677586 | NA | 0 | Undefined | Appears to be a drainage feature. Possible ephemeral drain. |
| **RA1-4-WC-04** | Undefined | Alternative-1-and-Alternative-4 | 519811 | 5678161 | NA | U | Unknown | No watercourse present. Historically mapped watercourse that appears to now be an ephemeral drain. |
| **RA1-4-WC-05** | Undefined | Alternative-1-and-Alternative-4 | 519666 | 5680140 | NA | 0 | Undefined | No watercourse present. Historically mapped watercourse that appears to now be an ephemeral drain. |
| **RA1-4-WC-06** | Undefined | Alternative-1-and-Alternative-4 | 519637 | 5680917 | NA | 0 | Undefined | No watercourse visible. Potential low-lying wetted area. |
| **RA1-4-WC-08** | Undefined | Alternative-1-and-Alternative-4 | 518949 | 5682735 | NA | 0 | Undefined | No watercourse visible. Potential low-lying wetted area. |
| **RA1-4-WC-09** | Undefined | Alternative-1-and-Alternative-4 | 519730 | 5684531 | NA | 0 | Undefined | No watercourse visible. Potential wetted area. |
| **RA1-4-WC-11** | Undefined | Alternative-1-and-Alternative-4 | 541778 | 5741437 | NA | 0 | Undefined | No watercourse visible. Potential low-lying wetted area. |
| **RA1-4-WC-12** | Undefined | Alternative-1-and-Alternative-4 | 543279 | 5742500 | NA | 1 | Undefined | No watercourse visible. Potential low-lying wetted area. |
| **RA1-4-WC-13** | Undefined | Alternative-1-and-Alternative-4 | 544083 | 5742651 | NA | 0 | Undefined | No watercourse visible. Potential low-lying wetted area. |
| **RA1-4-WC-14** | Undefined | Alternative-1-and-Alternative-4 | 544153 | 5742644 | NA | 0 | Undefined | No watercourse visible. Part of RA1-4-WC-13 |
| **RA1-4-WC-15** | Undefined | Alternative-1-and-Alternative-4 | 544234 | 5742636 | NA | 0 | Undefined | No watercourse visible. Part of RA1-4-WC-13 |
| **RA1-4-WC-16** | Undefined | Alternative-1-and-Alternative-4 | 544305 | 5742628 | NA | 0 | Undefined | No watercourse visible. Part of RA1-4-WC-13 |
| **RA1-4-WC-17** | Undefined | Alternative-1-and-Alternative-4 | 544347 | 5742624 | NA | 0 | Undefined | No watercourse visible. Part of RA1-4-WC-13 |
| **RA1-4-WC-18** | Undefined | Alternative-1-and-Alternative-4 | 545375 | 5742501 | NA | 0 | Undefined | No watercourse visible. |
| **RA1-4-WC-20** | Undefined | Alternative-1-and-Alternative-4 | 548340 | 5742737 | NA | 0 | Undefined | No watercourse visible. Appears to be a wetted area. |
| **RA1-4-WC-22** | Undefined | Alternative-1-and-Alternative-4 | 552546 | 5739419 | NA | U | Unknown | No watercourse visible. Appears to be low-lying wetted area. From elevation, area appears to drain into WC to the S. |
| **RA1-4-WC-23** | Undefined | Alternative-1-and-Alternative-4 | 554544 | 5739414 | NA | U | Unknown | Potential ephemeral drain leading into a low-lying area. |
| **RA1-4-WC-24** | Undefined | Alternative-1-and-Alternative-4 | 555686 | 5739573 | NA | 0 | Undefined | No watercourse visible. Potential wetland (fen) that drains to the south. |
| **RA1-4-WC-25** | Undefined | Alternative-1-and-Alternative-4 | 556921 | 5738753 | NA | U | Unknown | Potential wetland (i.e., fen) area. Low-lying area. |
| **RA1-4-WC-26** | Undefined | Alternative-1-and-Alternative-4 | 558205 | 5738243 | NA | U | Unknown | No watercourse. Potential wetted area. |
| **RA1-4-WC-28** | Undefined | Alternative-1-and-Alternative-4 | 562103 | 5738045 | NA | 0 | Undefined | No watercourse visible. Low-lying area. |
| **RA1-4-WC-29** | Undefined | Alternative-1-and-Alternative-4 | 563810 | 5734170 | NA | 0 | Undefined | Potential wetted area. Very small channel noticed SW of crossing |
| **RA1-4-WC-30** | Undefined | Alternative-1-and-Alternative-4 | 563822 | 5734153 | NA | 0 | Undefined | Potential wetted area. |
| **RA1-4-WC-32** | Undefined | Alternative-1-and-Alternative-4 | 567922 | 5732413 | NA | U | Unknown | Watercourse not visible. Potential ephemeral drain. Historically mapped watercourse that appears to now be an ephemeral drain. |

| Waterbody Crossing ID | Waterbody Type | Route | UTM 16U NAD 83 | | Habitat Unit | Estimate of wetted width (m) | Bed/Banks Description | Additional Notes from Aerial Reconnaissance |
|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | |
| **RA1-WC-03** | Undefined | Alternative-1 | 533812 | 5634366 | NA | U | Undefined | Likely undefined. |
| **RA1-WC-04** | Undefined | Alternative-1 | 534433 | 5635846 | NA | 0 | Undefined | No watercourse. Potential low-lying wetted area. |
| **RA1-WC-06** | Undefined | Alternative-1 | 532919 | 5639277 | NA | 0 | Undefined | No watercourse. Potential low-lying wetted area. |
| **RA1-WC-07** | Undefined | Alternative-1 | 532590 | 5642637 | NA | 0 | Undefined | No watercourse. Potential low-lying wetted area. |
| **RA1-WC-08** | Undefined | Alternative-1 | 532911 | 5643535 | NA | 0 | Undefined | ATV trail. No watercourse. |
| **RA1-WC-10** | Undefined | Alternative-1 | 532424 | 5646501 | NA | 0 | Undefined | ATV trail. No watercourse. |
| **RA1-WC-12** | Undefined | Alternative-1 | 532144 | 5653442 | NA | U | Unknown | Low-lying wetted area. Mapped watercourse ends 236 m southwest of crossing. |
| **RA1-WC-18** | Undefined | Alternative-1 | 523029 | 5662298 | NA | U | Unknown | No watercourse. Potential wetted area. |
| **RA1-WC-21** | Undefined | Alternative-1 | 522006 | 5663171 | NA | 0 | Undefined | No watercourse. Potential drain or wetted area. |
| **RA1-WC-24** | Undefined | Alternative-1 | 521657 | 5691768 | NA | U | Unknown | No watercourse. Low-lying section 43 m East from mapped watercourse. |
| **RA1-WC-25** | Undefined | Alternative-1 | 519678 | 5699413 | NA | U | Unknown | No watercourse observed. |
| **RA1-WC-31** | Undefined | Alternative-1 | 521587 | 5711787 | NA | U | Undefined | No watercourse was observed. No bed or banks. |
| **RA1-WC-33** | Undefined | Alternative-1 | 522725 | 5711811 | NA | U | Unknown | No watercourse was observed. No bed or banks. |
| **RA1-WC-34** | Undefined | Alternative-1 | 523410 | 5712188 | NA | U | Unknown | No watercourse. |
| **RA1-WC-35** | Undefined | Alternative-1 | 523937 | 5712348 | NA | U | Unknown | Watercourse not visible. Potential ephemeral drain. |
| **RA1-WC-37** | Undefined | Alternative-1 | 525524 | 5714913 | NA | U | Unknown | No watercourse. Appears to be low-lying drainage or wetted area. |
| **RA1-WC-43** | Undefined | Alternative-1 | 518281 | 5722675 | NA | U | Unknown | No watercourse. |
| **RA1-WC-55** | Undefined | Alternative-1 | 511484 | 5734824 | NA | U | Unknown | Appears to be a low-lying depression. No inlets and outlets are visible. |
| **RA1-WC-59** | Undefined | Alternative-1 | 521927 | 5742953 | NA | 0 | Undefined | Appears to be a low-lying wetted depression. |
| **RA1-WC-61** | Undefined | Alternative-1 | 523202 | 5742193 | NA | 0 | Undefined | Appears to be a low-lying wetted depression. |
| **RA1-WC-62** | Undefined | Alternative-1 | 523242 | 5741847 | NA | 0 | Undefined | No watercourse. |
| **RA1-WC-63** | Undefined | Alternative-1 | 523650 | 5740383 | NA | U | Unknown | Appears to be a low-lying wetted depression. |
| **RA1-WC-64** | Undefined | Alternative-1 | 523623 | 5740411 | NA | U | Unknown | Appears to be a low-lying wetted depression. |
| **RA1-WC-65** | Undefined | Alternative-1 | 524043 | 5739988 | NA | 0 | Undefined | No watercourse. |
| **RA1-WC-69** | Undefined | Alternative-1 | 534369 | 5740229 | NA | 0 | Undefined | Watercourse not visible. Potential ephemeral drain. |
| **RA4-WC-01** | Undefined | Alternative-4 | 523541 | 5621344 | NA | U | Unknown | No watercourse present. Appears to be a low-lying depression (i.e., potential wetted area). |
| **RA4-WC-03** | Undefined | Alternative-4 | 521041 | 5625041 | NA | 0 | Undefined | No watercourse visible. Potential low-lying depressional wetted area. |
| **RA4-WC-04** | Undefined | Alternative-4 | 519778 | 5627216 | NA | 0 | Undefined | No watercourse visible. Potential low-lying depressional wetted area. |
| **RA4-WC-06** | Undefined | Alternative-4 | 518282 | 5629251 | NA | U | Unknown | Appears to be a wetted area. Wetted width appears to stretch as much as 40 m at several sections. |
| **RA4-WC-07** | Undefined | Alternative-4 | 518280 | 5629260 | NA | U | Undefined | Directly beside RA-4-WC-06 |
| **RA4-WC-08** | Undefined | Alternative-4 | 518276 | 5629324 | NA | U | Undefined | Potential wetted area. |
| **RA4-WC-09** | Undefined | Alternative-4 | 518270 | 5629412 | NA | U | Undefined | Appears to be a wetted area. Wetted width appears to stretch as much as 40 m at several sections. |
| **RA4-WC-10** | Undefined | Alternative-4 | 518270 | 5629419 | NA | U | Undefined | Appears to be a wetted area. The entire floodplain area may need to be cleared if crossing structure is constructed. |

| Waterbody Crossing ID | Waterbody Type | Route | UTM 16U NAD 83 | | Habitat Unit | Estimate of wetted width (m) | Bed/Banks Description | Additional Notes from Aerial Reconnaissance |
|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | |
| **RA4-WC-11** | Undefined | Alternative-4 | 518268 | 5629451 | NA | U | Undefined | Appears to be a wetted area. The entire floodplain area may need to be cleared if crossing structure is constructed. |
| **RA4-WC-28** | Undefined | Alternative-4 | 522327 | 5694071 | NA | 0 | Undefined | No watercourse. Potential drain. Small channel east of crossing location. |
| **RA4-WC-30** | Undefined | Alternative-4 | 523610 | 5697164 | NA | 0 | Undefined | Appears to be a low-lying wetted area. |
| **RA4-WC-33** | Undefined | Alternative-4 | 524442 | 5703680 | NA | U | Unknown | No watercourse. Potential wetted area or drain. |
| **RA4-WC-35** | Undefined | Alternative-4 | 524911 | 5706281 | NA | U | Unknown | Watercourse not visible. Potential ephemeral drain. |
| **RA4-WC-36** | Undefined | Alternative-4 | 524911 | 5706281 | NA | U | Undefined | Watercourse not visible. Potential ephemeral drain or wetted area. Ponded area approximately 800 m south (downslope) of crossing location along mapped watercourse path. |
| **RA4-WC-38** | Undefined | Alternative-4 | 524820 | 5709893 | NA | U | Unknown | No watercourse visible. Potential low-lying wetted area or drainage feature. |
| **RA4-WC-40** | Undefined | Alternative-4 | 526271 | 5715544 | NA | U | Unknown | Watercourse not visible. Potential ephemeral drain. |
| **RA4-WC-44** | Undefined | Alternative-4 | 529272 | 5721878 | NA | 0 | Undefined | No watercourse. |
| **RA4-WC-46** | Undefined | Alternative-4 | 531310 | 5723310 | NA | 0 | Undefined | No watercourse. Potential wetted area or drainage feature. |
| **RA4-WC-47** | Undefined | Alternative-4 | 531559 | 5723581 | NA | 0 | Undefined | No watercourse. Potential wetted area or drainage feature. |
| **RA4-WC-48** | Undefined | Alternative-4 | 532055 | 5724757 | NA | 0 | Undefined | No watercourse. Potential wetted area or drainage feature. Waterbody feature 122 m East of crossing |
| **RA4-WC-49** | Undefined | Alternative-4 | 532545 | 5725566 | NA | U | Unknown | No watercourse. Potential wetted area or drainage feature. |
| **RA4-WC-50** | Undefined | Alternative-4 | 534466 | 5725709 | NA | U | Undefined | No watercourse. Potential wetted area or drainage feature. |
| **RA4-WC-51** | Undefined | Alternative-4 | 536335 | 5727159 | NA | U | Unknown | Watercourse not visible. Potential ephemeral drain. |
| **RA4-WC-52** | Undefined | Alternative-4 | 536623 | 5727401 | NA | U | Unknown | Watercourse not visible. Potential ephemeral drain. |
| **RA4-WC-53** | Undefined | Alternative-4 | 537667 | 5728714 | NA | 0 | Undefined | No watercourse. |
| **RA4-WC-54** | Undefined | Alternative-4 | 537072 | 5727839 | NA | 0 | Undefined | Watercourse not visible. Potential ephemeral drain. |
| **RA4-WC-56** | Undefined | Alternative-4 | 539023 | 5736140 | NA | 0 | Undefined | Watercourse not visible. Potential ephemeral drain or low-lying wetted area. |

# Annex B

**Table B-1: Effort Data for Marten Falls Community Access Road Fish Surveys, 2019 to 2022**

| Site ID | Year | Month | Effort ID | Start Easting | Start Northing | End Easting | End Northing | Total Distance (m) | Duration (seconds) | DateSet | Set Time | DateLift | Pull Time | Depth Minimum (m) | Depth Maximum (m) | Number of Traps | Duration (hours) | Fish Captured |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-4-WC-01** | 2021 | Sep | BP1 | 519667 | 5166959 | 519617 | 5666885 | 100 | 575 | - | - | - | - | - | - | - | - | 7 |
| **RA1-4-WC-01** | 2021 | Sep | BP1 | 519667 | 5666959 | 519617 | 5666885 | 100 | 575 | - | - | - | - | - | - | - | - | 1 |
| **RA1-4-WC-01** | 2021 | Sep | MT1 | 519670 | 5666959 | - | - | - | - | 2021-09-11 | 10:10:00 | 2021-09-11 | 13:35:00 | 0.7 | - | 3 | 3.42 | 36 |
| **RA1-4-WC-01** | 2021 | Sep | MT2 | 519624 | 5666914 | - | - | - | - | 2021-09-11 | 10:24:00 | 2021-09-11 | 13:50:00 | 0.8 | - | 3 | 3.43 | 147 |
| **RA1-4-WC-02** | 2019 | Sep | BP1 | NR | NR | NR | NR | 120 | 398 | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-07** | 2021 | Sep | BP1 | 519129 | 5682501 | 519040 | 5682471 | 100 | 553 | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-07** | 2021 | Sep | MT1 | 519066 | 5682471 | - | - | - | - | 2021-09-11 | 14:48:00 | 2021-09-11 | 18:10:00 | 1.3 | - | 2 | 3.37 | - |
| **RA1-4-WC-07** | 2021 | Sep | MT2 | 519603 | 5682484 | - | - | - | - | 2021-09-11 | 14:57:00 | 2021-09-11 | 18:07:00 | 0.65 | - | 3 | 3.17 | - |
| **RA1-4-WC-10** | 2022 | Aug | MT1 | 540940 | 5740552 | - | - | - | - | 2022-08-18 | 11:30:00 | 2022-08-18 | 13:32:00 | 0.55 | 1.3 | 3 | 2.03 | - |
| **RA1-4-WC-10** | 2022 | Aug | MT2 | 540823 | 5740600 | - | - | - | - | 2022-08-18 | 11:44:00 | 2022-08-18 | 13:32:00 | 0.65 | 1.05 | 3 | 1.80 | - |
| **RA1-4-WC-19** | 2022 | Jun | MT1 | 546816 | 5742739 | - | - | - | - | 2022-06-29 | 9:30:00 | 2022-06-29 | 12:30:00 | 0.5 | - | 1 | 3.00 | - |
| **RA1-4-WC-19** | 2022 | Aug | MT1 | 546826 | 5742704 | - | - | - | - | 2022-08-18 | 14:15:00 | 2022-08-18 | 16:20:00 | 0.8 | - | 1 | 2.08 | - |
| **RA1-4-WC-19** | 2022 | Aug | MT2 | 546812 | 5742742 | - | - | - | - | 2022-08-18 | 14:25:00 | 2022-08-18 | 16:15:00 | 0.35 | 0.55 | 1 | 1.83 | - |
| **RA1-4-WC-21** | 2019 | Sep | MT1 | NR | NR | - | - | - | - | 2019-09-08 | 11:40:00 | 2019-09-08 | 12:45:00 | 1.5 | - | 1 | 1.08 | - |
| **RA1-4-WC-21** | 2019 | Sep | MT2 | NR | NR | - | - | - | - | 2019-09-08 | 11:50:00 | 2019-09-08 | 12:50:00 | 1.5 | - | 1 | 1.00 | - |
| **RA1-4-WC-21** | 2022 | Jul | MT1 | 550980 | 5740599 | - | - | - | - | 2022-07-01 | 10:00:00 | 2022-07-01 | 13:20:00 | 0.4 | 2 | 10 | 3.33 | - |
| **RA1-4-WC-21** | 2022 | Aug | MT1 | 550989 | 5740805 | - | - | - | - | 2022-08-16 | 10:27:00 | 2022-08-16 | 12:41:00 | 0.7 | - | 1 | 2.23 | - |
| **RA1-4-WC-21** | 2022 | Aug | MT2 | 550996 | 5740801 | - | - | - | - | 2022-08-16 | 10:29:00 | 2022-08-16 | 12:42:00 | 0.7 | - | 1 | 2.22 | - |
| **RA1-4-WC-21** | 2022 | Aug | MT3 | 551011 | 5740769 | - | - | - | - | 2022-08-16 | 10:31:00 | 2022-08-16 | 12:44:00 | 1.1 | - | 1 | 2.22 | - |
| **RA1-4-WC-21** | 2022 | Aug | MT4 | 551030 | 5740733 | - | - | - | - | 2022-08-16 | 10:33:00 | 2022-08-16 | 12:48:00 | 1.2 | - | 1 | 2.25 | - |
| **RA1-4-WC-21** | 2022 | Aug | MT5 | 551014 | 5740693 | - | - | - | - | 2022-08-16 | 10:34:00 | 2022-08-16 | 12:51:00 | 0.4 | - | 1 | 2.28 | - |
| **RA1-4-WC-21** | 2022 | Aug | MT6 | 551004 | 5740660 | - | - | - | - | 2022-08-16 | 10:38:00 | 2022-08-16 | 12:51:00 | - | - | 1 | 2.22 | - |
| **RA1-4-WC-33** | 2022 | Jun | MT1 | 569513 | 5733042 | - | - | - | - | 2022-06-24 | 13:10:00 | 2022-06-24 | 16:10:00 | 0.5 | - | 2 | 3.00 | - |
| **RA1-4-WC-33** | 2022 | Jun | MT2 | 569512 | 5732985 | - | - | - | - | 2022-06-24 | 13:15:00 | 2022-06-24 | 16:15:00 | 0.5 | - | 2 | 3.00 | - |
| **RA1-4-WC-33** | 2022 | Jun | MT3 | 569514 | 5733022 | - | - | - | - | 2022-06-24 | 13:20:00 | 2022-06-24 | 16:20:00 | 0.5 | - | 2 | 3.00 | - |
| **RA1-4-WC-33** | 2022 | Aug | BP1 | 569509 | 5732999 | 569510 | 5733079 | 105 | 471 | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-35** | 2022 | Jun | MT1 | 573752 | 5732807 | - | - | - | - | 2022-06-28 | 13:20:00 | 2022-06-28 | 16:20:00 | 0.6 | - | 6 | 3.00 | - |
| **RA1-4-WC-35** | 2022 | Aug | BP1 | 573718 | 5732776 | 573747 | 5732807 | 60 | 678 | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-35** | 2022 | Aug | MT1 | 573747 | 5732807 | - | - | - | - | 2022-08-19 | 13:55:00 | 2022-08-19 | 16:31:00 | 0.75 | 0.95 | 3 | 2.60 | - |
| **RA1-4-WC-35** | 2022 | Aug | MT2 | 573758 | 5732809 | - | - | - | - | 2022-08-19 | 14:10:00 | 2022-08-19 | 16:35:00 | 0.45 | 0.75 | 3 | 2.42 | - |
| **RA1-4-WC-36** | 2022 | Jun | MT1 | 577675 | 5726008 | - | - | - | - | 2022-06-28 | 10:00:00 | 2022-06-28 | 13:00:00 | 0.75 | - | 6 | 3.00 | - |
| **RA1-4-WC-36** | 2022 | Aug | MT1 | 577635 | 5726060 | - | - | - | - | 2022-08-25 | 11:51:00 | 2022-08-25 | 15:33:00 | 0.7 | 1.3 | 1 | 3.70 | - |
| **RA1-4-WC-36** | 2022 | Aug | MT2 | 577674 | 5726014 | - | - | - | - | 2022-08-25 | 11:58:00 | 2022-08-25 | 15:27:00 | 0.65 | 1.6 | 1 | 3.48 | - |
| **RA1-4-WC-37** | 2022 | Aug | BP1 | 577427 | 5725562 | 577403 | 5725640 | 75 | 268 | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-37** | 2022 | Aug | MT1 | 577401 | 5725641 | - | - | - | - | 2022-08-16 | 14:01:00 | 2022-08-16 | 15:56:00 | 0.4 | - | 1 | 1.92 | - |
| **RA1-4-WC-37** | 2022 | Aug | MT2 | 577391 | 5725661 | - | - | - | - | 2022-08-16 | 14:03:00 | 2022-08-16 | 15:58:00 | 0.8 | - | 1 | 1.92 | - |
| **RA1-4-WC-37** | 2022 | Aug | MT3 | 577381 | 5725642 | - | - | - | - | 2022-08-16 | 14:05:00 | 2022-08-16 | 16:00:00 | 0.7 | - | 1 | 1.92 | - |
| **RA1-WC-01** | 2022 | Aug | MT1 | 530809 | 5628905 | - | - | - | - | 2022-08-20 | 11:41:00 | 2022-08-20 | 17:15:00 | 1 | - | 3 | 5.57 | - |

| Site ID | Year | Month | Effort ID | Start Easting | Start Northing | End Easting | End Northing | Total Distance (m) | Duration (seconds) | DateSet | Set Time | DateLift | Pull Time | Depth Minimum (m) | Depth Maximum (m) | Number of Traps | Duration (hours) | Fish Captured |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-01** | 2022 | Aug | MT2 | 530800 | 5628919 | - | - | - | - | 2022-08-20 | 11:49:00 | 2022-08-20 | 17:20:00 | 1.2 | - | 3 | 5.52 | - |
| **RA1-WC-02** | 2021 | Sep | MT1 | 532285 | 5633018 | - | - | - | - | 2021-09-14 | 10:42:00 | 2021-09-14 | 15:30:00 | 0.5 | - | 3 | 4.80 | - |
| **RA1-WC-02** | 2021 | Sep | MT2 | 532389 | 5632975 | - | - | - | - | 2021-09-14 | 11:09:00 | 2021-09-14 | 15:50:00 | 0.7 | - | 2 | 4.68 | - |
| **RA1-WC-09** | 2022 | Jun | MT1 | 532548 | 5644541 | - | - | - | - | 2022-06-23 | 13:14:00 | 2022-06-23 | 16:13:00 | 0.5 | - | 1 | 2.98 | 11 |
| **RA1-WC-09** | 2022 | Jun | MT2 | 532575 | 5644560 | - | - | - | - | 2022-06-23 | 13:16:00 | 2022-06-23 | 16:10:00 | 0.6 | - | 1 | 2.90 | 105 |
| **RA1-WC-09** | 2022 | Jun | MT3 | 532620 | 5644626 | - | - | - | - | 2022-06-23 | 13:23:00 | 2022-06-23 | 15:54:00 | 0.5 | - | 1 | 2.52 | 20 |
| **RA1-WC-09** | 2022 | Jun | MT4 | 532640 | 5644652 | - | - | - | - | 2022-06-23 | 13:26:00 | 2022-06-23 | 15:40:00 | 0.5 | - | 1 | 2.23 | 11 |
| **RA1-WC-09** | 2022 | Jun | MT5 | 532671 | 5644682 | - | - | - | - | 2022-06-23 | 13:29:00 | 2022-06-23 | 15:22:00 | 0.6 | - | 1 | 1.88 | 3 |
| **RA1-WC-09** | 2022 | Aug | BP1 | 532601 | 5644610 | 532550 | 5644550 | 100 | 961 | - | - | - | - | - | - | - | - | 1 |
| **RA1-WC-09** | 2022 | Aug | BP1 | 532601 | 5644610 | 532550 | 5644550 | 100 | 961 | - | - | - | - | - | - | - | - | 48 |
| **RA1-WC-11** | 2022 | Jun | MT1 | 534529 | 5649052 | - | - | - | - | 2022-06-29 | 8:44:00 | 2022-06-29 | 10:20:00 | 0.5 | - | 1 | 1.60 | - |
| **RA1-WC-11** | 2022 | Jun | MT2 | 534506 | 5649061 | - | - | - | - | 2022-06-29 | 8:46:00 | 2022-06-29 | 10:18:00 | 0.6 | - | 1 | 1.53 | - |
| **RA1-WC-11** | 2022 | Jun | MT3 | 534522 | 5649077 | - | - | - | - | 2022-06-29 | 8:48:00 | 2022-06-29 | 10:17:00 | 0.6 | - | 1 | 1.48 | - |
| **RA1-WC-11** | 2022 | Aug | BP1 | 534574 | 5649104 | 534471 | 5649059 | 235 | 1447 | - | - | - | - | - | - | - | - | 8 |
| **RA1-WC-14** | 2022 | Jun | BP1 | 529712 | 5656130 | 529589 | 5656102 | 150 | 570 | - | - | - | - | - | - | - | - | - |
| **RA1-WC-14** | 2022 | Jun | MT1 | 529557 | 5656057 | - | - | - | - | 2022-06-23 | 9:30:00 | 2022-06-23 | 12:33:00 | 1.1 | - | 1 | 3.05 | - |
| **RA1-WC-14** | 2022 | Jun | MT2 | 529595 | 5656104 | - | - | - | - | 2022-06-23 | 9:32:00 | 2022-06-23 | 12:30:00 | 1 | - | 1 | 2.97 | - |
| **RA1-WC-14** | 2022 | Jun | MT3 | 529631 | 5656141 | - | - | - | - | 2022-06-23 | 9:37:00 | 2022-06-23 | 12:27:00 | 1 | - | 1 | 2.83 | - |
| **RA1-WC-14** | 2022 | Jun | MT4 | 529672 | 5656135 | - | - | - | - | 2022-06-23 | 9:42:00 | 2022-06-23 | 12:24:00 | 1 | - | 1 | 2.70 | - |
| **RA1-WC-14** | 2022 | Jun | MT5 | 529712 | 5656127 | - | - | - | - | 2022-06-23 | 9:45:00 | 2022-06-23 | 12:21:00 | 0.8 | - | 1 | 2.60 | - |
| **RA1-WC-14** | 2022 | Aug | BP1 | 529690 | 5656135 | 529609 | 5656108 | 120 | 599 | - | - | - | - | - | - | - | - | - |
| **RA1-WC-16** | 2022 | Jun | MT1 | 526843 | 5657988 | - | - | - | - | 2022-06-22 | 14:20:00 | 2022-06-22 | 15:28:00 | 1.2 | - | 1 | 1.13 | - |
| **RA1-WC-16** | 2022 | Jun | MT2 | 526859 | 5658002 | - | - | - | - | 2022-06-22 | 14:18:00 | 2022-06-22 | 15:43:00 | 1.2 | - | 1 | 1.42 | - |
| **RA1-WC-16** | 2022 | Jun | MT3 | 526930 | 5658029 | - | - | - | - | 2022-06-22 | 14:25:00 | 2022-06-22 | 15:45:00 | 1.4 | - | 1 | 1.33 | - |
| **RA1-WC-16** | 2022 | Jun | MT4 | 526962 | 5658065 | - | - | - | - | 2022-06-22 | 14:31:00 | 2022-06-22 | 15:49:00 | 1.3 | - | 1 | 1.30 | - |
| **RA1-WC-16** | 2022 | Jun | MT5 | 526995 | 5658080 | - | - | - | - | 2022-06-22 | 14:30:00 | 2022-06-22 | 15:52:00 | 1.3 | - | 1 | 1.37 | - |
| **RA1-WC-16** | 2022 | Aug | MT1 | 526929 | 5658026 | - | - | - | - | 2022-08-19 | 14:46:00 | 2022-08-19 | 16:15:00 | 1.3 | - | 1 | 1.48 | - |
| **RA1-WC-16** | 2022 | Aug | MT2 | 526966 | 5658064 | - | - | - | - | 2022-08-19 | 14:50:00 | 2022-08-19 | 16:09:00 | 1.1 | - | 1 | 1.32 | - |
| **RA1-WC-16** | 2022 | Aug | MT3 | 527003 | 5658088 | - | - | - | - | 2022-08-19 | 14:52:00 | 2022-08-19 | 16:07:00 | 1.2 | - | 1 | 1.25 | - |
| **RA1-WC-16** | 2022 | Aug | MT4 | 526892 | 5658017 | - | - | - | - | 2022-08-19 | 15:57:00 | 2022-08-19 | 16:03:00 | 1.3 | - | 1 | 0.10 | - |
| **RA1-WC-16** | 2022 | Aug | MT5 | 526866 | 5658007 | - | - | - | - | 2022-08-19 | 14:59:00 | 2022-08-19 | 16:02:00 | 1 | - | 1 | 1.05 | - |
| **RA1-WC-16** | 2022 | Aug | MT6 | 526848 | 5657992 | - | - | - | - | 2022-08-19 | 15:00:00 | 2022-08-19 | 16:00:00 | 1 | - | 1 | 1.00 | - |
| **RA1-WC-17** | 2022 | Aug | BP1 | 525216 | 5658954 | 525149 | 5658880 | 100 | 1000 | - | - | - | - | - | - | - | - | 10 |
| **RA1-WC-17** | 2022 | Aug | MT1 | 525155 | 5658898 | - | - | - | - | 2022-08-19 | 16:54:00 | 2022-08-20 | 11:45:00 | 0.8 | - | 1 | 18.85 | - |
| **RA1-WC-17** | 2022 | Aug | MT2 | 525175 | 5658921 | - | - | - | - | 2022-08-19 | 16:57:00 | 2022-08-20 | 11:48:00 | 0.6 | - | 1 | 18.85 | - |
| **RA1-WC-17** | 2022 | Aug | MT3 | 525212 | 5658958 | - | - | - | - | 2022-08-19 | 17:02:00 | 2022-08-20 | 11:50:00 | 0.7 | - | 1 | 18.80 | - |
| **RA1-WC-17** | 2022 | Aug | MT4 | 525240 | 5658976 | - | - | - | - | 2022-08-19 | 17:07:00 | 2022-08-20 | 11:52:00 | 0.8 | - | 1 | 18.75 | - |
| **RA1-WC-17** | 2022 | Aug | MT5 | 525246 | 5659000 | - | - | - | - | 2022-08-19 | 17:10:00 | 2022-08-20 | 11:55:00 | 0.5 | - | 1 | 18.75 | - |
| **RA1-WC-17** | 2022 | Aug | MT6 | 525272 | 5659015 | - | - | - | - | 2022-08-19 | 17:14:00 | 2022-08-20 | 11:58:00 | 0.9 | - | 1 | 18.73 | - |
| **RA1-WC-22** | 2022 | Aug | MT1 | 521617 | 5663280 | - | - | - | - | 2022-08-20 | 15:32:00 | 2022-08-21 | 9:20:00 | 0.5 | - | 1 | 17.80 | 16 |

| Site ID | Year | Month | Effort ID | Start Easting | Start Northing | End Easting | End Northing | Total Distance (m) | Duration (seconds) | DateSet | Set Time | DateLift | Pull Time | Depth Minimum (m) | Depth Maximum (m) | Number of Traps | Duration (hours) | Fish Captured |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-22** | 2022 | Aug | MT2 | 521622 | 5663269 | - | - | - | - | 2022-08-20 | 15:33:00 | 2022-08-21 | 9:22:00 | 1 | - | 1 | 17.82 | 6 |
| **RA1-WC-22** | 2022 | Aug | MT3 | 521627 | 5663256 | - | - | - | - | 2022-08-20 | 15:34:00 | 2022-08-21 | 9:24:00 | 1.1 | - | 1 | 17.83 | - |
| **RA1-WC-22** | 2022 | Aug | MT4 | 521617 | 5663293 | - | - | - | - | 2022-08-20 | 15:36:00 | 2022-08-21 | 10:01:00 | 1 | - | 1 | 18.42 | 3 |
| **RA1-WC-22** | 2022 | Aug | MT5 | 521650 | 5663326 | - | - | - | - | 2022-08-20 | 15:39:00 | 2022-08-21 | 10:05:00 | 0.5 | - | 1 | 18.43 | 12 |
| **RA1-WC-22** | 2022 | Aug | MT6 | 521684 | 5663371 | - | - | - | - | 2022-08-20 | 15:41:00 | 2022-08-21 | 10:10:00 | 0.7 | - | 1 | 18.48 | 36 |
| **RA1-WC-23** | 2021 | Sep | MT1 | 521943 | 5691488 | - | - | - | - | 2021-09-15 | 9:18:00 | 2021-09-15 | 12:21:00 | 0.5 | - | 3 | 3.05 | - |
| **RA1-WC-23** | 2021 | Sep | MT2 | 521802 | 5691503 | - | - | - | - | 2021-09-15 | 9:38:00 | 2021-09-15 | 12:21:00 | 0.7 | - | 2 | 2.72 | - |
| **RA1-WC-28** | 2022 | Jun | BP1 | 520184 | 5703709 | 520166 | 5703834 | 135 | 460 | - | - | - | - | - | - | - | - | - |
| **RA1-WC-28** | 2022 | Jun | MT1 | 520174 | 5703730 | - | - | - | - | 2022-06-24 | 11:20:00 | 2022-06-24 | 13:26:00 | 0.6 | - | 1 | 2.10 | - |
| **RA1-WC-28** | 2022 | Jun | MT2 | 520153 | 5703794 | - | - | - | - | 2022-06-24 | 11:24:00 | 2022-06-24 | 13:23:00 | 0.5 | - | 1 | 1.98 | - |
| **RA1-WC-28** | 2022 | Jun | MT3 | 520166 | 5703838 | - | - | - | - | 2022-06-24 | 11:27:00 | 2022-06-24 | 13:19:00 | 0.5 | - | 1 | 1.87 | - |
| **RA1-WC-28** | 2022 | Jun | MT4 | 520168 | 5703859 | - | - | - | - | 2022-06-24 | 11:29:00 | 2022-06-24 | 13:17:00 | 0.9 | - | 1 | 1.80 | - |
| **RA1-WC-28** | 2022 | Jun | MT5 | 520157 | 5703897 | - | - | - | - | 2022-06-24 | 11:32:00 | 2022-06-24 | 13:13:00 | 0.4 | - | 1 | 1.68 | - |
| **RA1-WC-28** | 2022 | Aug | BP1 | 520173 | 5703736 | 520161 | 5703877 | 200 | 627 | - | - | - | - | - | - | - | - | - |
| **RA1-WC-30** | 2022 | Aug | BP1 | 520549 | 5709381 | 520443 | 5709337 | 160 | 808 | - | - | - | - | - | - | - | - | - |
| **RA1-WC-30** | 2022 | Aug | MT1 | 520574 | 5709425 | - | - | - | - | 2022-08-22 | 11:18:00 | 2022-08-22 | 15:35:00 | 0.7 | 0.8 | 3 | 4.28 | 1 |
| **RA1-WC-30** | 2022 | Aug | MT2 | 520531 | 5709374 | - | - | - | - | 2022-08-22 | 11:33:00 | 2022-08-22 | 15:45:00 | 1 | - | 3 | 4.20 | - |
| **RA1-WC-32** | 2022 | Jun | MT1 | 522185 | 5711829 | - | - | - | - | 2022-06-25 | 9:45:00 | 2022-06-25 | 11:20:00 | 1 | - | 1 | 1.58 | - |
| **RA1-WC-32** | 2022 | Jun | MT2 | 522139 | 5711812 | - | - | - | - | 2022-06-25 | 9:48:00 | 2022-06-25 | 11:18:00 | 1.1 | - | 1 | 1.50 | - |
| **RA1-WC-32** | 2022 | Jun | MT3 | 522123 | 5711804 | - | - | - | - | 2022-06-25 | 9:56:00 | 2022-06-25 | 11:17:00 | 1 | - | 1 | 1.35 | - |
| **RA1-WC-32** | 2022 | Jun | MT4 | 522079 | 5711816 | - | - | - | - | 2022-06-25 | 9:54:00 | 2022-06-25 | 11:14:00 | 1.1 | - | 1 | 1.33 | - |
| **RA1-WC-32** | 2022 | Aug | MT1 | 522095 | 5711809 | - | - | - | - | 2022-08-21 | 10:36:00 | 2022-08-21 | 13:50:00 | 0.8 | - | 1 | 3.23 | - |
| **RA1-WC-32** | 2022 | Aug | MT2 | 522130 | 5711802 | - | - | - | - | 2022-08-21 | 10:46:00 | 2022-08-21 | 13:55:00 | 0.65 | 0.85 | 1 | 3.15 | - |
| **RA1-WC-41** | 2022 | Aug | MT1 | 521627 | 5720130 | - | - | - | - | 2022-08-23 | 13:42:00 | 2022-08-23 | 15:36:00 | 0.5 | 1 | 3 | 1.90 | - |
| **RA1-WC-41** | 2022 | Aug | MT2 | 521634 | 5720098 | - | - | - | - | 2022-08-23 | 13:50:00 | 2022-08-23 | 15:36:00 | 0.5 | 1 | 3 | 1.77 | - |
| **RA1-WC-51** | 2022 | Aug | MT1 | 511061 | 5732911 | - | - | - | - | 2022-08-26 | 10:34:00 | 2022-08-26 | 13:00:00 | 0.75 | - | 3 | 2.43 | - |
| **RA1-WC-51** | 2022 | Aug | MT2 | 510966 | 5732848 | - | - | - | - | 2022-08-26 | 10:43:00 | 2022-08-26 | 12:51:00 | 0.5 | 0.7 | 3 | 2.13 | - |
| **RA1-WC-57** | 2019 | Sep | MT1 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 9:55:00 | 2019-09-10 | 12:13:00 | - | - | 1 | 2.30 | - |
| **RA1-WC-57** | 2019 | Sep | MT2 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 9:58:00 | 2019-09-10 | 12:15:00 | - | - | 1 | 2.28 | - |
| **RA1-WC-57** | 2019 | Sep | MT3 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 10:00:00 | 2019-09-10 | 12:15:00 | - | - | 1 | 2.25 | - |
| **RA1-WC-66** | 2022 | Jun | MT1 | 527393 | 5740043 | - | - | - | - | 2022-06-30 | 10:00:00 | 2022-06-30 | 13:00:00 | 0.4 | 1.5 | 10 | 3.00 | 7 |
| **RA1-WC-67** | 2022 | Jun | MT1 | #N/A | #N/A | - | - | - | - | 2022-06-30 | 13:55:00 | 2022-06-30 | 16:55:00 | - | - | 10 | 3.00 | - |
| **RA4B-WC-02** | 2022 | Aug | BP1 | 517157 | 5630979 | 517181 | 5631059 | 100 | 278 | - | - | - | - | - | - | - | - | - |
| **RA4B-WC-02** | 2022 | Aug | MT1 | 527156 | 5630931 | - | - | - | - | 2022-08-23 | 13:10:00 | 2022-08-23 | 14:58:00 | 0.7 | - | 1 | 1.80 | - |
| **RA4B-WC-02** | 2022 | Aug | MT2 | 517168 | 5631027 | - | - | - | - | 2022-08-23 | 13:14:00 | 2022-08-23 | 14:53:00 | 0.7 | - | 1 | 1.65 | - |
| **RA4B-WC-02** | 2022 | Aug | MT3 | 517178 | 5631062 | - | - | - | - | 2022-08-23 | 13:16:00 | 2022-08-23 | 14:51:00 | 0.7 | - | 1 | 1.58 | - |
| **RA4B-WC-02** | 2022 | Aug | MT4 | 517170 | 5631094 | - | - | - | - | 2022-08-23 | 13:19:00 | 2022-08-23 | 14:50:00 | 0.7 | - | 1 | 1.52 | - |
| **RA4B-WC-02** | 2022 | Aug | MT5 | 517183 | 5631105 | - | - | - | - | 2022-08-23 | 13:21:00 | 2022-08-23 | 14:47:00 | 0.6 | - | 1 | 1.43 | - |
| **RA4B-WC-02** | 2022 | Aug | MT6 | 517137 | 5630970 | - | - | - | - | 2022-08-23 | 13:32:00 | 2022-08-23 | 15:00:00 | 0.8 | - | 1 | 1.47 | - |
| **RA4-WC-00** | 2022 | Jun | BP1 | 524233 | 5619983 | 524115 | 5620004 | 120 | 532 | - | - | - | - | - | - | - | - | 2 |

| Site ID | Year | Month | Effort ID | Start Easting | Start Northing | End Easting | End Northing | Total Distance (m) | Duration (seconds) | DateSet | Set Time | DateLift | Pull Time | Depth Minimum (m) | Depth Maximum (m) | Number of Traps | Duration (hours) | Fish Captured |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-00** | 2022 | Jun | MT1 | 524116 | 5620003 | - | - | - | - | 2022-06-26 | 9:13:00 | 2022-06-26 | 10:44:00 | 0.9 | - | 1 | 1.52 | 2 |
| **RA4-WC-00** | 2022 | Jun | MT2 | 524131 | 5620003 | - | - | - | - | 2022-06-26 | 9:14:00 | 2022-06-26 | 10:45:00 | 0.9 | - | 1 | 1.52 | - |
| **RA4-WC-00** | 2022 | Jun | MT3 | 524209 | 5619998 | - | - | - | - | 2022-06-26 | 9:30:00 | 2022-06-26 | 10:55:00 | 0.7 | - | 1 | 1.42 | 2 |
| **RA4-WC-00** | 2022 | Jun | MT4 | 524263 | 5619979 | - | - | - | - | 2022-06-26 | 9:29:00 | 2022-06-26 | 10:54:00 | 1 | - | 1 | 1.42 | - |
| **RA4-WC-00** | 2022 | Jun | MT5 | 524293 | 5619966 | - | - | - | - | 2022-06-26 | 9:27:00 | 2022-06-26 | 10:52:00 | 1 | - | 1 | 1.42 | 2 |
| **RA4-WC-00** | 2022 | Aug | BP1 | 524263 | 5619973 | 524121 | 5620002 | 125 | 769 | - | - | - | - | - | - | - | - | 67 |
| **RA4-WC-00** | 2022 | Aug | MT1 | 524118 | 5620003 | - | - | - | - | 2022-08-25 | 11:15:00 | 2022-08-25 | 15:59:00 | 0.5 | - | 1 | 4.73 | - |
| **RA4-WC-00** | 2022 | Aug | MT2 | 524132 | 5620003 | - | - | - | - | 2022-08-25 | 11:16:00 | 2022-08-25 | 15:58:00 | 0.5 | - | 1 | 4.70 | 1 |
| **RA4-WC-00** | 2022 | Aug | MT3 | 524172 | 5619994 | - | - | - | - | 2022-08-25 | 11:23:00 | 2022-08-25 | 15:45:00 | 0.6 | - | 1 | 4.37 | - |
| **RA4-WC-00** | 2022 | Aug | MT4 | 524231 | 5619991 | - | - | - | - | 2022-08-25 | 11:30:00 | 2022-08-25 | 15:42:00 | 0.5 | - | 1 | 4.20 | 1 |
| **RA4-WC-00** | 2022 | Aug | MT5 | 524279 | 5619965 | - | - | - | - | 2022-08-25 | 11:32:00 | 2022-08-25 | 15:39:00 | 0.5 | - | 1 | 4.12 | 1 |
| **RA4-WC-00** | 2022 | Aug | MT6 | 524303 | 5619951 | - | - | - | - | 2022-08-25 | 11:34:00 | 2022-08-25 | 15:38:00 | 0.4 | - | 1 | 4.07 | - |
| **RA4-WC02** | 2022 | Jun | MT1 | 521762 | 5624141 | - | - | - | - | 2022-06-21 | 10:56:00 | 2022-06-21 | 13:04:00 | 0.6 | - | 1 | 2.13 | - |
| **RA4-WC02** | 2022 | Jun | MT2 | 521789 | 5624165 | - | - | - | - | 2022-06-21 | 10:58:00 | 2022-06-21 | 13:07:00 | 0.6 | - | 1 | 2.15 | 2 |
| **RA4-WC02** | 2022 | Jun | MT3 | 521822 | 5624197 | - | - | - | - | 2022-06-21 | 11:04:00 | 2022-06-21 | 13:18:00 | 0.5 | - | 1 | 2.23 | - |
| **RA4-WC02** | 2022 | Jun | MT4 | 521862 | 5624231 | - | - | - | - | 2022-06-21 | 11:07:00 | 2022-06-21 | 13:20:00 | 0.6 | - | 1 | 2.22 | - |
| **RA4-WC02** | 2022 | Jun | MT5 | 521891 | 5624258 | - | - | - | - | 2022-06-21 | 11:08:00 | 2022-06-21 | 13:24:00 | 0.7 | - | 1 | 2.27 | - |
| **RA4-WC-05** | 2022 | Jun | MT1 | 519813 | 5628207 | - | - | - | - | 2022-06-26 | 12:20:00 | 2022-06-26 | 13:40:00 | 0.7 | - | 1 | 1.33 | - |
| **RA4-WC-05** | 2022 | Jun | MT2 | 519770 | 5628187 | - | - | - | - | 2022-06-26 | 12:31:00 | 2022-06-26 | 13:38:00 | 0.7 | - | 1 | 1.12 | - |
| **RA4-WC-05** | 2022 | Jun | MT3 | 519717 | 5628191 | - | - | - | - | 2022-06-26 | 12:30:00 | 2022-06-26 | 13:36:00 | 0.8 | - | 1 | 1.10 | - |
| **RA4-WC-05** | 2022 | Jun | MT4 | 519683 | 5628197 | - | - | - | - | 2022-06-26 | 12:27:00 | 2022-06-26 | 13:35:00 | 0.8 | - | 1 | 1.13 | - |
| **RA4-WC-05** | 2022 | Jun | MT5 | 519651 | 5628214 | - | - | - | - | 2022-06-26 | 12:28:00 | 2022-06-26 | 13:34:00 | 0.8 | - | 1 | 1.10 | - |
| **RA4-WC-12** | 2019 | Sep | MT1 | #N/A | #N/A | - | - | - | - | 2019-09-09 | 9:22:00 | 2019-09-09 | 10:50:00 | 0.8 | - | 1 | 1.47 | - |
| **RA4-WC-12** | 2019 | Sep | MT2 | #N/A | #N/A | - | - | - | - | 2019-09-09 | 9:25:00 | 2019-09-09 | 10:55:00 | 0.9 | - | 1 | 1.50 | - |
| **RA4-WC-12** | 2019 | Sep | MT3 | #N/A | #N/A | - | - | - | - | 2019-09-09 | 9:35:00 | 2019-09-09 | 11:00:00 | 0.3 | - | 1 | 1.42 | - |
| **RA4-WC-17** | 2022 | Jun | MT1 | 522125 | 5646008 | - | - | - | - | 2022-06-28 | 13:26:00 | 2022-06-28 | 17:07:00 | 0.8 | - | 1 | 3.68 | 24 |
| **RA4-WC-17** | 2022 | Jun | MT1 | 522125 | 5646008 | - | - | - | - | 2022-06-28 | 13:26:00 | 2022-06-28 | 17:07:00 | 0.8 | - | 1 | 3.68 | 2 |
| **RA4-WC-17** | 2022 | Jun | MT2 | 522023 | 5645978 | - | - | - | - | 2022-06-28 | 13:10:00 | 2022-06-28 | 16:12:00 | 0.6 | - | 1 | 3.03 | 2 |
| **RA4-WC-17** | 2022 | Jun | MT2 | 522023 | 5645978 | - | - | - | - | 2022-06-28 | 13:10:00 | 2022-06-28 | 16:12:00 | 0.6 | - | 1 | 3.03 | 43 |
| **RA4-WC-17** | 2022 | Jun | MT3 | 522023 | 5645977 | - | - | - | - | 2022-06-28 | 13:10:00 | 2022-06-28 | 15:54:00 | 0.6 | - | 1 | 2.73 | 23 |
| **RA4-WC-17** | 2022 | Jun | MT4 | 522013 | 5645997 | - | - | - | - | 2022-06-28 | 13:13:00 | 2022-06-28 | 15:05:00 | 0.7 | - | 1 | 1.87 | 2 |
| **RA4-WC-17** | 2022 | Jun | MT4 | 522013 | 5645997 | - | - | - | - | 2022-06-28 | 13:13:00 | 2022-06-28 | 15:05:00 | 0.7 | - | 1 | 1.87 | 25 |
| **RA4-WC-18** | 2019 | Sep | MT1 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 15:18:00 | 2019-09-07 | 18:28:00 | 0.7 | - | 1 | 3.17 | - |
| **RA4-WC-18** | 2019 | Sep | MT2 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 15:24:00 | 2019-09-07 | 18:34:00 | 0.4 | - | 1 | 3.17 | - |
| **RA4-WC-18** | 2019 | Sep | MT3 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 15:33:00 | 2019-09-07 | 18:37:00 | 1 | - | 1 | 3.07 | - |
| **RA4-WC-18** | 2019 | Sep | MT4 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 15:39:00 | 2019-09-07 | 18:41:00 | 0.5 | - | 1 | 3.03 | - |
| **RA4-WC-19** | 2022 | Aug | MT1 | 523040 | 5649773 | - | - | - | - | 2022-08-22 | 10:03:00 | 2022-08-22 | 12:09:00 | 1.04 | - | 1 | 2.10 | - |
| **RA4-WC-19** | 2022 | Aug | MT2 | 523015 | 5649752 | - | - | - | - | 2022-08-22 | 10:06:00 | 2022-08-22 | 12:00:00 | 1.2 | - | 1 | 1.90 | - |
| **RA4-WC-19** | 2022 | Aug | MT3 | 522999 | 5649745 | - | - | - | - | 2022-08-22 | 10:09:00 | 2022-08-22 | 11:50:00 | 1 | - | 1 | 1.68 | - |
| **RA4-WC-19** | 2022 | Aug | MT4 | 523057 | 5649785 | - | - | - | - | 2022-08-22 | 10:16:00 | 2022-08-22 | 12:30:00 | 0.8 | - | 1 | 2.23 | - |

| Site ID | Year | Month | Effort ID | Start Easting | Start Northing | End Easting | End Northing | Total Distance (m) | Duration (seconds) | DateSet | Set Time | DateLift | Pull Time | Depth Minimum (m) | Depth Maximum (m) | Number of Traps | Duration (hours) | Fish Captured |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-19** | 2022 | Aug | MT5 | 523090 | 5649817 | - | - | - | - | 2022-08-22 | 10:20:00 | 2022-08-22 | 12:26:00 | 0.7 | - | 1 | 2.10 | - |
| **RA4-WC-19** | 2022 | Aug | MT6 | 523118 | 5649852 | - | - | - | - | 2022-08-22 | 10:25:00 | 2022-08-22 | 12:23:00 | 0.7 | - | 1 | 1.97 | - |
| **RA4-WC-21** | 2022 | Jun | MT1 | 521015 | 5656063 | - | - | - | - | 2022-06-27 | 9:45:00 | 2022-06-27 | 11:05:00 | 1.4 | - | 1 | 1.33 | 1 |
| **RA4-WC-21** | 2022 | Jun | MT2 | 521061 | 5656059 | - | - | - | - | 2022-06-27 | 9:42:00 | 2022-06-27 | 11:07:00 | 1.2 | - | 1 | 1.42 | - |
| **RA4-WC-21** | 2022 | Jun | MT3 | 521106 | 5656080 | - | - | - | - | 2022-06-27 | 9:51:00 | 2022-06-27 | 11:24:00 | 0.5 | - | 1 | 1.55 | 2 |
| **RA4-WC-21** | 2022 | Jun | MT4 | 521122 | 5656048 | - | - | - | - | 2022-06-27 | 9:54:00 | 2022-06-27 | 11:15:00 | 0.4 | - | 1 | 1.35 | - |
| **RA4-WC-21** | 2022 | Jun | MT5 | 521145 | 5656027 | - | - | - | - | 2022-06-27 | 9:57:00 | 2022-06-27 | 11:20:00 | 0.6 | - | 1 | 1.38 | - |
| **RA4-WC-21** | 2022 | Aug | MT1 | 521100 | 5656090 | - | - | - | - | 2022-08-24 | 13:28:00 | 2022-08-24 | 15:36:00 | 0.5 | - | 1 | 2.13 | - |
| **RA4-WC-21** | 2022 | Aug | MT2 | 521081 | 5656084 | - | - | - | - | 2022-08-24 | 13:33:00 | 2022-08-24 | 14:42:00 | 1.6 | - | 1 | 1.15 | - |
| **RA4-WC-21** | 2022 | Aug | MT3 | 521066 | 5656064 | - | - | - | - | 2022-08-24 | 13:36:00 | 2022-08-24 | 14:40:00 | 1.8 | - | 1 | 1.07 | - |
| **RA4-WC-21** | 2022 | Aug | MT4 | 521055 | 5656055 | - | - | - | - | 2022-08-24 | 13:37:00 | 2022-08-24 | 14:37:00 | 1.2 | - | 1 | 1.00 | - |
| **RA4-WC-21** | 2022 | Aug | MT5 | 521126 | 5656044 | - | - | - | - | 2022-08-24 | 13:46:00 | 2022-08-24 | 15:34:00 | 1.1 | - | 1 | 1.80 | - |
| **RA4-WC-21** | 2022 | Aug | MT6 | 521150 | 5656018 | - | - | - | - | 2022-08-24 | 13:48:00 | 2022-08-24 | 15:32:00 | 1.3 | - | 1 | 1.73 | - |
| **RA4-WC-22** | 2022 | Jun | BP1 | 530878 | 5722879 | 530793 | 5723127 | 105 | 340 | - | - | - | - | - | - | - | - | 6 |
| **RA4-WC-22** | 2022 | Jun | MT1 | 520798 | 5657220 | - | - | - | - | 2022-06-22 | 9:30:00 | 2022-06-22 | 11:47:00 | 1 | - | 1 | 2.28 | - |
| **RA4-WC-22** | 2022 | Jun | MT2 | 520818 | 5657262 | - | - | - | - | 2022-06-22 | 9:33:00 | 2022-06-22 | 11:50:00 | 0.8 | - | 1 | 2.28 | - |
| **RA4-WC-22** | 2022 | Jun | MT3 | 520863 | 5657309 | - | - | - | - | 2022-06-22 | 9:37:00 | 2022-06-22 | 11:53:00 | 0.9 | - | 1 | 2.27 | - |
| **RA4-WC-22** | 2022 | Jun | MT4 | 520872 | 5657320 | - | - | - | - | 2022-06-22 | 9:42:00 | 2022-06-22 | 11:55:00 | 0.7 | - | 1 | 2.22 | - |
| **RA4-WC-22** | 2022 | Jun | MT5 | 520885 | 5657336 | - | - | - | - | 2022-06-22 | 9:43:00 | 2022-06-22 | 11:57:00 | 0.7 | - | 1 | 2.23 | - |
| **RA4-WC-22** | 2022 | Aug | BP1 | 520886 | 5657374 | 520839 | 5657279 | 115 | 1389 | - | - | - | - | - | - | - | - | 14 |
| **RA4-WC-22** | 2022 | Aug | MT1 | 520797 | 5657246 | - | - | - | - | 2022-08-24 | 15:51:00 | 2022-08-24 | 17:00:00 | 1 | - | 1 | 1.15 | - |
| **RA4-WC-22** | 2022 | Aug | MT2 | 520799 | 5657217 | - | - | - | - | 2022-08-24 | 15:53:00 | 2022-08-24 | 17:02:00 | 0.9 | - | 1 | 1.15 | - |
| **RA4-WC-22** | 2022 | Aug | MT3 | 520841 | 5657287 | - | - | - | - | 2022-08-24 | 16:07:00 | 2022-08-24 | 17:08:00 | 0.7 | - | 1 | 1.02 | - |
| **RA4-WC-22** | 2022 | Aug | MT4 | 520849 | 5657297 | - | - | - | - | 2022-08-24 | 16:08:00 | 2022-08-24 | 17:09:00 | 1 | - | 1 | 1.02 | - |
| **RA4-WC-22** | 2022 | Aug | MT5 | 520866 | 5657312 | - | - | - | - | 2022-08-24 | 16:10:00 | 2022-08-24 | 17:13:00 | 1.2 | - | 1 | 1.05 | - |
| **RA4-WC-22** | 2022 | Aug | MT6 | 520887 | 5657332 | - | - | - | - | 2022-08-24 | 16:11:00 | 2022-08-24 | 17:17:00 | 1.1 | - | 1 | 1.10 | - |
| **RA4-WC-24** | 2022 | Jun | BP1 | 519906 | 5659783 | 519806 | 5659780 | 105 | 425 | - | - | - | - | - | - | - | - | 20 |
| **RA4-WC-25** | 2019 | Sep | MT Pooled | #N/A | #N/A | - | - | - | - | 2019-09-10 | (blank) | 2019-09-10 | (blank) | - | - | 1 | 0.00 | 78 |
| **RA4-WC-25** | 2019 | Sep | MT1 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 14:10:00 | 2019-09-10 | 15:35:00 | 0.8 | - | 1 | 1.42 | - |
| **RA4-WC-25** | 2019 | Sep | MT2 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 14:15:00 | 2019-09-10 | 15:42:00 | 0.45 | - | 1 | 1.45 | - |
| **RA4-WC-25** | 2019 | Sep | MT3 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 14:20:00 | 2019-09-10 | 15:45:00 | 0.35 | - | 1 | 1.42 | - |
| **RA4-WC-25** | 2019 | Sep | MT4 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 14:23:00 | 2019-09-10 | 15:50:00 | 0.4 | - | 1 | 1.45 | - |
| **RA4-WC-25** | 2019 | Sep | MT5 | #N/A | #N/A | - | - | - | - | 2019-09-10 | 14:25:00 | 2019-09-10 | 15:56:00 | 0.45 | - | 1 | 1.52 | - |
| **RA4-WC-26** | 2021 | Sep | BP1 | 519598 | 5663171 | 519977 | 5663181 | 60 | 695 | - | - | - | - | - | - | - | - | 45 |
| **RA4-WC-26** | 2021 | Sep | MT1 | 520016 | 5663163 | - | - | - | - | 2021-09-13 | 11:15:00 | 2021-09-13 | 16:38:00 | 0.7 | - | 2 | 5.38 | 7 |
| **RA4-WC-26** | 2021 | Sep | MT1 | 521999 | 5691380 | - | - | - | - | 2021-09-15 | 12:45:00 | 2021-09-15 | 14:30:00 | 0.6 | - | 2 | 1.75 | - |
| **RA4-WC-26** | 2021 | Sep | MT2 | 519959 | 5663168 | - | - | - | - | 2021-09-13 | 11:38:00 | 2021-09-13 | 16:33:00 | 0.9 | - | 3 | 4.92 | 44 |
| **RA4-WC-27** | 2019 | Sep | MT1 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 12:13:00 | 2019-09-07 | 14:14:00 | 0.3 | - | 1 | 2.02 | - |
| **RA4-WC-27** | 2019 | Sep | MT2 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 12:19:00 | 2019-09-07 | 14:17:00 | 0.4 | - | 1 | 1.97 | - |
| **RA4-WC-27** | 2019 | Sep | MT3 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 12:25:00 | 2019-09-07 | 14:11:00 | 0.8 | - | 1 | 1.77 | - |

| Site ID | Year | Month | Effort ID | Start Easting | Start Northing | End Easting | End Northing | Total Distance (m) | Duration (seconds) | DateSet | Set Time | DateLift | Pull Time | Depth Minimum (m) | Depth Maximum (m) | Number of Traps | Duration (hours) | Fish Captured |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-27** | 2019 | Sep | MT4 | #N/A | #N/A | - | - | - | - | 2019-09-07 | 12:37:00 | 2019-09-07 | 14:08:00 | 0.3 | - | 1 | 1.52 | - |
| **RA4-WC-34** | 2021 | Sep | MT1 | 525246 | 5705329 | - | - | - | - | 2021-09-15 | 14:52:00 | 2021-09-15 | 17:20:00 | 0.5 | - | 3 | 2.47 | - |
| **RA4-WC-34** | 2021 | Sep | MT2 | 525121 | 5705262 | - | - | - | - | 2021-09-15 | 15:14:00 | 2021-09-15 | 17:09:00 | 0.5 | - | 2 | 1.92 | - |
| **RA4-WC-37** | 2021 | Sep | BP1 | 524697 | 5708581 | 524596 | 5708523 | 120 | 510 | - | - | - | - | - | - | - | - | - |
| **RA4-WC-37** | 2021 | Sep | MT1 | 524615 | 5708541 | - | - | - | - | 2021-09-12 | 12:23:00 | 2021-09-12 | 16:30:00 | 1 | - | 3 | 4.12 | - |
| **RA4-WC-37** | 2021 | Sep | MT2 | 524691 | 5708584 | - | - | - | - | 2021-09-12 | 13:09:00 | 2021-09-12 | 15:51:00 | 1 | - | 2 | 2.70 | - |
| **RA4-WC-41** | 2022 | Jun | MT1 | 526644 | 5715946 | - | - | - | - | 2022-06-25 | 10:30:00 | 2022-06-26 | 12:30:00 | 1 | - | 6 | 26.00 | 3 |
| **RA4-WC-45** | 2022 | Jun | MT1 | 530793 | 5723127 | - | - | - | - | 2022-06-27 | 13:30:00 | 2022-06-27 | 16:30:00 | - | - | 6 | 3.00 | - |
| **RA4-WC-45** | 2022 | Aug | MT1 | 530778 | 5723046 | - | - | - | - | 2022-08-26 | 13:38:00 | 2022-08-26 | 15:30:00 | 1.1 | - | 3 | 1.87 | - |
| **RA4-WC-45** | 2022 | Aug | MT2 | 530789 | 5723005 | - | - | - | - | 2022-08-26 | 13:43:00 | 2022-08-26 | 15:35:00 | 1.2 | - | 3 | 1.87 | - |
| **RA4-WC-55** | 2022 | Jun | MT1 | 539102 | 5735949 | - | - | - | - | 2022-06-27 | 10:00:00 | 2022-06-27 | 13:00:00 | - | - | 6 | 3.00 | - |

**Table B-2: Catch data for Marten Falls Community Access Road Fish Surveys, 2019 to 2022**

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-4-WC-01** | 1 | 2021-09-11 | 21-Sep | BP1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 2 | 2021-09-11 | 21-Sep | BP1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 3 | 2021-09-11 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 4 | 2021-09-11 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 5 | 2021-09-11 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 6 | 2021-09-11 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 7 | 2021-09-11 | 21-Sep | BP1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 8 | 2021-09-11 | 21-Sep | BP1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 9 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 10 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 11 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 12 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 13 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 14 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 15 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 16 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 17 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 18 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 19 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 20 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 21 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 22 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 23 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 24 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 25 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 26 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 27 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 28 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 29 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 30 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 31 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 32 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 33 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 34 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 35 | 2021-09-11 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 36 | 2021-09-11 | 21-Sep | MT1 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 37 | 2021-09-11 | 21-Sep | MT1 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 38 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 39 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 40 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 41 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 42 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 43 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 44 | 2021-09-11 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 45 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 46 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 47 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 48 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 49 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 50 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 51 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 52 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 53 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 54 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 55 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 56 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 57 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 58 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 59 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 60 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 61 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 62 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 63 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 64 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 65 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 66 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 67 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 68 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-4-WC-01** | 69 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 70 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 71 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 72 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 73 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 74 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 75 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 76 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 77 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 78 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 79 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 80 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 81 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 82 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 83 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 84 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 85 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 86 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 87 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 88 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 89 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 90 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 91 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 92 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 93 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 94 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 95 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 96 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 97 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 98 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 99 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 100 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 101 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 102 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 103 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 104 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 105 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 106 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 107 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 108 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 109 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 110 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 111 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 112 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 113 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 114 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 115 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 116 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 117 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 118 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 119 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 120 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 121 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 122 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 123 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 124 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 125 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 126 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 127 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 128 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 129 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 130 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 131 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 132 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 133 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 134 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 135 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 136 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 137 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 138 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-4-WC-01** | 139 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 140 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 141 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 142 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 143 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 144 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 145 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 146 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 147 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 148 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 149 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 150 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 151 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 152 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 153 | 2021-09-11 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA1-4-WC-01** | 154 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 155 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 156 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 157 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 158 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 159 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 160 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 161 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 162 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 163 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 164 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 165 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 166 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 167 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 168 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 169 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 170 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 171 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 172 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 173 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 174 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 175 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 176 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 177 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 178 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 179 | 2021-09-11 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA1-4-WC-01** | 180 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 181 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 182 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 183 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 184 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 185 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 186 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 187 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 188 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 189 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 190 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-4-WC-01** | 191 | 2021-09-11 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA1-WC-09** | 192 | 2022-06-23 | 22-Jun | MT5 | 1 | FNDC | 68 | 3.1 | U | A |
| **RA1-WC-09** | 193 | 2022-06-23 | 22-Jun | MT5 | 1 | NRDC | 60 | 2.7 | U | A |
| **RA1-WC-09** | 194 | 2022-06-23 | 22-Jun | MT5 | 1 | BRST | 59 | 1.4 | U | A |
| **RA1-WC-09** | 195 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 48 | 1.2 | U | A |
| **RA1-WC-09** | 196 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 51 | 1.9 | U | A |
| **RA1-WC-09** | 197 | 2022-06-23 | 22-Jun | MT4 | 1 | FNDC | 50 | 1.6 | U | A |
| **RA1-WC-09** | 198 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 46 | 1.1 | U | A |
| **RA1-WC-09** | 199 | 2022-06-23 | 22-Jun | MT4 | 1 | FNDC | 60 | 2.1 | U | A |
| **RA1-WC-09** | 200 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 43 | 1.5 | U | A |
| **RA1-WC-09** | 201 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 56 | 2.2 | U | A |
| **RA1-WC-09** | 202 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 55 | 1.8 | U | A |
| **RA1-WC-09** | 203 | 2022-06-23 | 22-Jun | MT4 | 1 | BRST | 50 | 1.0 | U | A |
| **RA1-WC-09** | 204 | 2022-06-23 | 22-Jun | MT4 | 1 | FNDC | 44 | 1.0 | U | A |
| **RA1-WC-09** | 205 | 2022-06-23 | 22-Jun | MT4 | 1 | NRDC | 55 | 1.9 | U | A |
| **RA1-WC-09** | 206 | 2022-06-23 | 22-Jun | MT3 | 1 | PRDC | 79 | 5.1 | U | A |
| **RA1-WC-09** | 207 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 59 | 1.7 | U | U |
| **RA1-WC-09** | 208 | 2022-06-23 | 22-Jun | MT3 | 1 | NRDC | 56 | 1.9 | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-09** | 209 | 2022-06-23 | 22-Jun | MT3 | 1 | NRDC | 52 | 1.9 | U | U |
| **RA1-WC-09** | 210 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 50 | 1.1 | U | U |
| **RA1-WC-09** | 211 | 2022-06-23 | 22-Jun | MT3 | 1 | FNDC | 55 | 1.8 | U | U |
| **RA1-WC-09** | 212 | 2022-06-23 | 22-Jun | MT3 | 1 | NRDC | 49 | 1.4 | U | U |
| **RA1-WC-09** | 213 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 51 | 1.2 | U | U |
| **RA1-WC-09** | 214 | 2022-06-23 | 22-Jun | MT3 | 1 | PRDC | 59 | 2.1 | U | U |
| **RA1-WC-09** | 215 | 2022-06-23 | 22-Jun | MT3 | 1 | PRDC | 60 | 2.0 | U | U |
| **RA1-WC-09** | 216 | 2022-06-23 | 22-Jun | MT3 | 1 | PRDC | 52 | 1.2 | U | U |
| **RA1-WC-09** | 217 | 2022-06-23 | 22-Jun | MT3 | 1 | FNDC | 53 | 1.3 | U | U |
| **RA1-WC-09** | 218 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 55 | 1.3 | U | U |
| **RA1-WC-09** | 219 | 2022-06-23 | 22-Jun | MT3 | 1 | FNDC | 49 | 1.0 | U | U |
| **RA1-WC-09** | 220 | 2022-06-23 | 22-Jun | MT3 | 1 | NRDC | 60 | 2.7 | U | U |
| **RA1-WC-09** | 221 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 50 | 1.1 | U | U |
| **RA1-WC-09** | 222 | 2022-06-23 | 22-Jun | MT3 | 1 | NRDC | 65 | 2.7 | U | U |
| **RA1-WC-09** | 223 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 50 | 1.1 | U | A |
| **RA1-WC-09** | 224 | 2022-06-23 | 22-Jun | MT3 | 1 | BRST | 47 | 0.9 | U | A |
| **RA1-WC-09** | 225 | 2022-06-23 | 22-Jun | MT3 | 1 | PRDC | 49 | 1.3 | U | A |
| **RA1-WC-09** | 226 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 65 | 2.8 | U | A |
| **RA1-WC-09** | 227 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 46 | 1.2 | U | A |
| **RA1-WC-09** | 228 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 56 | 1.6 | U | A |
| **RA1-WC-09** | 229 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 96 | 9.3 | U | A |
| **RA1-WC-09** | 230 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 52 | 1.0 | U | A |
| **RA1-WC-09** | 231 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 64 | 2.6 | U | A |
| **RA1-WC-09** | 232 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 62 | 2.2 | U | A |
| **RA1-WC-09** | 233 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 60 | 2.2 | U | A |
| **RA1-WC-09** | 234 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 48 | 1.0 | U | A |
| **RA1-WC-09** | 235 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 64 | 2.7 | U | A |
| **RA1-WC-09** | 236 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 57 | 2.0 | U | A |
| **RA1-WC-09** | 237 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 56 | 1.8 | U | A |
| **RA1-WC-09** | 238 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 57 | 2.0 | U | A |
| **RA1-WC-09** | 239 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 57 | 1.5 | U | A |
| **RA1-WC-09** | 240 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 56 | 1.4 | U | A |
| **RA1-WC-09** | 241 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 55 | 2.2 | U | A |
| **RA1-WC-09** | 242 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 54 | 1.2 | U | A |
| **RA1-WC-09** | 243 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 56 | 1.9 | U | A |
| **RA1-WC-09** | 244 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 47 | 1.1 | U | A |
| **RA1-WC-09** | 245 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 49 | 1.2 | U | A |
| **RA1-WC-09** | 246 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.3 | U | A |
| **RA1-WC-09** | 247 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 112 | 12.7 | U | A |
| **RA1-WC-09** | 248 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 52 | 1.6 | U | A |
| **RA1-WC-09** | 249 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 57 | 1.9 | U | A |
| **RA1-WC-09** | 250 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 55 | 1.9 | U | A |
| **RA1-WC-09** | 251 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.4 | U | A |
| **RA1-WC-09** | 252 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 65 | 2.8 | U | A |
| **RA1-WC-09** | 253 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 47 | 1.3 | U | A |
| **RA1-WC-09** | 254 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 58 | 1.8 | U | A |
| **RA1-WC-09** | 255 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.1 | U | A |
| **RA1-WC-09** | 256 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 45 | 1.0 | U | A |
| **RA1-WC-09** | 257 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.0 | U | A |
| **RA1-WC-09** | 258 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 55 | 2.0 | U | A |
| **RA1-WC-09** | 259 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 50 | 1.4 | U | A |
| **RA1-WC-09** | 260 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 46 | 1.1 | U | A |
| **RA1-WC-09** | 261 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 57 | 1.8 | U | A |
| **RA1-WC-09** | 262 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 57 | 1.9 | U | A |
| **RA1-WC-09** | 263 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 53 | 0.9 | U | A |
| **RA1-WC-09** | 264 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.2 | U | A |
| **RA1-WC-09** | 265 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 63 | 2.5 | U | A |
| **RA1-WC-09** | 266 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 56 | 1.8 | U | A |
| **RA1-WC-09** | 267 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 48 | 1.1 | U | A |
| **RA1-WC-09** | 268 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 55 | 1.8 | U | A |
| **RA1-WC-09** | 269 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 55 | 1.8 | U | A |
| **RA1-WC-09** | 270 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 49 | 1.3 | U | A |
| **RA1-WC-09** | 271 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 55 | 1.5 | U | A |
| **RA1-WC-09** | 272 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 50 | 1.4 | U | A |
| **RA1-WC-09** | 273 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 56 | 1.3 | U | A |
| **RA1-WC-09** | 274 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 57 | 1.9 | U | A |
| **RA1-WC-09** | 275 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 48 | 1.2 | U | A |
| **RA1-WC-09** | 276 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 54 | 2.0 | U | A |
| **RA1-WC-09** | 277 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 47 | 1.0 | U | A |
| **RA1-WC-09** | 278 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 48 | 1.3 | U | A |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-09** | 279 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.6 | U | A |
| **RA1-WC-09** | 280 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 47 | 0.9 | U | A |
| **RA1-WC-09** | 281 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 62 | 2.5 | U | A |
| **RA1-WC-09** | 282 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.1 | U | A |
| **RA1-WC-09** | 283 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.1 | U | A |
| **RA1-WC-09** | 284 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 50 | 1.2 | U | A |
| **RA1-WC-09** | 285 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 47 | 0.9 | U | A |
| **RA1-WC-09** | 286 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 57 | 1.7 | U | A |
| **RA1-WC-09** | 287 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 53 | 1.4 | U | A |
| **RA1-WC-09** | 288 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.2 | U | A |
| **RA1-WC-09** | 289 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 45 | 1.1 | U | A |
| **RA1-WC-09** | 290 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.2 | U | A |
| **RA1-WC-09** | 291 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 62 | 2.4 | U | A |
| **RA1-WC-09** | 292 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.3 | U | A |
| **RA1-WC-09** | 293 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 55 | 1.9 | U | A |
| **RA1-WC-09** | 294 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 52 | 1.4 | U | A |
| **RA1-WC-09** | 295 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 49 | 1.0 | U | A |
| **RA1-WC-09** | 296 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 62 | 2.2 | U | A |
| **RA1-WC-09** | 297 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.5 | U | A |
| **RA1-WC-09** | 298 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 60 | 2.1 | U | A |
| **RA1-WC-09** | 299 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 62 | 2.6 | U | A |
| **RA1-WC-09** | 300 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 50 | 1.3 | U | A |
| **RA1-WC-09** | 301 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 49 | 1.2 | U | A |
| **RA1-WC-09** | 302 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 65 | 3.1 | U | A |
| **RA1-WC-09** | 303 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.4 | U | A |
| **RA1-WC-09** | 304 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 56 | 1.8 | U | A |
| **RA1-WC-09** | 305 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 65 | 2.9 | U | A |
| **RA1-WC-09** | 306 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 46 | 0.9 | U | A |
| **RA1-WC-09** | 307 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 48 | 1.3 | U | A |
| **RA1-WC-09** | 308 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 84 | 6.3 | U | A |
| **RA1-WC-09** | 309 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 44 | 1.0 | U | A |
| **RA1-WC-09** | 310 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 44 | 0.9 | U | A |
| **RA1-WC-09** | 311 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 49 | 1.4 | U | A |
| **RA1-WC-09** | 312 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 50 | 1.2 | U | A |
| **RA1-WC-09** | 313 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 55 | 1.6 | U | A |
| **RA1-WC-09** | 314 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.2 | U | A |
| **RA1-WC-09** | 315 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 59 | 1.2 | U | A |
| **RA1-WC-09** | 316 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 60 | 2.5 | U | A |
| **RA1-WC-09** | 317 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 77 | 4.1 | U | A |
| **RA1-WC-09** | 318 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 55 | 1.2 | U | A |
| **RA1-WC-09** | 319 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 50 | 1.1 | U | A |
| **RA1-WC-09** | 320 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 54 | 1.8 | U | A |
| **RA1-WC-09** | 321 | 2022-06-23 | 22-Jun | MT2 | 1 | PRDC | 50 | 1.2 | U | A |
| **RA1-WC-09** | 322 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 52 | 1.4 | U | A |
| **RA1-WC-09** | 323 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 63 | 2.6 | U | A |
| **RA1-WC-09** | 324 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.4 | U | A |
| **RA1-WC-09** | 325 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.0 | U | A |
| **RA1-WC-09** | 326 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 46 | 1.1 | U | A |
| **RA1-WC-09** | 327 | 2022-06-23 | 22-Jun | MT2 | 1 | NRDC | 50 | 1.2 | U | A |
| **RA1-WC-09** | 328 | 2022-06-23 | 22-Jun | MT2 | 1 | BRST | 50 | 0.9 | U | A |
| **RA1-WC-09** | 329 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 48 | 1.0 | U | A |
| **RA1-WC-09** | 330 | 2022-06-23 | 22-Jun | MT2 | 1 | FNDC | 99 | 0.8 | U | A |
| **RA1-WC-09** | 331 | 2022-06-23 | 22-Jun | MT1 | 1 | PRDC | 70 | 5.4 | U | A |
| **RA1-WC-09** | 332 | 2022-06-23 | 22-Jun | MT1 | 1 | NRDC | 48 | 1.3 | U | A |
| **RA1-WC-09** | 333 | 2022-06-23 | 22-Jun | MT1 | 1 | BRST | 50 | 1.1 | U | A |
| **RA1-WC-09** | 334 | 2022-06-23 | 22-Jun | MT1 | 1 | BRST | 54 | 1.1 | U | A |
| **RA1-WC-09** | 335 | 2022-06-23 | 22-Jun | MT1 | 1 | NRDC | 46 | 1.3 | U | A |
| **RA1-WC-09** | 336 | 2022-06-23 | 22-Jun | MT1 | 1 | BRST | 46 | 0.7 | U | A |
| **RA1-WC-09** | 337 | 2022-06-23 | 22-Jun | MT1 | 1 | BRST | 49 | 0.9 | U | A |
| **RA1-WC-09** | 338 | 2022-06-23 | 22-Jun | MT1 | 1 | BRST | 56 | 1.4 | U | A |
| **RA1-WC-09** | 339 | 2022-06-23 | 22-Jun | MT1 | 1 | BRST | 52 | 1.2 | U | A |
| **RA1-WC-09** | 340 | 2022-06-23 | 22-Jun | MT1 | 1 | NRDC | 50 | 1.2 | U | A |
| **RA1-WC-09** | 341 | 2022-06-23 | 22-Jun | MT1 | 1 | NRDC | 47 | 1.0 | U | A |
| **RA1-WC-09** | 342 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 58 | 3.0 | U | A |
| **RA1-WC-09** | 343 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 38 | 0.6 | U | U |
| **RA1-WC-09** | 344 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 53 | 1.2 | U | U |
| **RA1-WC-09** | 345 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 51 | 1.1 | U | U |
| **RA1-WC-09** | 346 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 50 | 1.7 | U | A |
| **RA1-WC-09** | 347 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 54 | 2.3 | U | A |
| **RA1-WC-09** | 348 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 47 | 1.2 | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-09** | 349 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 49 | 1.2 | U | U |
| **RA1-WC-09** | 350 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 48 | 0.7 | U | U |
| **RA1-WC-09** | 351 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 47 | 1.0 | U | U |
| **RA1-WC-09** | 352 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 49 | 1.4 | U | U |
| **RA1-WC-09** | 353 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 38 | 0.4 | U | U |
| **RA1-WC-09** | 354 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 45 | 0.8 | U | U |
| **RA1-WC-09** | 355 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | - | - | U | U |
| **RA1-WC-09** | 356 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 50 | 1.2 | U | A |
| **RA1-WC-09** | 357 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 57 | 1.4 | U | A |
| **RA1-WC-09** | 358 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 48 | 1.2 | U | U |
| **RA1-WC-09** | 359 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 41 | 0.8 | U | U |
| **RA1-WC-09** | 360 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 48 | 1.3 | U | U |
| **RA1-WC-09** | 361 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | - | - | U | U |
| **RA1-WC-09** | 362 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 37 | 0.4 | U | U |
| **RA1-WC-09** | 363 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 51 | 0.9 | U | U |
| **RA1-WC-09** | 364 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 40 | 0.5 | U | U |
| **RA1-WC-09** | 365 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | - | - | U | U |
| **RA1-WC-09** | 366 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | - | - | U | U |
| **RA1-WC-09** | 367 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 55 | 1.4 | U | U |
| **RA1-WC-09** | 368 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | - | - | U | U |
| **RA1-WC-09** | 369 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 37 | 0.4 | U | U |
| **RA1-WC-09** | 370 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 39 | 0.5 | U | U |
| **RA1-WC-09** | 371 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 40 | 0.6 | U | U |
| **RA1-WC-09** | 372 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 53 | 1.5 | U | U |
| **RA1-WC-09** | 373 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 31 | 0.3 | U | U |
| **RA1-WC-09** | 374 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 51 | 1.2 | U | A |
| **RA1-WC-09** | 375 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 57 | 2.0 | U | U |
| **RA1-WC-09** | 376 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 31 | 0.3 | U | U |
| **RA1-WC-09** | 377 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 37 | 0.5 | U | U |
| **RA1-WC-09** | 378 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 48 | 0.9 | U | U |
| **RA1-WC-09** | 379 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 45 | 1.0 | U | U |
| **RA1-WC-09** | 380 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | - | - | U | U |
| **RA1-WC-09** | 381 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | - | - | U | U |
| **RA1-WC-09** | 382 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 44 | 0.8 | U | U |
| **RA1-WC-09** | 383 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 27 | 0.1 | U | J |
| **RA1-WC-09** | 384 | 2022-08-17 | 22-Aug | BP1 | 1 | PRDC | 52 | 1.3 | U | U |
| **RA1-WC-09** | 385 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 38 | 0.5 | U | U |
| **RA1-WC-09** | 386 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | - | - | U | U |
| **RA1-WC-09** | 387 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 40 | 0.5 | U | U |
| **RA1-WC-09** | 388 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 43 | 0.7 | U | U |
| **RA1-WC-09** | 389 | 2022-08-17 | 22-Aug | BP1 | 1 | NRDC | 42 | 0.8 | U | U |
| **RA1-WC-09** | 390 | 2022-08-17 | 22-Aug | BP1 | 1 | BRST | 48 | 1.0 | U | A |
| **RA1-WC-11** | 391 | 2022-08-21 | 22-Aug | BP1 | 1 | NRPK | 160 | 32.5 | U | J |
| **RA1-WC-11** | 392 | 2022-08-21 | 22-Aug | BP1 | 1 | NRPK | 120 | 9.5 | U | J |
| **RA1-WC-11** | 393 | 2022-08-21 | 22-Aug | BP1 | 1 | NRPK | 135 | 15.2 | U | J |
| **RA1-WC-11** | 394 | 2022-08-21 | 22-Aug | BP1 | 1 | BURB | 130 | 12.4 | U | J |
| **RA1-WC-11** | 395 | 2022-08-21 | 22-Aug | BP1 | 1 | BURB | 75 | 3.5 | U | J |
| **RA1-WC-11** | 396 | 2022-08-21 | 22-Aug | BP1 | 1 | BURB | 55 | 1.4 | U | J |
| **RA1-WC-11** | 397 | 2022-08-21 | 22-Aug | BP1 | 1 | UNDC | 32 | 0.3 | U | J |
| **RA1-WC-11** | 398 | 2022-08-21 | 22-Aug | BP1 | 1 | MTSC | 69 | 4.3 | U | A |
| **RA1-WC-17** | 399 | 2022-08-19 | 22-Aug | BP1 | 1 | NRPK | 97 | - | U | J |
| **RA1-WC-17** | 400 | 2022-08-19 | 22-Aug | BP1 | 1 | LNDC | 61 | 1.8 | U | A |
| **RA1-WC-17** | 401 | 2022-08-19 | 22-Aug | BP1 | 1 | LNDC | 52 | 1.4 | U | A |
| **RA1-WC-17** | 402 | 2022-08-19 | 22-Aug | BP1 | 1 | LNDC | 53 | 1.5 | U | A |
| **RA1-WC-17** | 403 | 2022-08-19 | 22-Aug | BP1 | 1 | LNDC | 50 | 1.2 | U | A |
| **RA1-WC-17** | 404 | 2022-08-19 | 22-Aug | BP1 | 1 | LNDC | 72 | 4.3 | U | A |
| **RA1-WC-17** | 405 | 2022-08-19 | 22-Aug | BP1 | 1 | LNDC | 75 | 4.6 | U | A |
| **RA1-WC-17** | 406 | 2022-08-19 | 22-Aug | BP1 | 1 | JHDR | 60 | 1.7 | U | A |
| **RA1-WC-17** | 407 | 2022-08-19 | 22-Aug | BP1 | 1 | JHDR | 45 | 0.8 | U | A |
| **RA1-WC-17** | 408 | 2022-08-19 | 22-Aug | BP1 | 1 | JHDR | 46 | 0.9 | U | A |
| **RA1-WC-22** | 409 | 2022-08-20 | 22-Aug | MT2 | 1 | CMSH | 77 | 3.7 | U | A |
| **RA1-WC-22** | 410 | 2022-08-20 | 22-Aug | MT2 | 1 | CMSH | 64 | 2.8 | U | U |
| **RA1-WC-22** | 411 | 2022-08-20 | 22-Aug | MT2 | 1 | CMSH | 56 | 1.9 | U | U |
| **RA1-WC-22** | 412 | 2022-08-20 | 22-Aug | MT2 | 1 | BRST | 44 | 0.7 | U | U |
| **RA1-WC-22** | 413 | 2022-08-20 | 22-Aug | MT2 | 1 | PRDC | 50 | 1.2 | U | U |
| **RA1-WC-22** | 414 | 2022-08-20 | 22-Aug | MT2 | 1 | BRST | 51 | 1.0 | U | U |
| **RA1-WC-22** | 415 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 65 | 3.0 | U | U |
| **RA1-WC-22** | 416 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 55 | 1.8 | U | U |
| **RA1-WC-22** | 417 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 62 | 3.1 | U | U |
| **RA1-WC-22** | 418 | 2022-08-20 | 22-Aug | MT1 | 1 | PRDC | 71 | 4.2 | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-22** | 419 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 54 | 2.6 | U | U |
| **RA1-WC-22** | 420 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 44 | 0.8 | U | U |
| **RA1-WC-22** | 421 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 55 | 1.7 | U | U |
| **RA1-WC-22** | 422 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 58 | 2.0 | U | U |
| **RA1-WC-22** | 423 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 58 | 1.8 | U | U |
| **RA1-WC-22** | 424 | 2022-08-20 | 22-Aug | MT1 | 1 | PRDC | 57 | 1.9 | U | U |
| **RA1-WC-22** | 425 | 2022-08-20 | 22-Aug | MT1 | 1 | FTMN | 51 | 1.6 | U | U |
| **RA1-WC-22** | 426 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 45 | 0.8 | U | U |
| **RA1-WC-22** | 427 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 47 | 1.1 | U | U |
| **RA1-WC-22** | 428 | 2022-08-20 | 22-Aug | MT1 | 1 | FNDC | 51 | 2.0 | U | U |
| **RA1-WC-22** | 429 | 2022-08-20 | 22-Aug | MT1 | 1 | BRST | 48 | 0.8 | U | U |
| **RA1-WC-22** | 430 | 2022-08-20 | 22-Aug | MT1 | 1 | BRST | 49 | 0.8 | U | U |
| **RA1-WC-22** | 431 | 2022-08-20 | 22-Aug | MT4 | 1 | FNDC | 65 | 3.5 | U | U |
| **RA1-WC-22** | 432 | 2022-08-20 | 22-Aug | MT4 | 1 | PRDC | 84 | 7.3 | U | U |
| **RA1-WC-22** | 433 | 2022-08-20 | 22-Aug | MT4 | 1 | PRDC | 99 | 11.3 | U | U |
| **RA1-WC-22** | 434 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 65 | 3.5 | U | U |
| **RA1-WC-22** | 435 | 2022-08-20 | 22-Aug | MT5 | 1 | FTMN | 66 | 3.4 | U | U |
| **RA1-WC-22** | 436 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 65 | 2.8 | U | U |
| **RA1-WC-22** | 437 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 64 | 2.7 | U | U |
| **RA1-WC-22** | 438 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 61 | 2.6 | U | U |
| **RA1-WC-22** | 439 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 65 | 2.5 | U | U |
| **RA1-WC-22** | 440 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 55 | 1.5 | U | U |
| **RA1-WC-22** | 441 | 2022-08-20 | 22-Aug | MT5 | 1 | CMSH | 58 | 2.2 | U | U |
| **RA1-WC-22** | 442 | 2022-08-20 | 22-Aug | MT5 | 1 | WHSC | 96 | 9.4 | U | U |
| **RA1-WC-22** | 443 | 2022-08-20 | 22-Aug | MT5 | 1 | WHSC | 94 | 9.1 | U | U |
| **RA1-WC-22** | 444 | 2022-08-20 | 22-Aug | MT5 | 1 | PRDC | 103 | 15.6 | U | U |
| **RA1-WC-22** | 445 | 2022-08-20 | 22-Aug | MT5 | 1 | FNDC | 60 | 2.5 | U | U |
| **RA1-WC-22** | 446 | 2022-08-20 | 22-Aug | MT6 | 1 | PRDC | 80 | 5.5 | U | U |
| **RA1-WC-22** | 447 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 68 | 3.7 | U | U |
| **RA1-WC-22** | 448 | 2022-08-20 | 22-Aug | MT6 | 1 | CMSH | 66 | 3.6 | U | U |
| **RA1-WC-22** | 449 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 60 | 2.8 | U | U |
| **RA1-WC-22** | 450 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 58 | 2.4 | U | U |
| **RA1-WC-22** | 451 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 55 | 2.1 | U | U |
| **RA1-WC-22** | 452 | 2022-08-20 | 22-Aug | MT6 | 1 | CMSH | 67 | 3.5 | U | U |
| **RA1-WC-22** | 453 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 75 | 4.5 | U | U |
| **RA1-WC-22** | 454 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 57 | 2.9 | U | U |
| **RA1-WC-22** | 455 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 54 | 2.2 | U | U |
| **RA1-WC-22** | 456 | 2022-08-20 | 22-Aug | MT6 | 1 | CMSH | 63 | 2.7 | U | U |
| **RA1-WC-22** | 457 | 2022-08-20 | 22-Aug | MT6 | 1 | CMSH | 62 | 2.8 | U | U |
| **RA1-WC-22** | 458 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 57 | 2.2 | U | U |
| **RA1-WC-22** | 459 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 62 | 3.1 | U | U |
| **RA1-WC-22** | 460 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 67 | 3.9 | U | U |
| **RA1-WC-22** | 461 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 75 | 5.0 | U | U |
| **RA1-WC-22** | 462 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | 66 | 4.5 | U | U |
| **RA1-WC-22** | 463 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 3.8 | U | U |
| **RA1-WC-22** | 464 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 4.1 | U | U |
| **RA1-WC-22** | 465 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.5 | U | U |
| **RA1-WC-22** | 466 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 4.7 | U | U |
| **RA1-WC-22** | 467 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.2 | U | U |
| **RA1-WC-22** | 468 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.2 | U | U |
| **RA1-WC-22** | 469 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.8 | U | U |
| **RA1-WC-22** | 470 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.0 | U | U |
| **RA1-WC-22** | 471 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.9 | U | U |
| **RA1-WC-22** | 472 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 1.7 | U | U |
| **RA1-WC-22** | 473 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 2.1 | U | U |
| **RA1-WC-22** | 474 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 1.9 | U | U |
| **RA1-WC-22** | 475 | 2022-08-20 | 22-Aug | MT6 | 1 | PRDC | 74 | 4.2 | U | U |
| **RA1-WC-22** | 476 | 2022-08-20 | 22-Aug | MT6 | 1 | PRDC | 59 | 2.5 | U | U |
| **RA1-WC-22** | 477 | 2022-08-20 | 22-Aug | MT6 | 1 | PRDC | 68 | 3.4 | U | U |
| **RA1-WC-22** | 478 | 2022-08-20 | 22-Aug | MT6 | 1 | FNDC | - | 1.8 | U | U |
| **RA1-WC-22** | 479 | 2022-08-20 | 22-Aug | MT6 | 1 | PRDC | 52 | 1.6 | U | U |
| **RA1-WC-22** | 480 | 2022-08-20 | 22-Aug | MT6 | 1 | BRST | 48 | 0.8 | U | U |
| **RA1-WC-22** | 481 | 2022-08-20 | 22-Aug | MT6 | 1 | BRST | 47 | 0.8 | U | U |
| **RA1-WC-30** | 482 | 2022-08-22 | 22-Aug | MT1 | 1 | NRPK | 75 | 2.5 | U | J |
| **RA1-WC-41** | 483 | 2022-06-25 | 22-Jun | MT1 | 1 | JHDR | 49 | 1.0 | U | U |
| **RA1-WC-41** | 484 | 2022-06-25 | 22-Jun | MT1 | 1 | TRPR | 41 | 0.9 | U | U |
| **RA1-WC-41** | 485 | 2022-06-25 | 22-Jun | MT1 | 1 | TRPR | 57 | 2.1 | U | U |
| **RA1-WC-66** | 486 | 2022-06-30 | 22-Jun | MT1 | 1 | BRST | 40 | 0.5 | U | U |
| **RA1-WC-66** | 487 | 2022-06-30 | 22-Jun | MT1 | 1 | BRST | 34 | 0.6 | U | U |
| **RA1-WC-66** | 488 | 2022-06-30 | 22-Jun | MT1 | 1 | BRST | 35 | 1.0 | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA1-WC-66** | 489 | 2022-06-30 | 22-Jun | MT1 | 1 | BRST | 41 | 1.5 | U | U |
| **RA1-WC-66** | 490 | 2022-06-30 | 22-Jun | MT1 | 1 | BRST | 42 | 1.3 | U | U |
| **RA1-WC-66** | 491 | 2022-06-30 | 22-Jun | MT1 | 1 | BRST | 41 | 1.1 | U | U |
| **RA1-WC-66** | 492 | 2022-06-30 | 22-Jun | MT1 | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 493 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 72 | 3.2 | U | J |
| **RA4-WC-25** | 494 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 76 | 4.3 | U | U |
| **RA4-WC-25** | 495 | 2019-09-06 | 19-Sep | MT Pooled | 1 | IWDR | 59 | 1.3 | U | U |
| **RA4-WC-25** | 496 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 66 | 2.9 | U | U |
| **RA4-WC-25** | 497 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 73 | 3.6 | U | U |
| **RA4-WC-25** | 498 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 63 | 2.9 | U | U |
| **RA4-WC-25** | 499 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 64 | 2.9 | U | U |
| **RA4-WC-25** | 500 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 61 | 2.6 | U | U |
| **RA4-WC-25** | 501 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 81 | 5.2 | U | U |
| **RA4-WC-25** | 502 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 81 | 5.1 | U | U |
| **RA4-WC-25** | 503 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 72 | 4.7 | U | U |
| **RA4-WC-25** | 504 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 65 | 2.9 | U | U |
| **RA4-WC-25** | 505 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 56 | 2.9 | U | U |
| **RA4-WC-25** | 506 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 59 | 3 | U | U |
| **RA4-WC-25** | 507 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 53 | 2.2 | U | U |
| **RA4-WC-25** | 508 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 58 | 2.3 | U | U |
| **RA4-WC-25** | 509 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 52 | 2.6 | U | U |
| **RA4-WC-25** | 510 | 2019-09-06 | 19-Sep | MT Pooled | 1 | IWDR | 49 | 1.5 | U | U |
| **RA4-WC-25** | 511 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 78 | 5 | U | U |
| **RA4-WC-25** | 512 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 57 | 2.8 | U | U |
| **RA4-WC-25** | 513 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 64 | 3.4 | U | U |
| **RA4-WC-25** | 514 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 86 | 7.9 | U | U |
| **RA4-WC-25** | 515 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 76 | 5.3 | U | U |
| **RA4-WC-25** | 516 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 59 | 1.8 | U | J |
| **RA4-WC-25** | 517 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 54 | 1.6 | U | J |
| **RA4-WC-25** | 518 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 64 | 2.9 | U | U |
| **RA4-WC-25** | 519 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 60 | 2.3 | U | J |
| **RA4-WC-25** | 520 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 48 | 1.3 | U | U |
| **RA4-WC-25** | 521 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 76 | 4.9 | U | U |
| **RA4-WC-25** | 522 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 65 | 3.6 | U | U |
| **RA4-WC-25** | 523 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | 89 | 4.9 | U | U |
| **RA4-WC-25** | 524 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | 67 | 3.3 | U | U |
| **RA4-WC-25** | 525 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | J |
| **RA4-WC-25** | 526 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 64 | 2.7 | U | U |
| **RA4-WC-25** | 527 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 528 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 529 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | J |
| **RA4-WC-25** | 530 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 531 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 532 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 533 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 66 | 3 | U | U |
| **RA4-WC-25** | 534 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | 80 | 5 | U | U |
| **RA4-WC-25** | 535 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 536 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | J |
| **RA4-WC-25** | 537 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 538 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | - | - | U | U |
| **RA4-WC-25** | 539 | 2019-09-06 | 19-Sep | MT Pooled | 1 | PRDC | - | - | U | J |
| **RA4-WC-25** | 540 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 541 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 542 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | J |
| **RA4-WC-25** | 543 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | J |
| **RA4-WC-25** | 544 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 545 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | J |
| **RA4-WC-25** | 546 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | J |
| **RA4-WC-25** | 547 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 548 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | J |
| **RA4-WC-25** | 549 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 58 | 2.1 | U | J |
| **RA4-WC-25** | 550 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 551 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 552 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | J |
| **RA4-WC-25** | 553 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 554 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 59 | 2.1 | U | J |
| **RA4-WC-25** | 555 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 556 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 557 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 558 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-25** | 559 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 560 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 561 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 562 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 563 | 2019-09-06 | 19-Sep | MT Pooled | 1 | CMSH | - | - | U | U |
| **RA4-WC-25** | 564 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 64 | 3 | U | J |
| **RA4-WC-25** | 565 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 566 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 56 | 1.5 | U | J |
| **RA4-WC-25** | 567 | 2019-09-06 | 19-Sep | MT Pooled | 1 | FNDC | - | - | U | U |
| **RA4-WC-25** | 568 | 2019-09-06 | 19-Sep | MT Pooled | 1 | BRST | 52 | 1.1 | U | U |
| **RA4-WC-25** | 569 | 2019-09-06 | 19-Sep | MT Pooled | 1 | WHSC | 48 | 1 | U | J |
| **RA4-WC-25** | 570 | 2019-09-06 | 19-Sep | MT Pooled | 1 | BRST | 45 | 0.9 | U | U |
| **RA4-WC-00** | 571 | 2022-06-26 | 22-Jun | BP1 | 1 | BRST | 52 | 1.7 | U | A |
| **RA4-WC-00** | 572 | 2022-06-26 | 22-Jun | BP1 | 1 | BRST | 50 | 1.5 | U | A |
| **RA4-WC-00** | 573 | 2022-06-26 | 22-Jun | MT1 | 1 | BRST | 45 | 0.9 | U | A |
| **RA4-WC-00** | 574 | 2022-06-26 | 22-Jun | MT1 | 1 | BRST | 46 | 0.9 | U | A |
| **RA4-WC-00** | 575 | 2022-06-26 | 22-Jun | MT3 | 1 | BRST | 61 | 2.5 | U | A |
| **RA4-WC-00** | 576 | 2022-06-26 | 22-Jun | MT3 | 1 | BRST | 48 | 1.2 | U | A |
| **RA4-WC-00** | 577 | 2022-06-26 | 22-Jun | MT5 | 1 | BRST | 44 | 0.8 | U | A |
| **RA4-WC-00** | 578 | 2022-06-26 | 22-Jun | MT5 | 1 | BRST | 55 | 1.6 | U | A |
| **RA4-WC-00** | 579 | 2022-08-25 | 22-Aug | MT2 | 1 | IWDR | 46 | 0.6 | U | A |
| **RA4-WC-00** | 580 | 2022-08-25 | 22-Aug | MT4 | 1 | IWDR | 45 | 0.7 | U | A |
| **RA4-WC-00** | 581 | 2022-08-25 | 22-Aug | MT5 | 1 | BRST | 57 | 0.9 | U | A |
| **RA4-WC-00** | 582 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 22 | 0.2 | U | J |
| **RA4-WC-00** | 583 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 28 | 0.2 | U | J |
| **RA4-WC-00** | 584 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 59 | 2.5 | U | A |
| **RA4-WC-00** | 585 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 26 | 0.2 | U | J |
| **RA4-WC-00** | 586 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 26 | 0.2 | U | J |
| **RA4-WC-00** | 587 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 27 | 0.2 | U | J |
| **RA4-WC-00** | 588 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 16 | 0.1 | U | FRY |
| **RA4-WC-00** | 589 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 27 | 0.2 | U | J |
| **RA4-WC-00** | 590 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 27 | 0.2 | U | J |
| **RA4-WC-00** | 591 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 25 | 0.2 | U | J |
| **RA4-WC-00** | 592 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 21 | 0.1 | U | FRY |
| **RA4-WC-00** | 593 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 21 | 0.1 | U | FRY |
| **RA4-WC-00** | 594 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 21 | 0.1 | U | FRY |
| **RA4-WC-00** | 595 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 21 | 0.1 | U | FRY |
| **RA4-WC-00** | 596 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 32 | 0.2 | U | J |
| **RA4-WC-00** | 597 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 19 | 0.1 | U | FRY |
| **RA4-WC-00** | 598 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 23 | 0.1 | U | FRY |
| **RA4-WC-00** | 599 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 25 | 0.2 | U | J |
| **RA4-WC-00** | 600 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 22 | 0.1 | U | FRY |
| **RA4-WC-00** | 601 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 25 | 0.1 | U | J |
| **RA4-WC-00** | 602 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 59 | 1.8 | U | A |
| **RA4-WC-00** | 603 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 57 | 1.9 | U | A |
| **RA4-WC-00** | 604 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 37 | 0.5 | U | J |
| **RA4-WC-00** | 605 | 2022-08-25 | 22-Aug | BP1 | 1 | BRST | 32 | 0.3 | U | J |
| **RA4-WC-00** | 606 | 2022-08-25 | 22-Aug | BP1 | 1 | IWDR | 48 | 1.1 | U | A |
| **RA4-WC-00** | 607 | 2022-08-25 | 22-Aug | BP1 | 1 | IWDR | 47 | 0.8 | U | A |
| **RA4-WC-00** | 608 | 2022-08-25 | 22-Aug | BP1 | 1 | IWDR | 46 | 0.8 | U | A |
| **RA4-WC-00** | 609 | 2022-08-25 | 22-Aug | BP1 | 1 | IWDR | 44 | 0.8 | U | A |
| **RA4-WC-00** | 610 | 2022-08-25 | 22-Aug | BP1 | 1 | IWDR | 45 | 0.8 | U | A |
| **RA4-WC-00** | 611 | 2022-08-25 | 22-Aug | BP1 | 1 | IWDR | 42 | 0.7 | U | U |
| **RA4-WC-00** | 612 | 2022-08-25 | 22-Aug | BP1 | 37 | BRST | - | 8.0 | U | U |
| **RA4-WC-02** | 613 | 2022-06-21 | 22-Jun | MT2 | 1 | YLPR | 79 | 5.5 | U | J |
| **RA4-WC-02** | 614 | 2022-06-21 | 22-Jun | MT2 | 1 | YLPR | 74 | 4.1 | U | J |
| **RA4-WC-17** | 615 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 51 | 1.2 | U | A |
| **RA4-WC-17** | 616 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 65 | - | U | A |
| **RA4-WC-17** | 617 | 2022-06-28 | 22-Jun | MT4 | 1 | PRDC | 73 | 4.3 | U | A |
| **RA4-WC-17** | 618 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 69 | 3.7 | U | A |
| **RA4-WC-17** | 619 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 47 | 0.9 | U | A |
| **RA4-WC-17** | 620 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 63 | 2.5 | U | A |
| **RA4-WC-17** | 621 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 53 | 1.8 | U | A |
| **RA4-WC-17** | 622 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 57 | 2.2 | U | A |
| **RA4-WC-17** | 623 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 46 | 0.9 | U | A |
| **RA4-WC-17** | 624 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 52 | 1.2 | U | A |
| **RA4-WC-17** | 625 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 73 | 3.6 | U | A |
| **RA4-WC-17** | 626 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 47 | 1.3 | U | A |
| **RA4-WC-17** | 627 | 2022-06-28 | 22-Jun | MT4 | 1 | BRST | 50 | 1.1 | U | A |
| **RA4-WC-17** | 628 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 40 | 0.7 | U | A |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-17** | 629 | 2022-06-28 | 22-Jun | MT4 | 1 | FTMN | 56 | 2.1 | U | A |
| **RA4-WC-17** | 630 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 48 | 1.2 | U | A |
| **RA4-WC-17** | 631 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 51 | 1.6 | U | A |
| **RA4-WC-17** | 632 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 47 | 0.8 | U | A |
| **RA4-WC-17** | 633 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 53 | 1.7 | U | A |
| **RA4-WC-17** | 634 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 43 | 0.8 | U | A |
| **RA4-WC-17** | 635 | 2022-06-28 | 22-Jun | MT4 | 1 | PRDC | 72 | 3.9 | U | A |
| **RA4-WC-17** | 636 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 43 | 1.1 | U | A |
| **RA4-WC-17** | 637 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 52 | 1.6 | U | A |
| **RA4-WC-17** | 638 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 45 | 1.0 | U | A |
| **RA4-WC-17** | 639 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 46 | 0.9 | U | A |
| **RA4-WC-17** | 640 | 2022-06-28 | 22-Jun | MT4 | 1 | FNDC | 48 | 1.2 | U | A |
| **RA4-WC-17** | 641 | 2022-06-28 | 22-Jun | MT4 | 1 | NRDC | 42 | 0.8 | U | A |
| **RA4-WC-17** | 642 | 2022-06-28 | 22-Jun | MT3 | 1 | PRDC | 69 | 3.6 | U | A |
| **RA4-WC-17** | 643 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 48 | 1.2 | U | A |
| **RA4-WC-17** | 644 | 2022-06-28 | 22-Jun | MT3 | 1 | BRST | 57 | 1.4 | U | A |
| **RA4-WC-17** | 645 | 2022-06-28 | 22-Jun | MT3 | 1 | FNDC | 38 | 0.7 | U | J |
| **RA4-WC-17** | 646 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 57 | 1.6 | U | A |
| **RA4-WC-17** | 647 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 46 | 1.0 | U | A |
| **RA4-WC-17** | 648 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 40 | 0.8 | U | J |
| **RA4-WC-17** | 649 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 43 | 0.9 | U | A |
| **RA4-WC-17** | 650 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 54 | 1.6 | U | A |
| **RA4-WC-17** | 651 | 2022-06-28 | 22-Jun | MT3 | 1 | FNDC | 45 | 1.1 | U | A |
| **RA4-WC-17** | 652 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 47 | 1.0 | U | A |
| **RA4-WC-17** | 653 | 2022-06-28 | 22-Jun | MT3 | 1 | PRDC | 67 | 2.9 | U | A |
| **RA4-WC-17** | 654 | 2022-06-28 | 22-Jun | MT3 | 1 | FNDC | 45 | 1.3 | U | A |
| **RA4-WC-17** | 655 | 2022-06-28 | 22-Jun | MT3 | 1 | FNDC | 47 | 1.3 | U | A |
| **RA4-WC-17** | 656 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 48 | 1.2 | U | A |
| **RA4-WC-17** | 657 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 50 | 1.4 | U | A |
| **RA4-WC-17** | 658 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 44 | 1.0 | U | A |
| **RA4-WC-17** | 659 | 2022-06-28 | 22-Jun | MT3 | 1 | FNDC | 43 | 0.9 | U | A |
| **RA4-WC-17** | 660 | 2022-06-28 | 22-Jun | MT3 | 1 | FTMN | 52 | 2.1 | U | A |
| **RA4-WC-17** | 661 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 39 | 0.7 | U | J |
| **RA4-WC-17** | 662 | 2022-06-28 | 22-Jun | MT3 | 1 | BRST | 44 | 0.8 | U | A |
| **RA4-WC-17** | 663 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 44 | 1.0 | U | A |
| **RA4-WC-17** | 664 | 2022-06-28 | 22-Jun | MT3 | 1 | NRDC | 49 | 1.1 | U | A |
| **RA4-WC-17** | 665 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 54 | 3.5 | U | A |
| **RA4-WC-17** | 666 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 74 | 4.3 | U | A |
| **RA4-WC-17** | 667 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 50 | 1.5 | U | A |
| **RA4-WC-17** | 668 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 51 | 1.5 | U | A |
| **RA4-WC-17** | 669 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 96 | 9.8 | U | A |
| **RA4-WC-17** | 670 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 89 | 8.5 | U | A |
| **RA4-WC-17** | 671 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 56 | 2.1 | U | A |
| **RA4-WC-17** | 672 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 72 | 4.1 | U | A |
| **RA4-WC-17** | 673 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 53 | 1.6 | U | A |
| **RA4-WC-17** | 674 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 92 | 10.8 | U | A |
| **RA4-WC-17** | 675 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 54 | 1.7 | U | A |
| **RA4-WC-17** | 676 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 58 | 1.9 | U | A |
| **RA4-WC-17** | 677 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 53 | 1.6 | U | A |
| **RA4-WC-17** | 678 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 59 | 2.2 | U | A |
| **RA4-WC-17** | 679 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 44 | 1.0 | U | A |
| **RA4-WC-17** | 680 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 48 | 1.2 | U | A |
| **RA4-WC-17** | 681 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 46 | 1.1 | U | A |
| **RA4-WC-17** | 682 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | 48 | 1.1 | U | A |
| **RA4-WC-17** | 683 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 82 | 6.2 | U | A |
| **RA4-WC-17** | 684 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 52 | 1.1 | U | A |
| **RA4-WC-17** | 685 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | 47 | 1.1 | U | A |
| **RA4-WC-17** | 686 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.5 | U | A |
| **RA4-WC-17** | 687 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.4 | U | A |
| **RA4-WC-17** | 688 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 69 | 3.6 | U | A |
| **RA4-WC-17** | 689 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 90 | 8.1 | U | A |
| **RA4-WC-17** | 690 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.2 | U | A |
| **RA4-WC-17** | 691 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.4 | U | A |
| **RA4-WC-17** | 692 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 2.5 | U | A |
| **RA4-WC-17** | 693 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 0.9 | U | A |
| **RA4-WC-17** | 694 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.8 | U | A |
| **RA4-WC-17** | 695 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.1 | U | A |
| **RA4-WC-17** | 696 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 67 | 3.7 | U | A |
| **RA4-WC-17** | 697 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.5 | U | A |
| **RA4-WC-17** | 698 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.2 | U | A |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-17** | 699 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 2.0 | U | A |
| **RA4-WC-17** | 700 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.5 | U | A |
| **RA4-WC-17** | 701 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.1 | U | A |
| **RA4-WC-17** | 702 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 0.9 | U | A |
| **RA4-WC-17** | 703 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.0 | U | A |
| **RA4-WC-17** | 704 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 0.9 | U | A |
| **RA4-WC-17** | 705 | 2022-06-28 | 22-Jun | MT2 | 1 | PRDC | 50 | 2.1 | U | A |
| **RA4-WC-17** | 706 | 2022-06-28 | 22-Jun | MT2 | 1 | IWDR | 50 | 1.1 | U | A |
| **RA4-WC-17** | 707 | 2022-06-28 | 22-Jun | MT2 | 1 | NRDC | - | 1.1 | U | A |
| **RA4-WC-17** | 708 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.2 | U | A |
| **RA4-WC-17** | 709 | 2022-06-28 | 22-Jun | MT2 | 1 | FNDC | - | 1.0 | U | A |
| **RA4-WC-17** | 710 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.0 | U | A |
| **RA4-WC-17** | 711 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.0 | U | A |
| **RA4-WC-17** | 712 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.3 | U | A |
| **RA4-WC-17** | 713 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.1 | U | A |
| **RA4-WC-17** | 714 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.3 | U | A |
| **RA4-WC-17** | 715 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.0 | U | A |
| **RA4-WC-17** | 716 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.6 | U | A |
| **RA4-WC-17** | 717 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.2 | U | A |
| **RA4-WC-17** | 718 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.5 | U | A |
| **RA4-WC-17** | 719 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.6 | U | A |
| **RA4-WC-17** | 720 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.3 | U | A |
| **RA4-WC-17** | 721 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 0.8 | U | A |
| **RA4-WC-17** | 722 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.1 | U | A |
| **RA4-WC-17** | 723 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.7 | U | A |
| **RA4-WC-17** | 724 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.8 | U | A |
| **RA4-WC-17** | 725 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.4 | U | A |
| **RA4-WC-17** | 726 | 2022-06-28 | 22-Jun | MT1 | 1 | PRDC | 94 | 8.6 | U | A |
| **RA4-WC-17** | 727 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 5.1 | U | A |
| **RA4-WC-17** | 728 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.4 | U | A |
| **RA4-WC-17** | 729 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.3 | U | A |
| **RA4-WC-17** | 730 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 3.2 | U | A |
| **RA4-WC-17** | 731 | 2022-06-28 | 22-Jun | MT1 | 1 | NRDC | - | 1.6 | U | A |
| **RA4-WC-17** | 732 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.1 | U | A |
| **RA4-WC-17** | 733 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.3 | U | A |
| **RA4-WC-17** | 734 | 2022-06-28 | 22-Jun | MT1 | 1 | FNDC | - | 1.1 | U | A |
| **RA4-WC-17** | 735 | 2022-06-28 | 22-Jun | MT1 | 1 | BRST | 55 | 0.9 | U | A |
| **RA4-WC-21** | 736 | 2022-06-27 | 22-Jun | MT1 | 1 | BRST | 60 | 1.4 | U | A |
| **RA4-WC-21** | 737 | 2022-06-27 | 22-Jun | MT3 | 1 | BRST | 53 | 1.1 | U | A |
| **RA4-WC-21** | 738 | 2022-06-27 | 22-Jun | MT3 | 1 | BRST | 53 | 1.0 | U | A |
| **RA4-WC-22** | 739 | 2022-06-22 | 22-Jun | BP1 | 1 | YLPR | 87 | 6.9 | U | J |
| **RA4-WC-22** | 740 | 2022-06-22 | 22-Jun | BP1 | 1 | JHDR | 34 | 0.4 | U | A |
| **RA4-WC-22** | 741 | 2022-06-22 | 22-Jun | BP1 | 1 | JHDR | 34 | 0.5 | U | A |
| **RA4-WC-22** | 742 | 2022-06-22 | 22-Jun | BP1 | 1 | JHDR | 31 | 0.3 | U | A |
| **RA4-WC-22** | 743 | 2022-06-22 | 22-Jun | BP1 | 1 | LNDC | 42 | 0.9 | U | J |
| **RA4-WC-22** | 744 | 2022-06-22 | 22-Jun | BP1 | 1 | BLSH | 43 | 0.9 | U | J |
| **RA4-WC-22** | 745 | 2022-08-24 | 22-Aug | BP1 | 1 | LNDC | 32 | 0.4 | U | J |
| **RA4-WC-22** | 746 | 2022-08-24 | 22-Aug | BP1 | 1 | BURB | 196 | 36.2 | U | J |
| **RA4-WC-22** | 747 | 2022-08-24 | 22-Aug | BP1 | 1 | NRPK | 102 | 6.0 | U | J |
| **RA4-WC-22** | 748 | 2022-08-24 | 22-Aug | BP1 | 1 | LKCH | 68 | 2.4 | U | A |
| **RA4-WC-22** | 749 | 2022-08-24 | 22-Aug | BP1 | 1 | UNDC | 32 | 0.3 | U | J |
| **RA4-WC-22** | 750 | 2022-08-24 | 22-Aug | BP1 | 1 | CMSH | 45 | 1.0 | U | A |
| **RA4-WC-22** | 751 | 2022-08-24 | 22-Aug | BP1 | 1 | LNDC | 29 | 0.3 | U | A |
| **RA4-WC-22** | 752 | 2022-08-24 | 22-Aug | BP1 | 1 | LNDC | 49 | 1.3 | U | A |
| **RA4-WC-22** | 753 | 2022-08-24 | 22-Aug | BP1 | 1 | JHDR | 60 | 1.3 | U | A |
| **RA4-WC-22** | 754 | 2022-08-24 | 22-Aug | BP1 | 1 | JHDR | 52 | 1.0 | U | A |
| **RA4-WC-22** | 755 | 2022-08-24 | 22-Aug | BP1 | 1 | JHDR | 58 | 1.4 | U | A |
| **RA4-WC-22** | 756 | 2022-08-24 | 22-Aug | BP1 | 1 | JHDR | 52 | 1.1 | U | A |
| **RA4-WC-22** | 757 | 2022-08-24 | 22-Aug | BP1 | 1 | JHDR | 49 | 0.9 | U | A |
| **RA4-WC-22** | 758 | 2022-08-24 | 22-Aug | BP1 | 1 | JHDR | 45 | 0.8 | U | A |
| **RA4-WC-24** | 759 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 68 | 3.9 | U | A |
| **RA4-WC-24** | 760 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 72 | 5.4 | U | A |
| **RA4-WC-24** | 761 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 69 | 3.6 | U | A |
| **RA4-WC-24** | 762 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 62 | 2.4 | U | A |
| **RA4-WC-24** | 763 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 65 | 3.1 | U | A |
| **RA4-WC-24** | 764 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 54 | 2.0 | U | A |
| **RA4-WC-24** | 765 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 67 | 3.2 | U | A |
| **RA4-WC-24** | 766 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 43 | 0.6 | U | A |
| **RA4-WC-24** | 767 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 64 | 3.3 | U | A |
| **RA4-WC-24** | 768 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 63 | 3.0 | U | A |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-24** | 769 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 65 | 3.3 | U | A |
| **RA4-WC-24** | 770 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 64 | 3.2 | U | A |
| **RA4-WC-24** | 771 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 65 | 3.7 | U | A |
| **RA4-WC-24** | 772 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 53 | 2.2 | U | A |
| **RA4-WC-24** | 773 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 63 | 2.8 | U | A |
| **RA4-WC-24** | 774 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 73 | 4.3 | U | A |
| **RA4-WC-24** | 775 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 49 | 1.2 | U | A |
| **RA4-WC-24** | 776 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 54 | 1.4 | U | A |
| **RA4-WC-24** | 777 | 2022-06-27 | 22-Jun | BP1 | 1 | FNDC | 29 | 0.9 | U | J |
| **RA4-WC-24** | 778 | 2022-06-27 | 22-Jun | BP1 | 1 | BRST | 53 | 1.1 | U | A |
| **RA4-WC-26** | 779 | 2021-09-13 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 780 | 2021-09-13 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 781 | 2021-09-13 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 782 | 2021-09-13 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 783 | 2021-09-13 | 21-Sep | BP1 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 784 | 2021-09-13 | 21-Sep | BP1 | 1 | IWDR | - | - | U | U |
| **RA4-WC-26** | 785 | 2021-09-13 | 21-Sep | BP1 | 1 | IWDR | - | - | U | U |
| **RA4-WC-26** | 786 | 2021-09-13 | 21-Sep | BP1 | 1 | IWDR | - | - | U | U |
| **RA4-WC-26** | 787 | 2021-09-13 | 21-Sep | BP1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 788 | 2021-09-13 | 21-Sep | BP1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 789 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 790 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 791 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 792 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 793 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 794 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 795 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 796 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 797 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 798 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 799 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 800 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 801 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 802 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 803 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 804 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 805 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 806 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 807 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 808 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 809 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 810 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 811 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 812 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 813 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 814 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 815 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 816 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 817 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 818 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 819 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 820 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 821 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 822 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 823 | 2021-09-13 | 21-Sep | BP1 | 1 | CMSH | - | - | U | U |
| **RA4-WC-26** | 824 | 2021-09-13 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 825 | 2021-09-13 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 826 | 2021-09-13 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 827 | 2021-09-13 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 828 | 2021-09-13 | 21-Sep | MT1 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 829 | 2021-09-13 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA4-WC-26** | 830 | 2021-09-13 | 21-Sep | MT1 | 1 | BRST | - | - | U | U |
| **RA4-WC-26** | 831 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 832 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 833 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 834 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 835 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 836 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 837 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 838 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |

| Site ID | FIN | Date | Date | Effort ID | Count | Species | Length (mm) | Weight (g) | Sex | Mat |
|---|---|---|---|---|---|---|---|---|---|---|
| **RA4-WC-26** | 839 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 840 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 841 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 842 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 843 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 844 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 845 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 846 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 847 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 848 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 849 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 850 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 851 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 852 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 853 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 854 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 855 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 856 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 857 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 858 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 859 | 2021-09-13 | 21-Sep | MT2 | 1 | FNDC | - | - | U | U |
| **RA4-WC-26** | 860 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 861 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 862 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 863 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 864 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 865 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 866 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 867 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 868 | 2021-09-13 | 21-Sep | MT2 | 1 | PRDC | - | - | U | U |
| **RA4-WC-26** | 869 | 2021-09-13 | 21-Sep | MT2 | 1 | IWDR | - | - | U | U |
| **RA4-WC-26** | 870 | 2021-09-13 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA4-WC-26** | 871 | 2021-09-13 | 21-Sep | MT2 | 1 | BRST | - | - | U | U |
| **RA4-WC-26** | 872 | 2021-09-13 | 21-Sep | MT2 | 1 | WHSC | - | - | U | U |
| **RA4-WC-26** | 873 | 2021-09-13 | 21-Sep | MT2 | 1 | WHSC | - | - | U | U |
| **RA4-WC-26** | 874 | 2021-09-13 | 21-Sep | MT2 | 1 | BLSH | - | - | U | U |

**Table B-3: Catch-per-unit effort for Marten Falls Community Access Road Fish Surveys, 2019 to 2022**

| Site ID | Years | Method | Effort (s) or (trap-hr) | Species | | | | | | | | | | | | | | | | | Grand Total | Total CPUE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BLSH | BRST | BURB | CMSH | FNDC | FTMN | IWDR | JHDR | LKCH | LNDC | MTSC | NRDC | NRPK | PRDC | TRPR | UNDC | WHSC | YLPR | |
| **RA1-4-WC-01** | 2021 | Backpack Electrofishing | 575 | - | 2 | - | - | 4 | - | - | - | - | - | - | - | - | 2 | - | - | - | - | 8 | 1.39 |
| | | Minnow Trapping | 20.55 | - | 19 | - | - | 28 | - | - | - | - | - | - | - | - | 136 | - | - | - | - | 183 | 8.91 |
| **RA1-4-WC-02** | 2019 | Backpack Electrofishing | 398 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-07** | 2021 | Backpack Electrofishing | 553 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 16.23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-10** | 2022 | Minnow Trapping | 11.50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-19** | 2022 | Minnow Trapping | 6.92 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-21** | 2019 | Minnow Trapping | 2.08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2022 | Minnow Trapping | 46.75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-33** | 2022 | Backpack Electrofishing | 471 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 18.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-35** | 2022 | Backpack Electrofishing | 678 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 33.05 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-36** | 2022 | Minnow Trapping | 25.18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-4-WC-37** | 2022 | Backpack Electrofishing | 268 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 5.75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-01** | 2022 | Minnow Trapping | 33.25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-02** | 2021 | Minnow Trapping | 23.77 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-09** | 2022 | Backpack Electrofishing | 961 | - | 14 | - | - | - | - | - | - | - | - | - | 25 | - | 10 | - | - | - | - | 49 | 5.10 |
| | | Minnow Trapping | 12.52 | - | 27 | - | - | 48 | - | - | - | - | - | - | 59 | - | 16 | - | - | - | - | 150 | 11.98 |
| **RA1-WC-11** | 2022 | Backpack Electrofishing | 1447 | - | - | 3 | - | - | - | - | - | - | - | 1 | - | 3 | - | - | 1 | - | - | 8 | 0.55 |
| | | Minnow Trapping | 4.62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-14** | 2022 | Backpack Electrofishing | 1169 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 14.15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-16** | 2022 | Minnow Trapping | 12.75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-17** | 2022 | Backpack Electrofishing | 1000 | - | - | - | - | - | - | - | 3 | - | 6 | - | - | 1 | - | - | - | - | - | 10 | 1.00 |
| | | Minnow Trapping | 112.73 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-22** | 2022 | Minnow Trapping | 108.78 | - | 6 | - | 14 | 38 | 2 | - | - | - | - | - | - | - | 11 | - | - | 2 | - | 73 | 0.67 |
| **RA1-WC-23** | 2021 | Minnow Trapping | 14.58 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-28** | 2022 | Backpack Electrofishing | 1087 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 9.43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-30** | 2022 | Backpack Electrofishing | 808 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 25.45 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | 1 | 0.04 |
| **RA1-WC-32** | 2022 | Minnow Trapping | 12.15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-41** | 2022 | Minnow Trapping | 11.01 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-51** | 2022 | Minnow Trapping | 13.70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-57** | 2019 | Minnow Trapping | 6.83 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA1-WC-66** | 2022 | Minnow Trapping | 30.00 | - | 6 | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | 0.23 |
| **RA1-WC-67** | 2022 | Minnow Trapping | 30.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Site ID | Years | Method | Effort (s) or (trap-hr) | Species | | | | | | | | | | | | | | | | | Grand Total | Total CPUE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BLSH | BRST | BURB | CMSH | FNDC | FTMN | IWDR | JHDR | LKCH | LNDC | MTSC | NRDC | NRPK | PRDC | TRPR | UNDC | WHSC | YLPR | |
| **RA4B-WC-02** | 2022 | Backpack Electrofishing | 278 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 9.45 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-00** | 2022 | Backpack Electrofishing | 1301 | - | 63 | - | - | - | - | 6 | - | - | - | - | - | - | - | - | - | - | - | 69 | 5.30 |
| | | Minnow Trapping | 33.47 | - | 7 | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 9 | 0.27 |
| **RA4-WC-02** | 2022 | Minnow Trapping | 11.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 0.18 |
| **RA4-WC-05** | 2022 | Minnow Trapping | 5.78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-12** | 2019 | Minnow Trapping | 4.38 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-17** | 2022 | Minnow Trapping | 11.32 | - | 4 | - | - | 49 | 2 | 1 | - | - | - | - | 50 | - | 15 | - | - | - | - | 121 | 10.69 |
| **RA4-WC-18** | 2019 | Minnow Trapping | 12.43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-19** | 2022 | Minnow Trapping | 11.98 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-21** | 2022 | Minnow Trapping | 15.92 | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | 0.19 |
| **RA4-WC-22** | 2022 | Backpack Electrofishing | 1729 | 1 | - | 1 | 1 | - | - | - | 9 | 1 | 4 | - | - | 1 | - | - | 1 | - | 1 | 20 | 1.16 |
| | | Minnow Trapping | 17.77 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-24** | 2022 | Backpack Electrofishing | 425 | - | 1 | - | - | 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | 20 | 4.71 |
| **RA4-WC-25** | 2019 | Minnow Trapping | 4.38 | - | 2 | - | 20 | 34 | - | 2 | - | - | - | - | - | - | 12 | - | - | 8 | - | 78 | 17.79 |
| **RA4-WC-26** | 2021 | Backpack Electrofishing | 695 | - | - | - | 35 | 5 | - | 3 | - | - | - | - | - | - | 2 | - | - | - | - | 45 | 6.47 |
| | | Minnow Trapping | 29.02 | 1 | 4 | - | - | 29 | - | 1 | - | - | - | - | - | - | 14 | - | - | 2 | - | 51 | 1.76 |
| **RA4-WC-27** | 2019 | Minnow Trapping | 7.27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-34** | 2021 | Minnow Trapping | 11.23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-37** | 2021 | Backpack Electrofishing | 510 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Minnow Trapping | 17.75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-41** | 2022 | Minnow Trapping | 12.00 | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 | - | - | - | 3 | 0.25 |
| **RA4-WC-45** | 2022 | Minnow Trapping | 29.20 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **RA4-WC-55** | 2022 | Minnow Trapping | 18.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Grand Total** | | | | 2 | 158 | 4 | 70 | 255 | 4 | 15 | 13 | 1 | 10 | 1 | 134 | 6 | 218 | 2 | 2 | 12 | 3 | 910 | |

# Attachment C – Benthic Invertebrate Baseline Report

MARTEN FALLS FIRST NATION
COMMUNITY ACCESS ROAD

# Attachment C: Benthic Invertebrate Existing Conditions Report

***November 2024***

# Disclaimer: WSP Canada

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Benchmark and elevations used in this report are primarily to establish relative elevation differences between the specific testing and/or sampling locations and should not be used for other purposes, such as grading, excavating, construction, planning and development.

Design recommendations given in this report are applicable only to the Project and areas as described in the text and then only if constructed in accordance with the details stated in this report. The comments made in this report on potential construction issues and possible methods are intended only for the guidance of the designer. The number of testing and/or sampling locations may not be sufficient to determine all the factors that may affect construction methods and costs. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

This limitations statement is considered an integral part of this report.

# Authors

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# Executive Summary

Benthic invertebrate community surveys were conducted between 2019 and 2022 to support the Environmental Assessment/Impact Statement for the Marten Falls First Nation (Marten Falls) Community Access Road (the Project). These surveys were completed in conjunction with the fish and fish habitat surveys, and consisted of benthic invertebrate community surveys completed in depositional and erosional habitats. A total of 40 of the 168 waterbodies on Route Alternatives 1 and 4 were identified as potential crossings and were targeted for benthic invertebrate field surveys. The 40 crossings were surveyed over multiple seasons and/or years.

Based on the results of the field surveys, benthic invertebrate communities were present at all sites sampled and a total of 40,841 invertebrate organisms were collected across all sites (based on raw data, before excluding non-benthic taxa and meiofauna). Communities in depositional habitat were dominated by Chironomidae (midges). Communities in erosional habitat were dominated by Pelecypoda (fingernail clams). Communities in erosional habitats were more diverse, with a lower representation of chironomids and greater variation in dominant taxa. Representation by Ephemeroptera, Plecoptera and Trichoptera (EPT; mayflies, stoneflies and caddisflies) was greater in erosional habitat.

# 1. Introduction and Objectives

Marten Falls First Nation (Marten Falls) is a remote First Nation community in northern Ontario, approximately 430 kilometres from Thunder Bay, Ontario, located at the junction of the Albany and Ogoki rivers. Marten Falls is proposing to construct a multi-purpose all-season Community Access Road that will connect the community to the Ontario provincial highway network (the Project).

This report has been prepared to describe the methods and results of field investigations that were undertaken to gather site specific information on the existing benthic invertebrate conditions in the Construction Disturbance Area. This report contains the field-collected information to supplement the desktop review of benthic invertebrate community in the Construction Disturbance Area, which are presented in the Benthic Invertebrate Community Baseline Report.

The results of this field survey report will be used to describe the existing benthic invertebrate community conditions to support the fish and fish habitat component for the Environmental Assessment/Impact Statement.

# 2. Methods

## 2.1 Site Selection

### 2.1.1 Waterbody Crossing List Development

The first step to identify potential sites for the benthic field survey was to identify locations where the Construction Disturbance Area intersected waterbodies, thereby the development of a waterbody crossing list. This list was developed by using GIS to overlay the Construction Disturbance Area with the Ontario Hydro Network (MNRF 2011) data layer to identify potential hydrology features crossed by the Project. Additional potential waterbodies that were not mapped in the Ontario Hydro Network were identified through manual review of the routes overlaid on aerial imagery. These “unmapped”, potential waterbody crossings were then added to the waterbody crossing list. Waterbody crossings were then assigned a site identification code that consisted of a route alternative identifier (RA-1 = Route Alternative 1, RA-4 = Route Alternative 4, or RA1-4 = overlapped section of both Route Alternative 1 and Route Alternative 4), followed by “ WC” (waterbody crossing) and then a two-digit number in sequential order from south to north. The two-digit number is unique for each waterbody crossing (i.e., there is no repetition of numbers).

LiDAR imagery was then used to refine the waterbody crossing list by re-examining the unmapped crossings to determine if the digital elevation model from LiDAR showed evidence of a defined channel. Water features without defined bed or banks (a criterion for the definition of a waterbody in Ontario [*Conservation Authorities Act*; Government of Ontario 2003; Stanfield 2017; Government of Ontario 1990]) were not considered waterbodies, and thus were not included in the crossing list.

The crossing list was refined further by incorporating data gathered from the field investigations (i.e., aerial reconnaissance and ground-based surveys) to verify the presence of a waterbody and to characterize channel morphology and fish habitat.

### 2.1.2 Revisions to Route Alignments

Field investigations were selected based on water crossings along the Rev01 alignment. A re-route to Rev01 was completed in September 2020 (Rev02) and a west crossing option for the Ogoki River was added to Alternative 4, among other route modifications. Both the east and west route options to cross the Ogoki River have been included in the baseline report. The final revision to the alignment (Rev03) was completed in September 2022, which include minor changes to the route alignments and defined potential pits and quarries. Wherever the route re-alignments resulted in a change to water crossing locations, the updated locations were used for the 2022 field investigations. All crossing locations were reviewed against the Rev03 alignment to certify that site-specific field data were collected at the most up to date crossing locations. In some cases, a field survey was completed at both the original Rev01 location and then surveyed again at the updated Rev 02 or Rev03 location.

### 2.1.3 Site Selection for Field Surveys

Waterbody crossings surveyed during field surveys were selected from the waterbody crossing list. Sites for the 2019 field programs were selected based on the Rev01 alignment. All sites on the initial 2019 crossing list (i.e., those determined by desktop methods) were surveyed during the aerial reconnaissance. Sites selected for the 2020, 2021, and 2022 field programs were based on the Rev 02 alignment and included both options (east and west) for the Ogoki River crossing.

All sites selected for field survey were selected based on a ‘scaled approach’. For this approach, a representative number of waterbody crossings were selected under three different categories of watershed size: small (areas of 2 to 50 $km^2$), medium (areas of 50 to 500 $km^2$), and large (areas greater than 500 $km^2$). The waterbodies chosen for field surveys were distributed evenly along the preferred routes and among tertiary watersheds. The percentage of each class of waterbody (i.e., small, medium, large) chosen for field work was also representative of the total number of each class across the entire route. For example, if 50% of the crossings along the preferred routes are classified as small waterbodies, then approximately 50% of the selected sites were small waterbodies. Secondary to this, site selection also considered waterbody crossing locations that were previously surveyed during the Cliffs Chromite Project (Golder 2013) (i.e., sections of the preferred route alternatives that overlap with the alignment of the Cliffs Chromite Project route). Access to the waterbody crossings also had a role in site selection. Some sites planned for survey were located in heavily treed areas, or in bogs, where no helicopter landing area was available within 500 m.

## 2.2 Sites Surveyed

Field programs to complete the benthic invertebrate surveys were completed between 2020 and 2022 to gather site-specific information on fish and fish habitat at each waterbody crossing. Benthic invertebrates were collected during four field programs on the following dates (Figures 1 to 4):

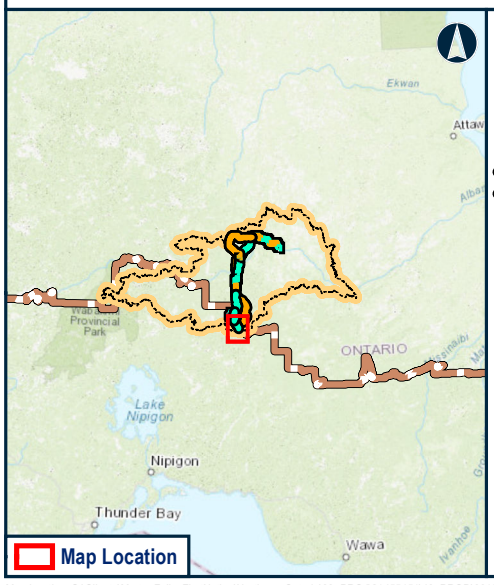
- October 14 to 26, 2020
- September 11 to 18, 2021
- June 24 to July 1, 2022
- August 16 to 25, 2022

In 2020, 16 proposed waterbody crossings were sampled for benthic invertebrates during a fall field program from October 14 to 26, 2020 (Table 1). Of the assessed waterbody crossings 6 were on Route Alternative 1, seven were on Route Alternative 4, and three were on overlapping sections of Route Alternatives 1 and 4 (Figures 1 to 7).

In 2021, 12 proposed waterbody crossings were sampled for benthic invertebrates from September 11 to 18, 2021 (Table 1). Four of the assessed waterbody crossings were on Route Alternative 1, six were on Route Alternative 4, and two were on overlapping sections of Route Alternatives 1 and 4 (Figures 1 to 7).

In 2022, 10 proposed waterbody crossings were sampled for benthic invertebrates from August 16 to 25, 2022. seven of the waterbody crossings were on Route Alternative 1, two were on Route Alternative 4, one was on overlapping sections of Route Alternatives 1 and 4 and one was on route RA4B (Figures 1 to 7).

RA4-WC-12
HARROGATE LAKE
ESSER LAKE
OGOKI RIVER
RA1-WC-02
MCCAW LAKE
RA4B-WC-03
RA4B-WC-02
RA1-WC-01
ARA04-WC-02
ARA04-WC-04
ARA04-WC-03
RA4-WC-05
ARA04-WC-01
PAINTER LAKE
DEBAERE LAKE
RA4-WC-02
ORVISS LAKE
COLPITTS LAKE
BURY LAKE
PIGMENT LAKE
RA4-WC-00
CRONY LAKE
RENWICK LAKE
ZURBRIGG LAKE
BURNABY LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
PERCY LAKE
LITTLE CURRENT RIVER
JUNGFRAU LAKE
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE




**Legend**

**WATER CROSSING**
- DEFINED
- ROAD
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 2.25 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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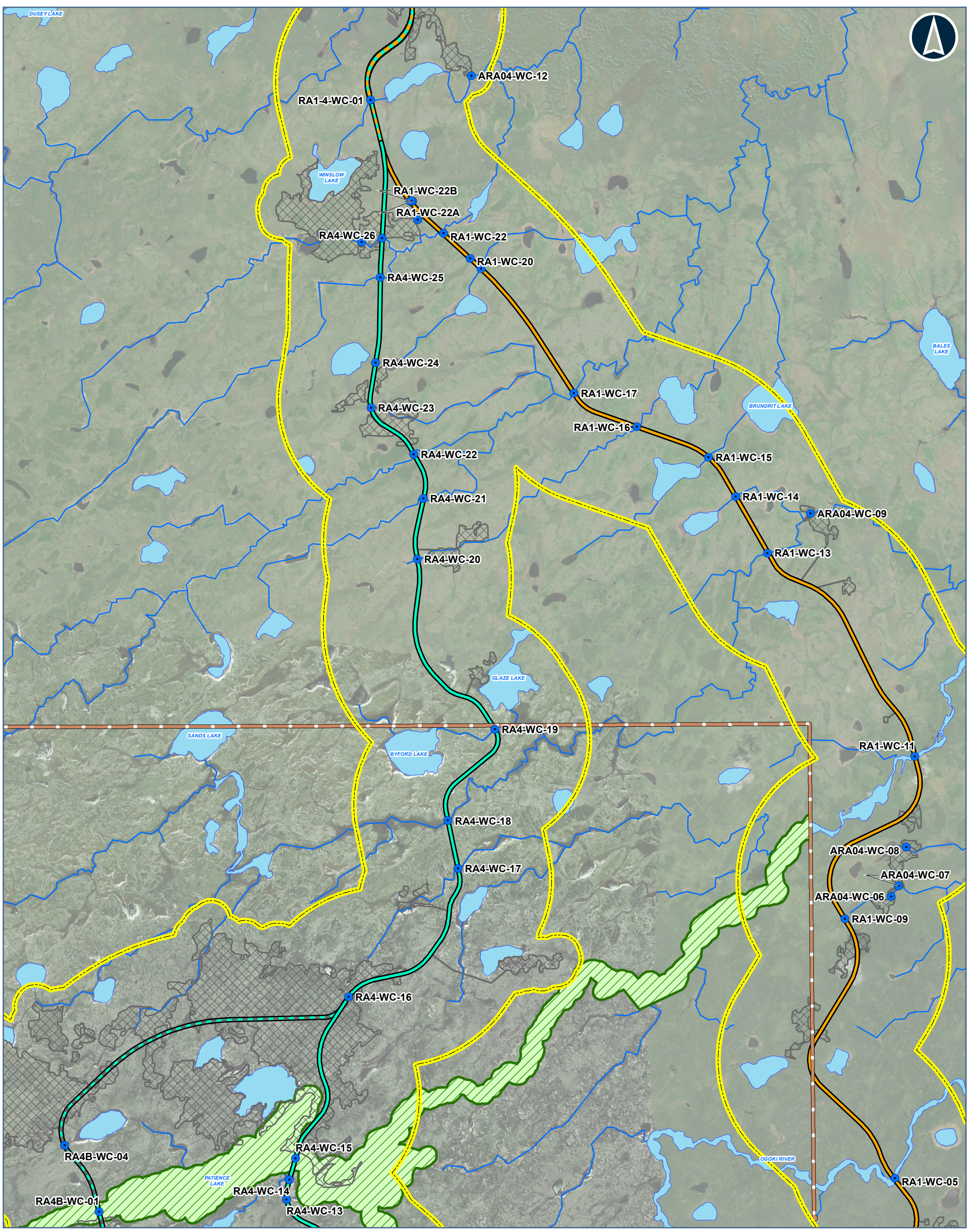


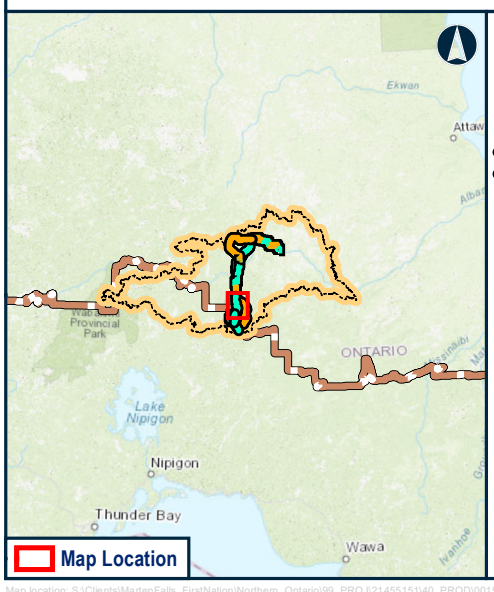


**Legend**

WATER CROSSING
- DEFINED
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4
- ALTERNATIVE 4 - WESTERN OGOKI RIVER CROSSING OPTION

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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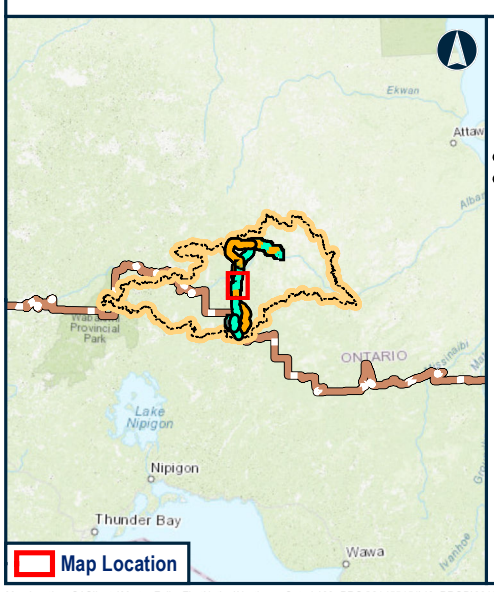
ARA04-WC-15
RA4-WC-32
RA1-WC-26
RA4-WC-31
TEABEAU LAKE
RA4-WC-29
TOLFREE LAKE
ALBANY RIVER
RA1-WC-23
RA4-WC-27
SUWALA LAKE
RA1-4-WC-07
DUSEY RIVER
ARA04-WC-13
ARA04-WC-14
RA1-4-WC-02
TANASE LAKE
DUSEY LAKE




**Legend**

**WATER CROSSING**
- DEFINED
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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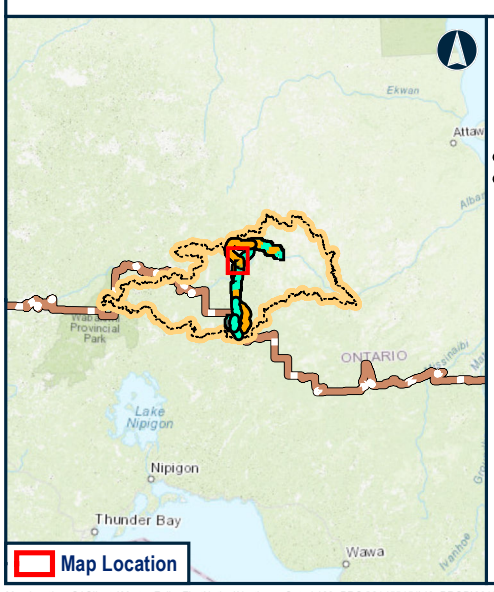
RA1-WC-54
RA1-WC-53
RA1-WC-52
WABASSI RIVER
VENTON LAKE
MAXEY LAKE
RA1-WC-44
RA1-WC-42
RA1-WC-41
ARA04-WC-22
RA1-WC-40
RA1-WC-39
RA1-WC-38
RA1-WC-32
RA1-WC-30
RA1-WC-29
RA1-WC-28
ARA04-WC-15
RA4-WC-32
SAARIMAKI LAKE
ARA04-WC-21
ARA04-WC-20
RA4-WC-50
RA4-WC-45
TREBELL LAKE
RA4-WC-43
ARA04-WC-19
RA4-WC-42
RA4-WC-41
RA1-4-WC-09B
ARA04-WC-18
RA4-WC-37
RA4-WC-36
ARA04-WC-17
ARA04-WC-16
RA4-WC-35
RA4-WC-34
ALBANY RIVER




**Legend**

WATER CROSSING
- DEFINED
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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GARVEY LAKE

SLADE LAKE

MABIE LAKE

OXTOBY LAKE

RA1-WC-56

RA1-WC-57

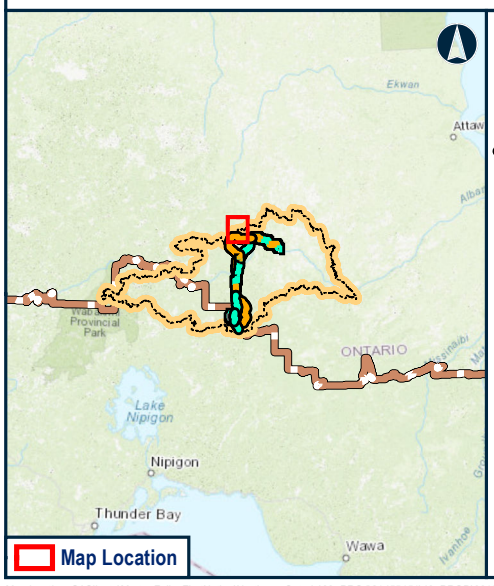
RA1-WC-58

RA1-WC-60

RA1-WC-66

RA1-WC-67

RA1-WC-68




**Legend**

WATER CROSSING
- DEFINED
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1

- FAR NORTH BOUNDARY
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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Date Saved: 11/1/2024 2:23:48 PM User Name: gld_dbondy

GURDEN LAKE

GITTINS LAKE

RA1-4-WC-19

ARA04-WC-23

RA1-4-WC-10

RA1-4-WC-21

RA1-4-WC-27

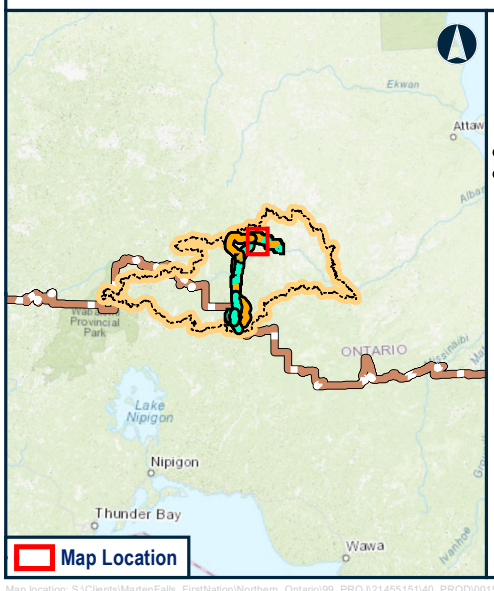
RA4-WC-58

RA4-WC-57

RA4-WC-55

WABASSI RIVER

ALBANY RIVER




**Legend**

**WATER CROSSING**
- DEFINED
- WATERBODY
- WATERCOURSE

**COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE**
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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|---|---|
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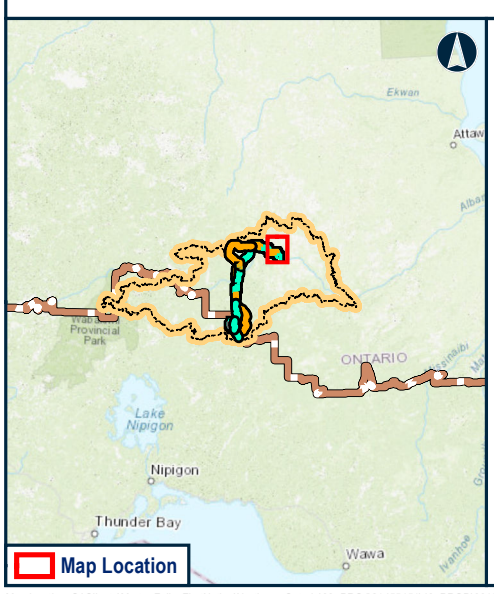
SEBERT LAKE
GURDEN LAKE
TIFFIN LAKE
RA1-4-WC-31
RA1-4-WC-33
RA1-4-WC-34
RA1-4-WC-35
RA1-4-WC-36
ALBANY RIVER




**Legend**

WATER CROSSING
- DEFINED
- ROAD
- WATERBODY
- WATERCOURSE

COMMUNITY ACCESS ROAD ALTERNATIVES CENTERLINE
- ALTERNATIVE 1 AND ALTERNATIVE 4

- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROPOSED DEVELOPMENT AREA
- AQUATIC LOCAL STUDY AREA (2.5 KM)
- AQUATIC REGIONAL STUDY AREA

**Notes:**
None

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# MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

## Proposed Route and Defined Water Crossings

0 2.25 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

| | |
|---|---|
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### 2.2.1 Benthic Invertebrate Community Surveys

Benthic invertebrate community and sediment samples were collected from 40 sites in watercourses intersecting Route Alternatives RA1, RA4, RA4B, and sites where Route Alternatives 1 and 4 overlap (RA1-4). Sites were located on various watercourses including the Dusey River, Albany River, Wabassi River, Colpitts Creek, and several tributaries (Table 2.1). Samples were collected at one sampling event per site in October 2020, September 2021, or August 2022 (see Annex A, Table A-1 for sampling year). Sites were generally located at or downstream of the proposed crossing location, determined by GPS in the field and adjusted based on accessibility. At several sites where the watercourse was too wide or deep with soft substrates to wade, samples were taken close to the bank. Environmental conditions including habitat type, bottom substrates and field water quality parameters were recorded, and are reported in Tables 2.2 to 2.4.

The following information, in-situ surface water quality measurements, and habitat characteristics were recorded for each sampling site:

- sampling date;
- GPS coordinates, recorded as Universal Transverse Mercator ;
- water depth;
- presence of aquatic vegetation and algae;
- field water quality measurements of water temperature, dissolved oxygen, pH and specific conductivity;
- photographs; and
- observations of the sediments for estimated particle size, colour, consistency, and odour.

Benthic invertebrate samples were collected using a Surber sampler (30.48 cm x 30.48 cm: bottom sampling area of 0.0929 $m^2$) at erosional stations, and a petite Ponar or Ekman grab (15.24 cm × 15.24 cm: bottom sampling area of 0.0232 $m^2$) at depositional stations. At each site, three subsamples, each composed of one Surber sample or one petite Ponar or Ekman grab, were collected and sieved through a 500 µm mesh screen in the field. The three sub-samples were combined to form a composite sample from the material retained on the mesh, placed in a separate 500 mL sample bottle, and preserved with 10% neutral buffered formalin.

Benthic invertebrate community samples were shipped to a qualified taxonomist (D. Zaranko, Ph.D., Zaranko Environmental Assessment Services [ZEAS] Incorporated, Nobleton, Ontario) for taxonomic identification and enumeration of invertebrates.

#### 2.2.1.1 Data Analysis

Raw benthic invertebrate abundance data were received from the taxonomist in electronic format. Abundance data were received as number of organisms per sample. The data were reviewed for unusual abundance values. Although variation in benthic invertebrate abundances among sites was high, none of the data were obviously inaccurate and reflected the field conditions noted at the time of sampling; therefore, the full dataset was used in the analysis.

#### 2.2.1.2 Data Preparation and Variable Selection

To prepare the data for analysis, meiofauna too small to be retained by 500 µm mesh (i.e., Nematoda and Copepoda – Harpacticoida), and non-benthic invertebrates (i.e., Collembola, Corixidae – Hemiptera, and Crambidae – Lepidoptera) were removed from the dataset prior to analysis.

The following variables were included in the data analysis, at the lowest identified taxonomic level:

- Total invertebrate density (i.e., number of individuals per square metre).
- Richness (i.e., total number of different taxa per station).
- EPT (Ephemeroptera, Plecoptera, Trichoptera) density (i.e., number of individuals in these three orders per square metre. These three orders are generally considered sensitive to impairment of water quality or aquatic habitat).
- EPT richness (i.e., number of taxa within the EPT orders).
- Simpson's diversity index (SDI; measures the proportional distribution of organisms in the community, which takes into account the abundance patterns and taxonomic richness of the community).
- Simpson's evenness index (SEI; measures the distribution of total abundance among the different taxa present in a sample).
- Relative density; quantifies the relative proportion (%) of each major invertebrate group in the community at each station sampled, visually presented as stacked bar graphs.

Additional aspects of benthic community structure examined visually included presence-absence by each invertebrate taxon.

Benthic invertebrate community results are presented with sites grouped by route alternative. Benthic invertebrate variables and metrics are expected to differ between depositional habitats (fine sediments, slow or no currents) and erosional habitats (exposed coarse substrates such as gravel and cobble, higher current velocity). Therefore, results of the benthic community analysis are presented separately for these two habitat types, within each route alternative.

## 2.3 Data Quality and Control

A quality assurance / quality control program was established for the Project to minimize the possibility of error during data collection, data entry, and data interpretation. Standardized data entry spreadsheets and methods were used as a means of consistency and to control the quality of data collected. Specific work instructions were written for this purpose. Data were entered into a waterbody crossing list. Data entry was evaluated for errors or omissions to verify that the electronic database accurately reflected the data collected during the aerial reconnaissance and fish and fish habitat assessments. Quality assurance/ quality control for the waterbody crossing list involved the following tasks:

- review by more than one person, including a senior biologist/ecologist
- review by a biologist/ecologist and a water resources engineer

### 2.3.1 Benthic Invertebrate Community

Quality assurance and quality control measures during sample processing and taxonomy in the laboratory included sorting recovery checks on 10% of the total number of samples processed.

Summary tables and calculations were checked to identify anomalous values and transcription errors. Results were reviewed by a senior scientist to confirm interpretations and analytical methods. Benthic invertebrate community sample processing included re-sorting of 10% of the total number of samples collected by a second individual to evaluate invertebrate removal efficiency. Re-sorted samples satisfied the data quality objective of at least 95% invertebrate removal.

The raw benthic invertebrate data are presented in Annex A, Table A-2, with Quality Control data recorded in Table I-2.

## 2.4 Benthic Invertebrate Community Results

### 2.4.1 Habitat Characteristics

Data collected to characterize the habitat at each sampling site is presented in Annex A, Table A-1.

Sampling sites were generally located in moderate to large watercourses, in slow flowing depositional environments with substrates composed predominantly of fine sediments and organics. This was largely consistent across the route alternatives, with high variability among sites within a route alternative and some variability among means between route alternatives. A small proportion of sites were classified as erosional habitat, dominated by coarse substrates (2 of 17 stations in RA1 and 6 of 16 stations in RA4). Some year-to-year

and seasonal variability may be expected among the route alternatives as sampling extended over three years and was undertaken in different months in each year of baseline monitoring, due to logistical challenges of the remote field program.

The depositional sites crossed by RA1 (15 stations) show the greatest variability in size; wetted width had a minimum of 2 m, maximum of 100 m, and mean of 35 m; mean depth was 0.7 m, with a range of 0.22 m to 1.5 m. Substrates at depositional sites were dominated by organics and fine sediments (sand/silt/clay). Two sites (RA1-WC-01 and RA1-WC-27) were identified as erosional habitats; these sites had wetted widths of 6 and 180 m, shallower depths of 0.14 and 0.2 m, and greater proportions of coarse gravel, cobble, and boulders. All sites common to both route alternatives (RA1-4) were depositional, with wetted widths ranging from 0.5 m to 15 m with a mean of 5.3 m, and depth ranging from 0.15 m to 1 m with a mean of 0.7 m. Substrates at these sites were dominated by organics, fine sediments, or a mix of these. Depositional sites crossed by RA4 had a minimum wetted width of 1.5 m and maximum of 90 m, with a mean width of 32 m, and depth ranging from 0.5 to 1.6 m with a mean of 0.9. Substrates at depositional sites were composed of organics and silt. Six sites on RA4 were identified as erosional. Wetted width at these sites ranged from 2.7 m to 11 m and averaged 5.4 m. Depth of erosional sites ranged from 0.18 m to 0.38 m and averaged 0.2 m, and substrates were composed of at least 50% gravel and cobble. The single site sampled on Route RA4B was depositional, with moderate width (3.1 m), a depth of 0.5 m, and entirely organic substrate.

Field-measured water quality parameters were variable among sites, but were generally within established ranges set by Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines (CCME 2002) and Ontario Ministry of Environment and Climate Change Provincial Water Quality Objectives (PWQO 1994). At all sites, water temperature ranged from less than 1°C to 19.7°C, and varied based on seasonal conditions at the time of sampling. Dissolved oxygen concentrations were within Provincial Water Quality Objectives guidelines for these temperatures for all sites, with the exception of RA1-4-WC-35 where dissolved oxygen was marginally below the guideline for the recorded water temperature. The Provincial Water Quality Objectives guideline for pH is the range between 6.5 and 8.5. Several sites within all route alternatives had pH values that fell below the guidelines, with pH between 5.1 and 6.1, which is within the expected range for boreal forest watercourses (Dangles et al. 2004). Specific conductivity was generally within the range of 27 µS/cm to 221 µS/cm, with one higher value of 707 µS/cm measured in the largest watercourse (the Albany River) at site RA1-WC-27. See the Baseline Existing Conditions Report (WSP 2023) for details of the baseline water quality data.

### 2.4.2 Benthic Invertebrate Community

The benthic invertebrate community data represent the baseline condition, and these data are presented in terms of summary statistics for each of the route alternative groups (RA1,

RA4, RA4B, and sites overlapping both are designated as RA1-4). Summary statistics calculated based on invertebrate density for sites within each route alternative are presented in Annex A, Table A-2 and A-3. A total of 40,841 invertebrate organisms were collected across all sites (based on raw data, before excluding non-benthic taxa and meiofauna). Results are discussed separately for depositional sites and erosional sites, as the benthic invertebrate community would be expected to be inherently different between these types of habitats.

#### 2.4.2.1 Depositional Habitat

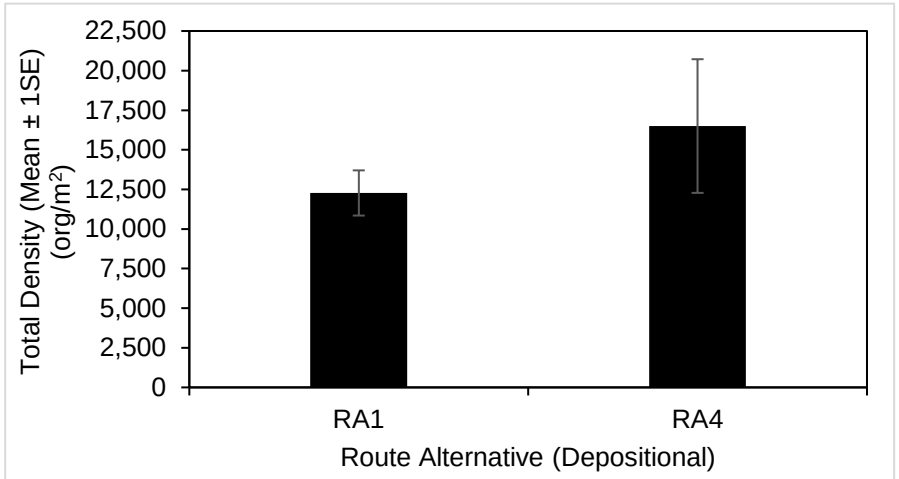
Average densities of benthic invertebrates in depositional habitat among the route alternatives are shown in **Figure 2-8**. The variation in mean density was relatively low among route alternatives, with an approximate range of 12,000 org/$m^2$ to 14,500 org/$m^2$. Among individual sites, density varied more widely, from a minimum of 1,149 org/$m^2$ at station RA1-WC-28 to a maximum of 81,523 org/$m^2$ at station RA4-WC-00 (primarily consisting of Chironomidae). Density at RA4-WC-00 was unusually high compared to the all other sites (i.e., nearly 5 SD higher compared to the overall mean density value); the next highest density of invertebrates was 25,776 at RA1-WC-14. This site was in the smallest watercourse sampled, as indicated by the narrowest wetted width. Mean density was greatest at RA4, due to the maximum density noted above. If station RA-WC-00 was excluded, all route alternatives with multiple sites would have similar mean densities.

Taxonomic richness (**Figure 2-8**) ranged from 4 to 38 taxa per site. Similar to density, the maximum richness was found in site RA4-WC-00, and RA4 sites had the greatest richness, with a mean of 19 taxa. RA1 had average richness values of 15 taxa per site.

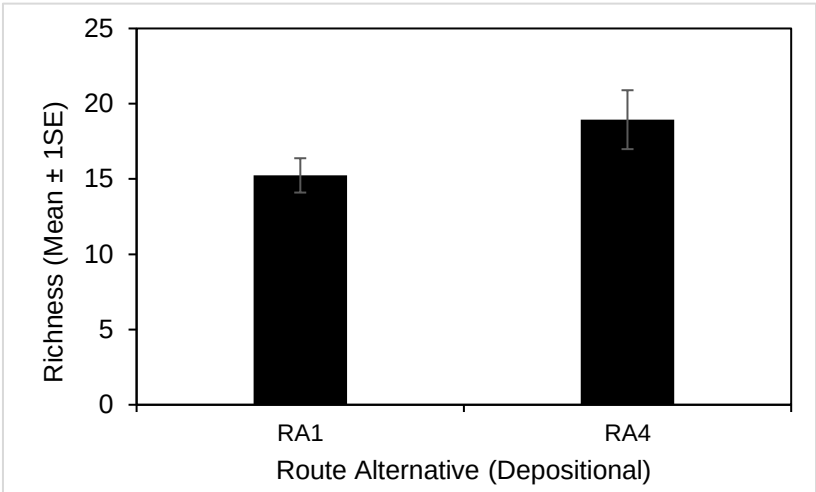
Sensitive taxa in the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) were represented at most sites. At RA1 stations, 6 of the 21 stations had no EPT organisms, and the mean EPT density was 879 org/$m^2$, with a mean EPT richness of 2 (**Figure 2-8**). Among the RA4 sites, only 3 of the 22 sites had no EPT organisms. Site RA4-WC-00 had the greatest EPT representation, with an EPT density of 5,977 org/$m^2$. Mean EPT density for RA4 was 956 org/$m^2$ and mean EPT richness was 2 taxa.

Simpson's Diversity Index (SDI) and Simpson's Evenness Index (SEI), represent the overall taxonomic diversity at each site; mean values per route alternative are plotted in **Figure 2-8**. The indices indicate a fairly diverse community at all sites, with an overall range of 0.44 to 0.94, and similar mean values among RA1and RA4 (0.83 and 0.82, respectively). The single site in RA4B had a slightly lower SDI value of 0.73. The SEI values show greater variability, with a range from 0.15 to 0.87. The highest mean SEI value of 0.55 occurred in RA1.

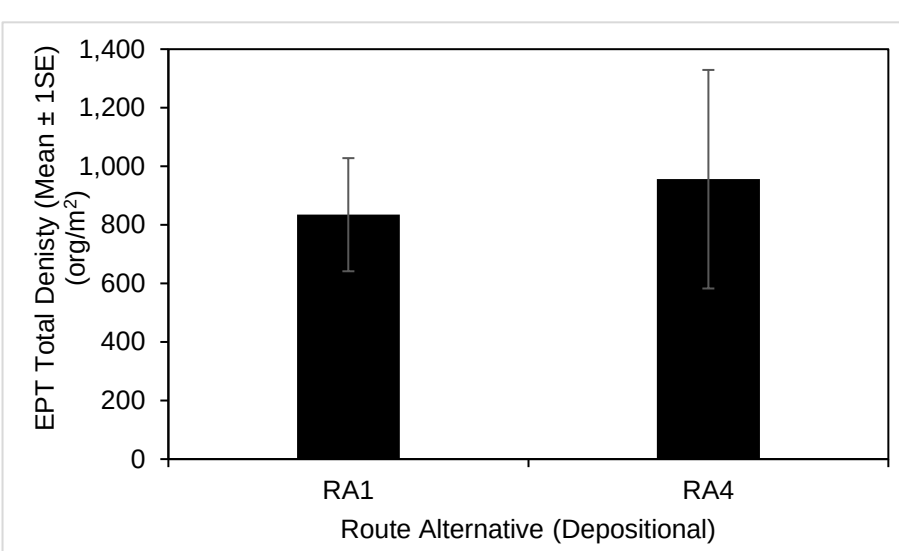
**Figure 2-8: Total Density, Taxonomic Richness, Density of EPT Taxa, SDI and SEI for Depositional Sites among Route Alternatives**



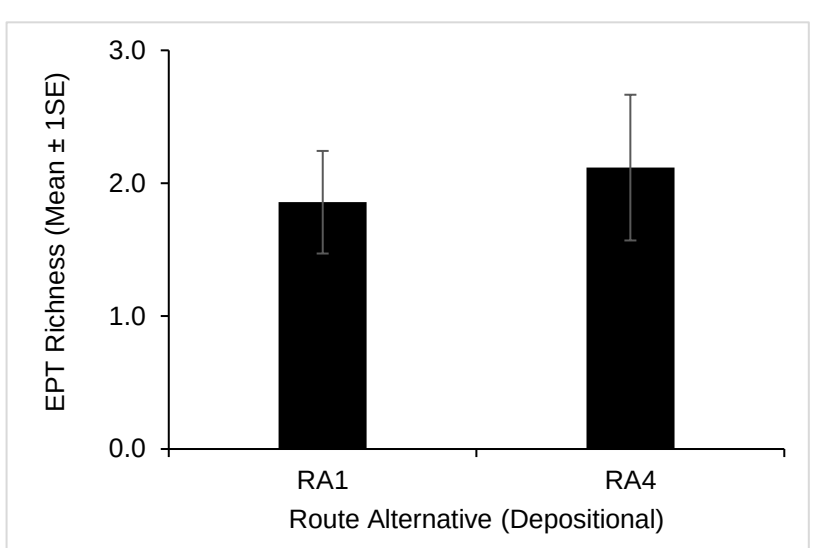

org/m² = number of organisms per square metre



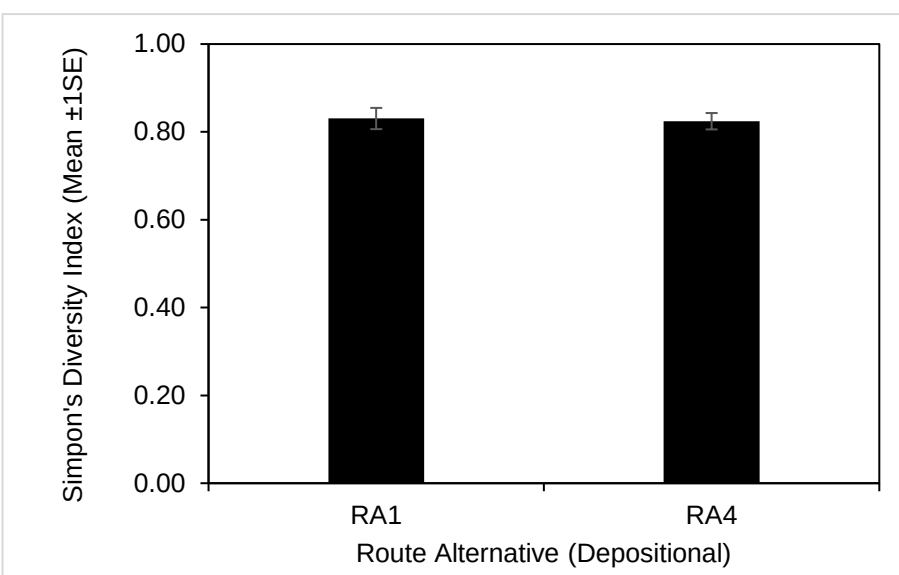

Richness = total taxa per sample

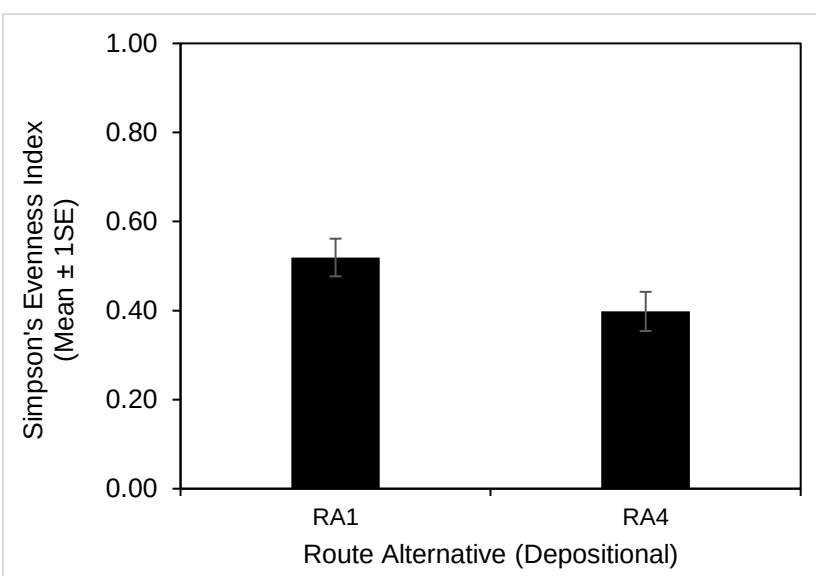



EPT = Ephemeroptera, Plectoptera, Trichoptera; org/m² = number of organisms per square metre




EPT = Ephemeroptera, Plecoptera, Trichoptera; Richness = number of taxa per sample

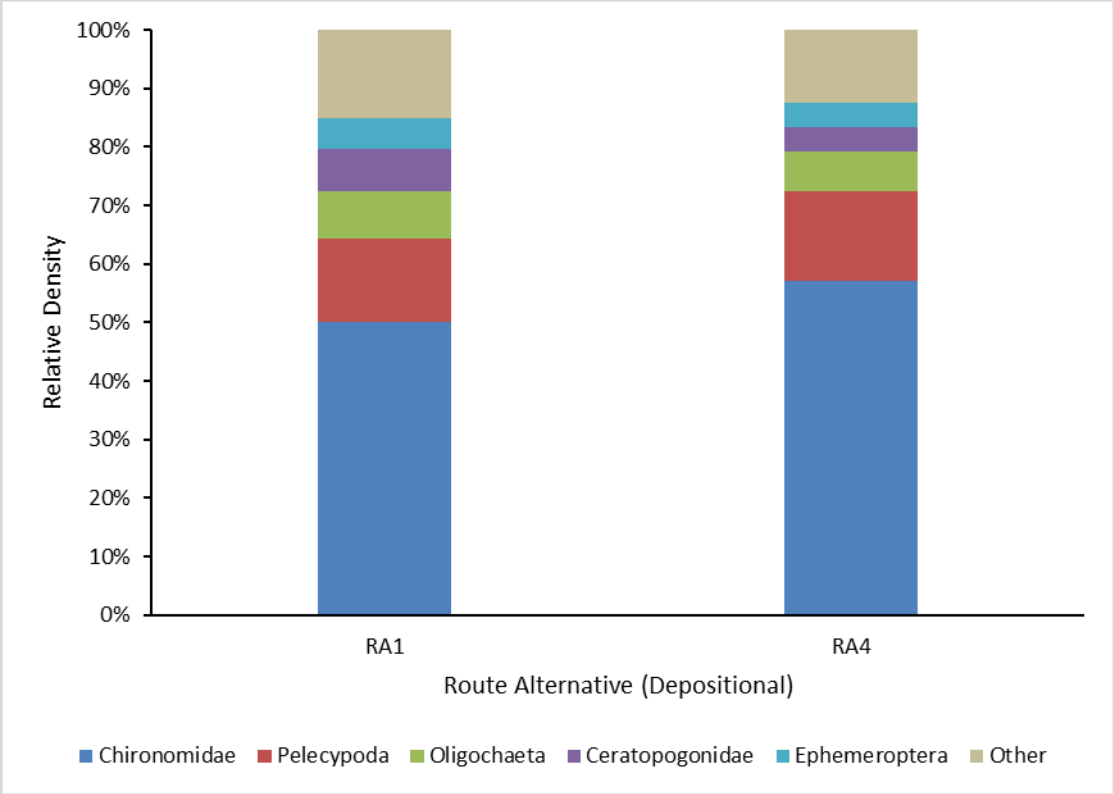


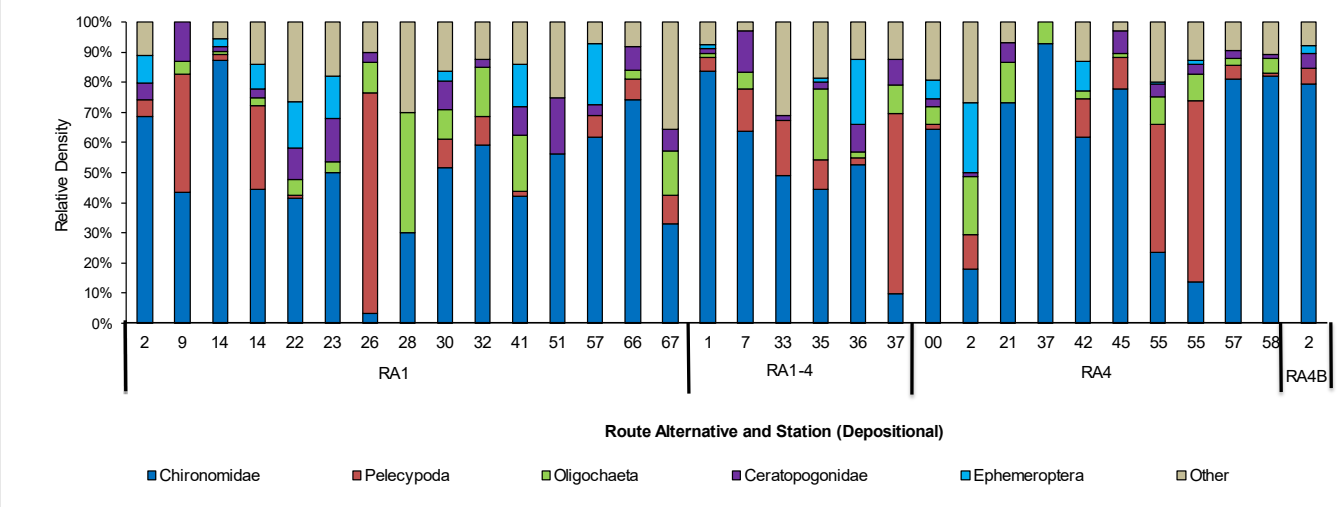




Notes: SE = standard error.

Community composition by major taxonomic group at depositional sites, grouped by route alternative, is illustrated in **Figure 2-9** and shows a common distribution of taxa, as expected for benthic invertebrate communities in this area of Ontario. The six most common major taxa were identified based on the proportion of total invertebrates represented (i.e., >5%) across all sites; all other groups were categorized as “Other”. On average, depositional habitats within all route alternatives were dominated by Chironomidae (midges), followed by Pelecypoda (fingernail clams) and other minor taxa. All of these taxonomic groups tend to be tolerant of a variety of water quality and habitat conditions and can be indicative of low-quality habitats. However, Chironomidae are a very diverse and abundant group and commonly dominate benthic communities in a variety of habitat types. Ephemeroptera, one of the sensitive taxa noted above, was present in low relative abundances, usually accounting for only 4% to 5% of the community on average, except at sites RA1-WC-57, RA1-4-WC-36, and RA4-WC-2 where this group contributed 20% to 23% of total density. Of the other EPT taxa, Plecoptera was absent from depositional sites, as expected, since they typically occur in erosional habitats. Trichoptera contributed less than 10% of the total number of invertebrates collected at most sites and is captured in the “Other” category. Most Plecoptera and Trichoptera species are reliant on coarse substrates in erosional habitats and increases in sedimentation can reduce suitability of the habitat for these taxa.

**Figure 2-9: Relative Density of Major Taxonomic Groups by Area and Site among Depositional Sites**



#### 2.4.2.2 Erosional Habitat

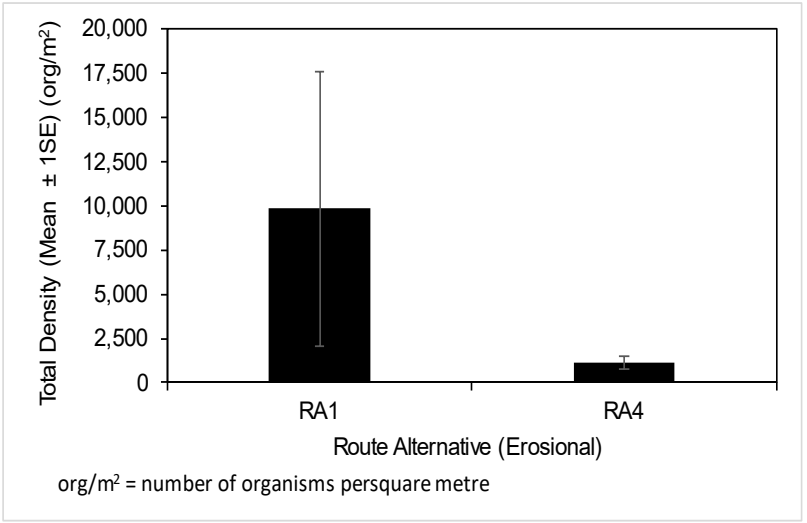
The average density of invertebrates in erosional habitats among route alternatives is shown in **Figure 2-10**. Erosional habitats were only identified at sites in RA1 and RA4. Density was generally lower at erosional sites than at depositional sites, ranging from 237 org/$m^2$ to 2,842 org/$m^2$, with the exception of site RA1-WC-27 which had 17,625 org/$m^2$.

Taxonomic richness (**Figure 2-10**) was greater at erosional sites compared to depositional sites, ranging from 15 to 46 taxonomic groups. Mean richness per station was greatest for RA1, at 42 taxa.

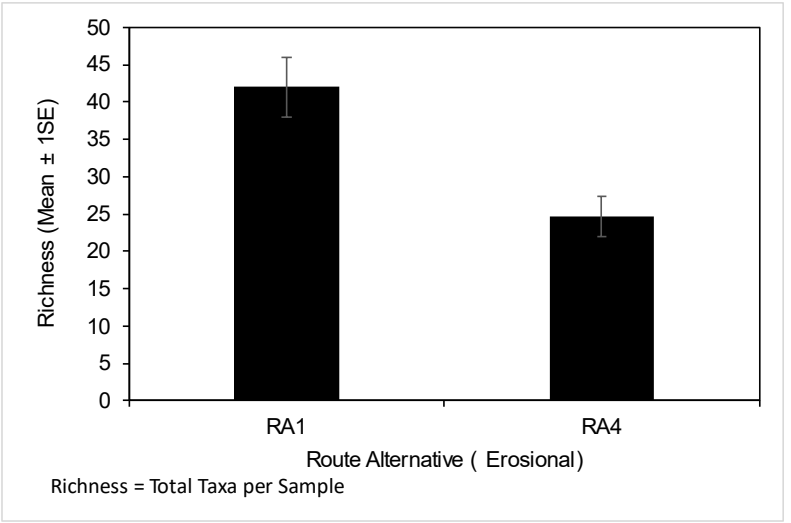
Mean EPT density and richness are illustrated in **Figure 2-10**. Sensitive EPT taxa were represented at all erosional sites, at generally greater density and richness compared to depositional sites, as expected based on typical habitat preferences of these taxa. In RA1 sites, the mean EPT density was 2,953 org/$m^2$ with a mean richness of 13 taxa. In RA4 sites EPT mean density was lower, at 287 org/$m^2$, and EPT richness was 6 taxa.

Simpson's Diversity Index (SDI) and Simpson's Evenness Index (SEI) are illustrated in **Figure 2-10**. The indices indicate a fairly diverse community at all sites, with an overall range of 0.77 to 0.94, and fairly consistent mean values between RA1 and RA4 (0.87 and 0.84, respectively). The SEI values show more variability in evenness among sites, with an overall range from 0.14 to 0.59. The higher mean SEI value occurred in RA4, at 0.33.

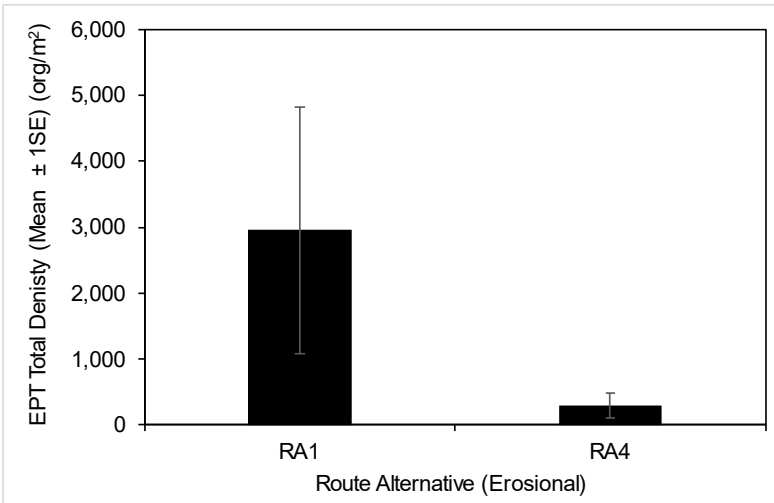
**Figure 2-10: Total Density, Taxonomic Richness, Density of EPT Taxa, SDI and SEI for Erosional Stations among Route Alternatives**



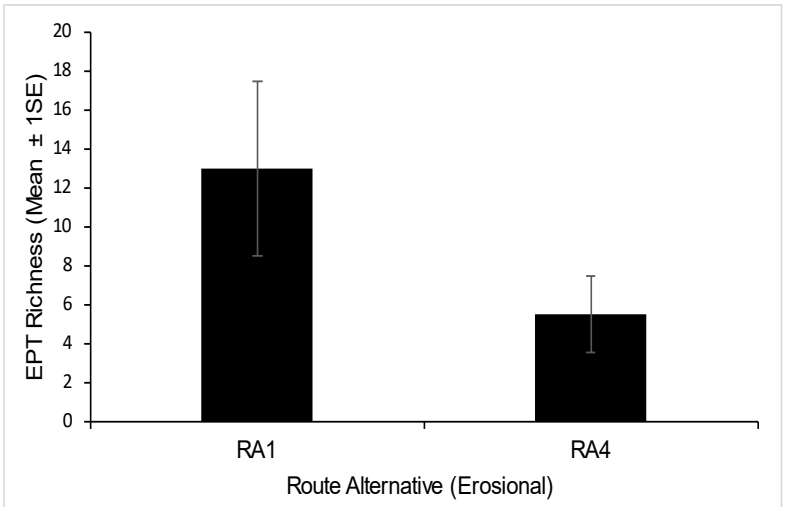

org/m² = number of organisms persquare metre



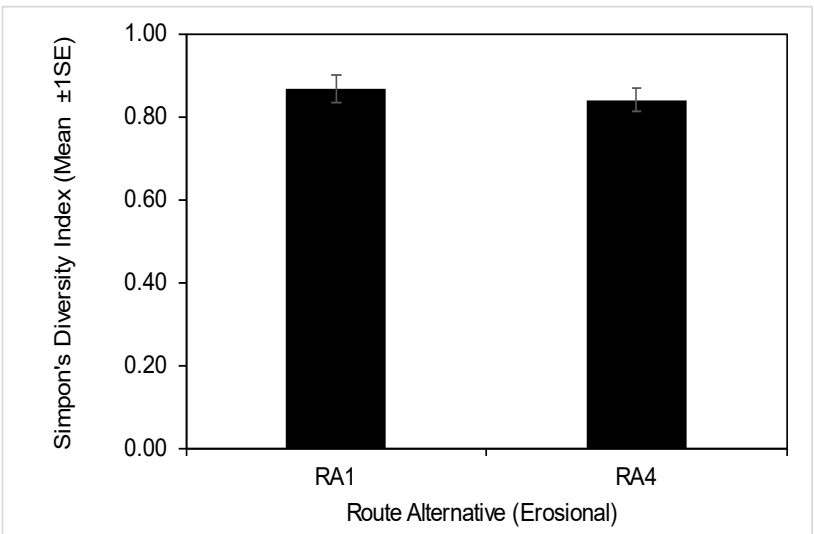

Richness = Total Taxa per Sample

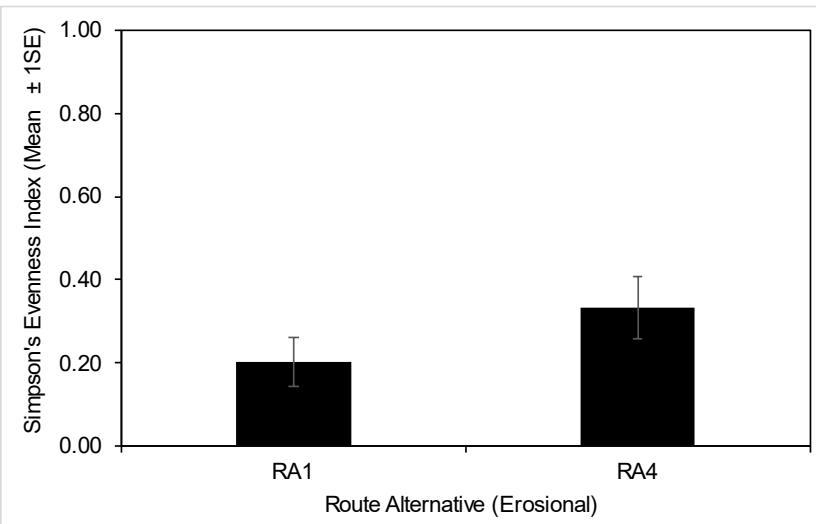



EPT = Ephemeroptera, Plectoptera, Trichoptera;org/m² = number of organisms per square metre




EPT = Ephemeroptera, Plecoptera, Trichoptera;Richness = Number of Taxa per Sample

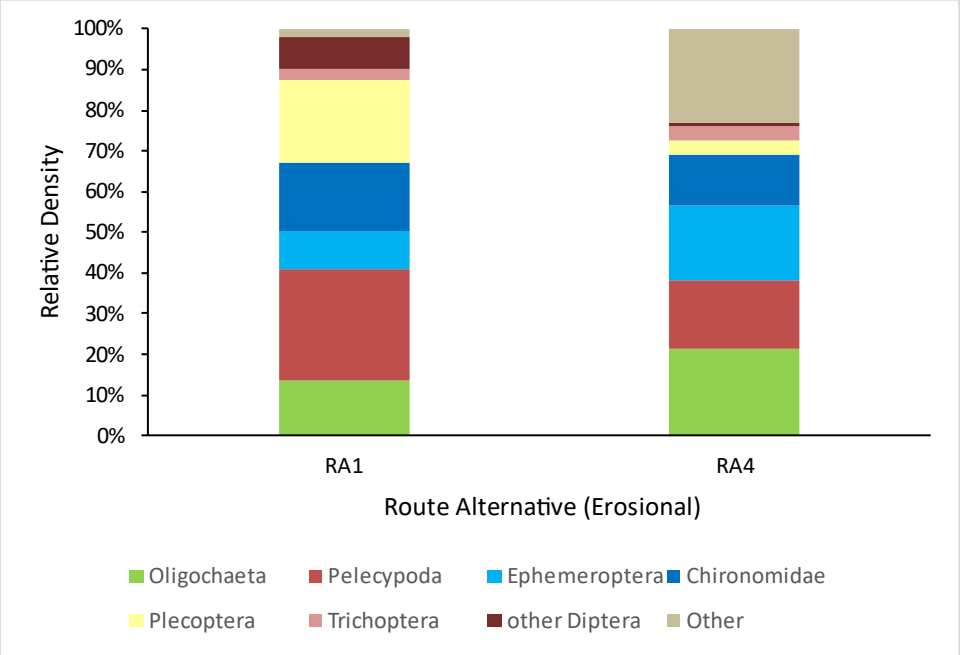


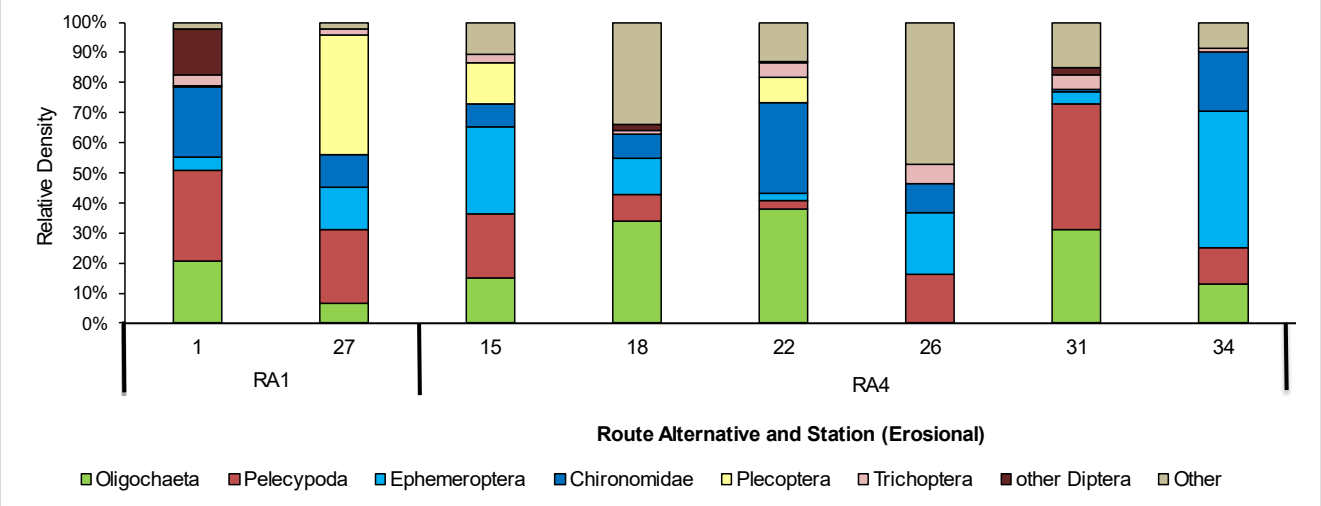




Notes: SE = standard error.

The community composition by major taxonomic group at erosional sites, grouped by route alternative, is illustrated in **Figure 2-11**. Sites in erosional habitats had greater variation in dominant taxa than depositional sites, and more balanced communities. On average, erosional sites in both route alternatives had lower proportions of Chironomidae (1% to 15%), and were dominated by Pelecypoda (RA1), or co-dominated by Oligochaeta, Pelecypoda and Ephemeroptera (RA4). Among the EPT taxa, Ephemeroptera was present in higher relative abundances than in depositional habitats, usually contributing 8% to 30% of the community, except at site RA4-WC-31 where it accounted for only 1%. Of the other EPT taxa, Plecoptera was present at both RA1 erosional sites, and 2 of the 6 RA4 sites. Trichoptera was present at all erosional sites, contributing between 1% and 6% of total density.

**Figure 2-11: Relative Density of Major Taxonomic Groups among Erosional Stations**



# 3. Summary and Conclusions

The benthic invertebrate community was sampled in 2020, 2021, and 2022 at 40 sites to establish a baseline for sites potentially effected by the access road route alternatives. Habitat characteristics at the benthic sampling sites ranged from small tributaries to large rivers, and were divided into 32 depositional sites dominated by fine sediments and organic material, and 8 erosional sites dominated by coarser substrates such as gravel and cobble. Field measured water quality parameters at all sites were generally within Provincial Water Quality Objectives, but several sites across all route alternatives had lower pH than the guideline range, which is typical of northern boreal systems (Dangles et al 2004).

Total density of benthic invertebrates was widely variable across sites, within both habitat types (erosional and depositional). Erosional sites sampled by the Surber sampler tended to have lower invertebrate densities than depositional sites sampled by grab samplers. Mean density among route alternatives was generally similar, with the exception of two sites (one depositional and one erosional), which could be considered outliers with substantially greater density compared to others in the same habitat type. Taxonomic richness was moderate to high, and was also fairly similar among stations, with higher richness at erosional stations than at depositional stations. Sensitive EPT taxa were present at most sites at low densities, with greater representation at erosional sites, as expected based on typical habitat preferences of these groups. The Simpson's diversity and evenness indices indicated a fairly diverse communities with low to moderate evenness across all route alternatives in both depositional and erosional habitats.

Community composition based on major taxonomic groups showed a wide variation among sites, but on average, communities were similar among route alternatives within each habitat type. Communities in depositional habitat were dominated by Chironomidae. Communities in erosional habitats were more diverse, with a lower representation of chironomids and greater variation in dominant taxa. Representation by EPT taxa was greater in erosional habitat. Ephemeroptera was often the second most abundant group in erosional habitat, but was a minor component of depositional communities. Plecoptera taxa were only present in erosional habitat, consistent with the general habitat preferences of this group.

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# Annex A

**Annex A, Table A-1: Benthic Invertebrate Community Sampling Locations, Habitat and In-situ Water Quality Results for the Martin Falls First Nation Community Access Road, 2020 to 2022**

| Waterbody | Easting | Northing | Sampling Date | Type of Habitat | Sampling Device | Habitat Type | Wetted Width (m) | Mean Depth (m) | Mean Current Velocity (m/s) | Organics | Sand/Silt/ Clay | Gravel | Cobble | Boulder | Bedrock | Temp (°C) | DO (mg/L) | pH | Specific Cond. (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROUTE ALTERNATIVE RA1 | | | | | | | | | | | | | | | | | | | |
| RA1-WC-01 | 530917 | 5629155 | Aug, 2022 | E | Surber | Riffle | 6.0 | 0.14 | 0.220 | 0 | 0 | 0 | 30 | 70 | 0 | 19.7 | 8.0 | 6.5 | 83 |
| RA1-WC-02 | 532285 | 5633018 | Sept, 2021 | D | Petite Ponar | Backwater | 60.0 | 0.43 | 0.000 | 0 | 20 | 0 | 30 | 50 | 0 | 12.2 | 10.4 | 6.9 | 99 |
| RA1-WC-09 | 532600 | 5644605 | Sept, 2021 | D | Petite Ponar | Pool | 4.5 | 0.32 | 0.001 | 60 | 40 | 0 | 0 | 0 | 0 | 12.1 | 8.2 | 5.9 | 81 |
| RA1-WC-14 | 529516 | 5656009 | Oct, 2020 | D | Petite Ponar | Flat | 30.0 | 0.88 | 0.005 | 70 | 30 | 0 | 0 | 0 | 0 | 2.3 | 10.9 | 6.6 | 86 |
| RA1-WC-14 | 529516 | 5656103 | Aug, 2022 | D | Ekman | Flat | 2.4 | 0.90 | 0.004 | 100 | 0 | 0 | 0 | 0 | 0 | 19.1 | 4.0 | 6.8 | 84 |
| RA1-WC-22 | 521646 | 5663318 | Aug, 2022 | D | Ekman | Flat | 80.0 | 0.73 | 0.006 | 100 | 0 | 0 | 0 | 0 | 0 | 19.5 | 4.2 | 6.3 | 114 |
| RA1-WC-23 | 521738 | 5691477 | Sept, 2021 | D | Petite Ponar | Flat | 100.0 | 0.85 | 0.043 | 30 | 70 | 0 | 0 | 0 | 0 | 11.6 | 7.0 | 6.7 | 94 |
| RA1-WC-26 | 519365 | 5700626 | Oct, 2020 | D | Petite Ponar | Flat | 21.0 | 0.22 | 0.042 | 90 | 10 | 0 | 0 | 0 | 0 | 1.1 | 10.4 | 6.3 | 53 |
| RA1-WC-27 | 519259 | 5702108 | Oct, 2020 | E | Surber | Run | 180.0 | 0.20 | 0.100 | 0 | 20 | 40 | 50 | 0 | 0 | 2.3 | 14.4 | 8.2 | 707 |
| RA1-WC-28 | 520165 | 5703845 | Oct, 2020 | D | Petite Ponar | Run | 2.0 | 0.28 | 0.195 | 0 | 100 | 0 | 0 | 0 | 0 | 0.0 | 11.2 | 6.3 | 43 |
| RA1-WC-30 | 520532 | 5709373 | Aug, 2022 | D | Petite Ponar | Flat | 40.0 | 0.75 | 0.000 | 50 | 50 | 0 | 0 | 0 | 0 | 17.9 | 9.9 | 5.2 | 40 |
| RA1-WC-32 | 512108 | 5711800 | Aug, 2022 | D | Petite Ponar | Flat | >80 | 1.05 | 0.015 | 100 | 0 | 0 | 0 | 0 | 0 | 17.1 | 4.6 | 5.7 | 49 |
| RA1-WC-41 | 521631 | 5720102 | Aug, 2022 | D | Petite Ponar | Flat | 4.9 | 1.10 | 0.044 | 75 | 25 | 0 | 0 | 0 | 0 | 17.6 | 8.2 | 6.0 | 49 |
| RA1-WC-51 | 510966 | 5732848 | Aug, 2022 | D | Petite Ponar | Flat | 65.0 | 1.05 | 0.048 | 50 | 50 | 0 | 0 | 0 | 0 | 16.6 | 8.3 | 6.1 | 123 |
| RA1-WC-57 | 518382 | 5743348 | Oct, 2020 | D | Petite Ponar | Flat | 12.0 | 1.50 | 0.014 | 80 | 20 | 0 | 0 | 0 | 0 | 1.0 | 10.3 | 5.8 | 43 |
| RA1-WC-66 | 527708 | 5740174 | Oct, 2020 | D | Petite Ponar | Flat | 9.0 | 0.50 | 0.030 | 10 | 90 | 0 | 0 | 0 | 0 | 1.0 | 10.9 | 6.5 | 31 |
| RA1-WC-67 | 531924 | 5741067 | Sept, 2021 | D | Petite Ponar | Flat | 18.0 | 0.95 | 0.120 | 10 | 90 | 0 | 0 | 0 | 0 | 11.6 | 7.9 | 6.4 | 43 |
| ROUTE ALTERNATIVES RA1-4 | | | | | | | | | | | | | | | | | | | |
| RA1-4-WC-01 | 519624 | 5666914 | Sept, 2021 | D | Petite Ponar | Flat | 3.0 | 0.80 | 0.045 | 80 | 20 | 0 | 0 | 0 | 0 | 12.7 | 10.0 | 6.1 | 58 |
| RA1-4-WC-07 | 519088 | 5682476 | Sept, 2021 | D | Petite Ponar | Flat | 15.0 | 0.75 | 0.002 | 80 | 20 | 0 | 0 | 0 | 0 | 14.1 | 6.3 | 6.6 | 64 |
| RA1-4-WC-33 | 569513 | 5733030 | Oct, 2020 | D | Petite Ponar | Flat | 5.2 | 1.00 | 0.076 | 100 | 0 | 0 | 0 | 0 | 0 | 1.9 | 11.3 | 6.5 | 27 |
| RA1-4-WC-35 | 573754 | 5732806 | Oct, 2020 | D | Petite Ponar | Run | 2.7 | 0.70 | 0.250 | 0 | 100 | 0 | 0 | 0 | 0 | 5.4 | 6.6 | 5.1 | 33 |
| RA1-4-WC-36 | 577674 | 5726014 | Aug, 2022 | D | Petite Ponar | Flat | 11.0 | 0.77 | 0.031 | 0 | 50 | 50 | 0 | 0 | 0 | 16.1 | 8.1 | 6.6 | 53 |
| RA1-4-WC-37 | 577422 | 5725562 | Oct, 2020 | D | Petite Ponar | Run | 0.5 | 0.15 | 0.006 | 0 | 100 | 0 | 0 | 0 | 0 | 5.0 | 9.8 | 7.1 | 221 |
| ROUTE ALTERNATIVE RA4 | | | | | | | | | | | | | | | | | | | |
| RA4-WC-00 | 524281 | 5619978 | Aug, 2022 | D | Ekman | Flat | 1.5-2.5 | 0.50 | 0.001 | 20 | 80 | 0 | 0 | 0 | 0 | 12.1 | 8.2 | 6.7 | 101 |
| RA4-WC-02 | 521687 | 5624111 | Sept, 2021 | D | Petite Ponar | Flat | 13.0 | 0.81 | 0.073 | 0 | 95 | 0 | 0 | 5 | 0 | 15.8 | 8.5 | 6.5 | 91 |
| RA4-WC-15 | 517636 | 5638222 | Oct, 2020 | E | Surber | Flat | 2.7 | 0.32 | - | 0 | 50 | 15 | 35 | 0 | 0 | 0.1 | 14.6 | 7.8 | 123 |
| RA4-WC-18 | 521912 | 5647403 | Oct, 2020 | E | Surber | Riffle | 11.0 | 0.20 | 0.400 | 0 | 0 | 20 | 75 | 5 | 0 | 5.0 | - (b) | 6.6 | 58 |
| RA4-WC-21 | 521033 | 5656086 | Aug, 2022 | D | Petite Ponar | Flat | 70.0 | 1.23 | 0.111 | 75 | 25 | 0 | 0 | 0 | 0 | 16.8 | 6.6 | 6.8 | 81 |
| RA4-WC-22 | 520840 | 5657294 | Oct, 2020 | E | Surber | Run | 6.5 | 0.18 | 0.800 | 0 | 5 | 40 | 55 | 0 | 0 | 0.2 | 14.5 | 7.6 | 97 |
| RA4-WC-26 | 519984 | 5663175 | Sept, 2021 | E | Surber | Run | 4.1 | 0.38 | 0.250 | 0 | 5 | 15 | 30 | 50 | 0 | 14.0 | 10.3 | 6.8 | 112 |
| RA4-WC-31 | 523970 | 5698738 | Oct, 2020 | E | Surber | Run | 2.7 | 0.29 | 0.200 | 0 | 30 | 15 | 35 | 20 | 0 | 3.8 | 12.2 | 6.0 | 33 |
| RA4-WC-34 | 525235 | 5705323 | Sept, 2021 | E | Surber | Backwater | - | 0.21 | 0.067 | 0 | 0 | 80 | 15 | 5 | 0 | 14.6 | 11.6 | 7.7 | 135 |
| RA4-WC-37 | 524697 | 5708581 | Sept, 2021 | D | Petite Ponar | Flat | 90.0 | 0.82 | 0.000 | 80 | 20 | 0 | 0 | 0 | 0 | 12.2 | 6.4 | 5.9 | 55 |
| RA4-WC-42 | 528262 | 5716758 | Oct, 2020 | D | Petite Ponar | Flat | 6.0 | 1.60 | 0.025 | 10 | 90 | 0 | 0 | 0 | 0 | 1.5 | 11.3 | 5.6 | 37 |
| RA4-WC-45 | 530773 | 5723169 | Oct, 2020 | D | Petite Ponar | Flat | 50.0 | 1.30 | 0.020 | 20 | 80 | 0 | 0 | 0 | 0 | 2.3 | 10.7 | 5.7 | 32 |
| RA4-WC-58 | 539622 | 5736589 | Oct, 2020 | D | Petite Ponar | Flat | 9.0 | 1.00 | - | 100 | 0 | 0 | 0 | 0 | 0 | 1.9 | 10.5 | 5.7 | 30 |
| RA4-WC-55 | 539024 | 5735944 | Sept, 2021 | D | Petite Ponar | Backwater | 45.0 | 0.62 | -0.100 | 0 | 100 | 0 | 0 | 0 | 0 | 12.4 | 10.9 | 7.0 | 72 |
| RA4-WC-57 | 539254 | 5736883 | Sept, 2021 | D | Petite Ponar | Flat | 2.0 | 0.50 | 0.180 | 75 | 20 | 0 | 0 | 5 | 0 | 12.2 | 7.1 | 6.0 | 43 |
| ROUTE ALTERNATIVE RA4B | | | | | | | | | | | | | | | | | | | |
| RA4B-WC-02 | 517170 | 5631029 | Aug, 2022 | D | Ekman | Flat | 3.1 | 0.50 | 0.043 | 100 | 0 | 0 | 0 | 0 | 0 | 17.7 | 8.6 | 6.7 | 38 |

Notes: Universal Transverse Mecator values are presented as NAD 83 Zone 16 U.
D = depositional (dominant fine sediments and organics); E = erosional (dominant coarse substrates, gravel, cobble, boulder); - = reading unreliable/not collected; µS/cm = microsiemens per centimetre.

## Annex A, Table A-2A. Baseline Benthic Invertebrate Abundance Data by Route Alternative, Site and Year for the Martin Falls First Nation Community Access Road, 2020 to 2022

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/Species | RA1-WC | | | | | | | | | | | | | | | | | RA1-4WC | | | | | | RA4-WC | | | | | | | | | | | | | | RA4B-WC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 9 | 14 | 14 | 22 | 23 | 26 | 27 | 28 | 30 | 32 | 41 | 51 | 57 | 66 | 67 | 1 | 7 | 33 | 35 | 36 | 37 | 00 | 2 | 15 | 18 | 21 | 22 | 26 | 31 | 34 | 37 | 42 | 45 | 55 | 55 | 57 | 58 | 2 |
| | | | | 2022 | 2021 | 2021 | 2020 | 2022 | 2022 | 2021 | 2020 | 2020 | 2020 | 2022 | 2022 | 2022 | 2022 | 2020 | 2020 | 2021 | 2021 | 2021 | 2020 | 2020 | 2022 | 2020 | 2022 | 2021 | 2020 | 2020 | 2022 | 2020 | 2021 | 2020 | 2021 | 2020 | 2020 | 2020 | 2021 | 2021 | 2020 | 2022 |
| Nematoda | - | - | - | 32 | 0 | 16 | 0 | 0 | 0 | 128 | 0 | 10 | 16 | 0 | 0 | 16 | 128 | 0 | 8 | 16 | 0 | 32 | 48 | 16 | 0 | 240 | 64 | 16 | 2 | 2 | 64 | 2 | 8 | 16 | 1 | 0 | 80 | 36 | 12 | 0 | 0 | 16 | 0 |
| Turbellaria | - | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tricladida | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | Enchytraeidae | - | - | 16 | 0 | 0 | 0 | 0 | 0 | 32 | 32 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 16 | 0 | 64 | 96 | 0 | 3 | 14 | 0 | 2 | 4 | 2 | 37 | 0 | 0 | 4 | 0 | 16 | 0 | 0 | 0 |
| | Naididae | Naidinae | *Dero sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Nais sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 12 | 0 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Nais barbata* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Nais behningi* | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Nais communis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Nais variabilis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Slavina appendiculata* | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 32 | 0 | 0 | 2 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Specaria josinae* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| | | | *Stylaria lacustris* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Vejdovskyella comata* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Pristininae | *Pristina sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Tubificinae | (i/d) | 0 | 0 | 0 | 16 | 32 | 0 | 0 | 0 | 0 | 32 | 32 | 0 | 16 | 0 | 0 | 24 | 32 | 16 | 32 | 0 | 128 | 0 | 32 | 0 | 0 | 10 | 0 | 64 | 0 | 8 | 2 | 1 | 0 | 0 | 8 | 36 | 8 | 0 | 32 | 0 |
| | | | *Aulodrilus americanus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 8 | 0 | 0 | 0 |
| | | | *Limnodrilus udekemianus* | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 16 | 192 | 16 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 8 | 8 | 0 | 0 | 0 |
| | | | *Varichaetadrilus harmani* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Lumbricidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Lumbriculidae | - | *Lumbriculus sp.* | 32 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 4 | 0 | 6 | 32 | 6 | 3 | 0 | 0 | 0 | 0 | 8 | 16 | 32 | 0 |
| Hirudinea | Erpobdellidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Glossiphoniidae | - | *Glossiphonia complanata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Helobdella stagnalis* | 16 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 208 | 0 | 0 | 32 | 32 | 8 | 0 | 2 | 0 | 0 | 40 | 0 | 2 | 0 | 0 | 0 | 8 | 0 | 16 | 0 | 32 |
| Acari | Arrenuridae | - | *Arrenurus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hygrobatidae | - | *Hygrobates sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 320 | 8 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 16 | 0 |
| | Lebertiidae | - | *Lebertia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Limnesiidae | - | *Tyrrellia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pionidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sperchontidae | - | *Sperchon sp.* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Copepoda - Harpacticoida | - | - | - | 0 | 32 | 0 | 0 | 0 | 0 | 96 | 64 | 9 | 0 | 16 | 32 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ostracoda | - | - | - | 0 | 128 | 0 | 64 | 0 | 0 | 0 | 48 | 1 | 24 | 16 | 64 | 0 | 0 | 0 | 40 | 32 | 48 | 32 | 0 | 96 | 0 | 32 | 256 | 16 | 0 | 6 | 0 | 0 | 28 | 2 | 0 | 0 | 16 | 4 | 8 | 24 | 0 | 32 | 0 |
| Amphipoda | Hyalellidae | - | *Hyalella sp.* | 0 | 0 | 0 | 0 | 128 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 5 | 2 | 0 | 0 | 12 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 |
| Collembola | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 16 | 0 |
| Gastropoda | Ancylidae | - | *Ferrissia sp.* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 16 | 0 |
| | Hydrobiidae | - | *Amnicola sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 0 | 160 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 16 | 0 | 0 | 0 | 2 | 20 | 0 | 0 | 0 | 0 | 4 | 8 | 0 | 0 | 0 | 0 |
| | Lymnaeidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Bulimnea megasoma* | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Physidae | - | *Physella sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Planorbidae | - | *Armiger crista* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Gyraulus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 8 | 0 | 0 | 16 | 16 | 0 |
| | | | *Helisoma anceps* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 16 | 0 | 0 |
| | | | *Planorbella trivolvis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Valvatidae | - | *Valvata sp.* | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| | | | *Valvata lewisi/sincera* | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 16 | 8 | 0 | 0 | 0 | 0 | 0 |
| | | | *Valvata tricarinata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| Bivalvia | Sphaeriidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 112 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 32 | 0 | 0 | 0 | 0 | 0 |
| | | | *Pisidium/Cyclocalyx* | 928 | 96 | 144 | 32 | 320 | 0 | 0 | 240 | 17 | 0 | 48 | 128 | 0 | 0 | 64 | 64 | 80 | 48 | 128 | 160 | 56 | 8 | 608 | 64 | 16 | 10 | 94 | 0 | 302 | 0 | 74 | 10 | 0 | 144 | 116 | 160 | 312 | 32 | 16 | 64 |
| | | | *Pyganodon sp.* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Sphaerium (Amesoda) simile* | 0 | 0 | 0 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Sphaerium (Musculium) sp.* | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 144 | 0 | 48 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 116 | 8 | 0 | 0 | 0 |
| | | | *Sphaerium (Musculium) lacustre* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Sphaerium (Herringtonium) rhomboideum* | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | Baetidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Acerpenna pygmaea* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Baetis sp.* | 192 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Baetis tricaudatus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Callibaetis sp.* | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Labiobaetis propinquus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Caenidae | - | *Caenis sp.* | 0 | 128 | 0 | 48 | 32 | 96 | 128 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 112 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 2 | 32 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 32 |
| | Ephemeridae | - | *Ephemera sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Hexagenia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemerellidae | - | *Ephemerella sp.* | 832 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Eurylophella sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Serratella sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Heptageniidae | - | (i/d) | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Hexagenia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Leucrocuta sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Maccaffertium sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Maccaffertium vicarium* | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Isonychiidae | - | *Isonychia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Leptophlebiidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 112 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Leptophlebia sp.* | 80 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 9 | 0 | 16 | 0 | 32 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 8 | 44 | 0 | 288 | 0 | 5 | 22 | 0 | 0 | 4 | 2 | 18 | 0 | 96 | 0 | 4 | 8 | 0 | 0 | 0 |
| | | | *Paraleptophlebia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Odonata - Zygoptera | Coenagrionidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Odonata - Anisoptera | Aeshnidae | - | *Aeshna sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | Corduliidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Epitheca sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Somatochlora sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gomphidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Gomphus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | | | *Phanogomphus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Plecoptera | Capniidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 207 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Allocapnia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Paracapnia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Chloroperlidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/Species | RA1-WC | | | | | | | | | | | | | | | | RA1-4WC | | | | | | | RA4-WC | | | | | | | | | | | | | | RA4B-WC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 9 | 14 | 14 | 22 | 23 | 26 | 27 | 28 | 30 | 32 | 41 | 51 | 57 | 66 | 67 | 1 | 7 | 33 | 35 | 36 | 37 | 00 | 2 | 15 | 18 | 21 | 22 | 26 | 31 | 34 | 37 | 42 | 45 | 55 | 55 | 57 | 58 | 2 |
| | | | | 2022 | 2021 | 2021 | 2020 | 2022 | 2022 | 2021 | 2020 | 2020 | 2020 | 2022 | 2022 | 2022 | 2022 | 2020 | 2020 | 2021 | 2021 | 2021 | 2020 | 2020 | 2022 | 2020 | 2022 | 2021 | 2020 | 2020 | 2022 | 2020 | 2021 | 2020 | 2021 | 2021 | 2020 | 2020 | 2020 | 2021 | 2021 | 2020 | 2022 |
| | | | *Oxyethira sp.* | 0 | 0 | 0 | 16 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 32 | 0 | 20 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 48 | 0 |
| | Lepidostomatidae | - | *Lepidostoma sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Leptoceridae | - | *Ceraclea sp.* | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Mystacides sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| | | | *Oecetis sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| | | | *Triaenodes sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Limnephilidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 16 | 0 | 0 | 0 | 0 |
| | | | *Glyphopsyche sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Pycnopsyche sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 8 | 0 | 0 | 0 | 0 |
| | Odontoceridae | - | *Psilotreta sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Philopotamidae | - | *Chimarra sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Phryganeidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Ptilostomis* | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Polycentropodidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Polycentropus sp.* | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| | Rhyacophilidae | - | *Rhyacophila sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Uenoidae | - | *Neophylax sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lepidoptera | Crambidae | - | *Parapoynx sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| Coleoptera | Chrysomelidae | - | *Donacia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 16 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Elmidae | - | (i/d) | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 0 | 68 | 0 | 28 | 0 | 0 | 0 | 0 | 92 | 0 | 0 | 0 | 0 |
| | | | *Dubiraphia sp.* | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Optioservus fastiditus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Promoresia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Haliplidae | - | *Haliplus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Staphylinidae | - | | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Ceratopogonidae | - | *Bezzia sp.* | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 48 | 32 | 16 | 0 | 16 | 72 | 0 | 16 | 96 | 16 | 0 | 8 | 16 | 128 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 16 | 32 |
| | | | *Ceratopogon sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Culicoides sp.* | 0 | 0 | 16 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| | | | *Dasyhelea sp.* | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| | | | *Mallochohelea sp.* | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 16 | 0 | 48 | 0 | 0 | 0 | 0 | 16 | 20 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 12 | 0 | 0 | 0 | 0 | 0 |
| | | | *Probezzia sp.* | 32 | 32 | 16 | 32 | 0 | 0 | 32 | 16 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 8 | 32 | 0 | 0 | 1 | 30 | 0 | 22 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 8 | 16 | 0 | 32 |
| | | | *Serromyia sp.* | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 20 | 0 | 0 | 0 | 0 | 0 |
| | Chironomidae | - | (i/d) | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Chironominae | *Chironomus sp.* | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 24 | 0 | 176 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Cladopelma sp.* | 0 | 0 | 0 | 96 | 32 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 16 | 64 | 0 | 144 | 160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 |
| | | | *Cladotanytarsus sp.* | 0 | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Constempellina sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 |
| | | | *Cryptochironomus sp.* | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 3 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 16 | 8 | 0 | 0 | 0 |
| | | | *Demicryptochironomus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Dicrotendipes sp.* | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 32 | 0 | 0 | 48 | 8 | 0 | 160 | 0 | 0 | 0 | 0 | 0 | 160 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 16 | 8 | 0 | 0 | 0 | 16 | 0 |
| | | | *Glyptotendipes sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Lauterborniella sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 |
| | | | *Micropsectra sp.* | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 16 | 0 | 0 | 0 | 32 | 0 | 80 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 6 | 0 | 0 | 48 | 8 | 16 | 0 | 0 | 96 | 0 |
| | | | *Microtendipes sp.* | 16 | 32 | 0 | 128 | 64 | 128 | 128 | 0 | 0 | 0 | 16 | 0 | 16 | 32 | 0 | 0 | 0 | 0 | 0 | 80 | 8 | 16 | 0 | 32 | 8 | 0 | 0 | 0 | 0 | 8 | 0 | 1 | 0 | 192 | 71 | 0 | 0 | 0 | 32 | 32 |
| | | | *Neostempellina sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Pagastiella sp.* | 0 | 224 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 32 | 96 | 0 | 0 | 273 | 16 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 |
| | | | *Parachironomus sp.* | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 32 | 0 | 32 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Paratanytarsus sp.* | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 8 | 0 | 0 | 32 | 96 | 0 | 0 | 0 | 320 | 0 | 0 | 0 | 32 | 0 | 12 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 48 | 0 |
| | | | *Paratendipes sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 256 | 0 | 0 | 0 | 32 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Phaenopsectra sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 16 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Polypedilum sp.* | 0 | 352 | 0 | 0 | 0 | 0 | 64 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 64 | 0 |
| | | | *Polypedilum flavum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Polypedilum halterale* | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 32 | 0 | 248 | 0 | 0 | 192 | 0 | 0 | 0 | 0 | 0 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 16 | 0 | 0 | 0 | 0 | 0 |
| | | | *Polypedilum scalaenum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 32 | 0 | 0 | 112 | 0 | 0 | 0 | 0 | 140 | 0 | 0 | 24 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 104 | 16 | 64 | 0 | 0 |
| | | | *Rheotanytarsus sp.* | 96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Saetheria sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Stempellinella sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 |
| | | | *Stictochironomus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Tanytarsus sp.* | 32 | 96 | 16 | 928 | 256 | 0 | 96 | 0 | 31 | 0 | 48 | 256 | 16 | 64 | 32 | 168 | 0 | 128 | 64 | 16 | 144 | 4 | 0 | 1.280 | 8 | 1 | 2 | 64 | 0 | 0 | 4 | 0 | 192 | 192 | 545 | 8 | 0 | 0 | 400 | 544 |
| | | | *Tribelos sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 272 | 0 | 0 |
| | | Diamesinae | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Pagastia sp.* | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Potthastia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 |
| | | Orthocladiinae | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Corynoneura sp.* | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Cricotopus sp.* | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Cricotopus bicinctus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Cricotopus/Orthocladius* | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 |
| | | | *Epoicocladius sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Eukiefferiella sp.* | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Eukiefferiella devonica group* | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Heterotrissocladius sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Hydrobaenus sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Lopescladius sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Nanocladius sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Orthocladiinae* Species C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Orthocladius annectens* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Parakiefferiella sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 |
| | | | *Parametriocnemus sp.* | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Psectrocladius sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Rheosmittia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Smittia sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Synorthocladius sp.* | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Thienemanniella sp.* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Tvetenia sp.* | 528 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Zalutschia sp.* | 0 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 0 | 0 | 512 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 0 | 64 | 0 | 0 |
| | | Tanypodinae | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 224 | 0 |

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/Species | RA1-WC | | | | | | | | | | | | | | | | | RA1-4WC | | | | | | RA4-WC | | | | | | | | | | | | | | | | RA4B-WC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 9 | 14 | 14 | 22 | 23 | 26 | 27 | 28 | 30 | 32 | 41 | 51 | 57 | 66 | 67 | 1 | 7 | 33 | 35 | 36 | 37 | 00 | 2 | 15 | 18 | 21 | 22 | 26 | 31 | 34 | 37 | 42 | 45 | 55 | 55 | 57 | 58 | 2 |
| | | | | 2022 | 2021 | 2021 | 2020 | 2022 | 2022 | 2021 | 2020 | 2020 | 2020 | 2022 | 2022 | 2022 | 2022 | 2020 | 2020 | 2021 | 2021 | 2021 | 2020 | 2020 | 2022 | 2020 | 2022 | 2021 | 2020 | 2020 | 2022 | 2020 | 2021 | 2020 | 2021 | 2021 | 2020 | 2020 | 2020 | 2021 | 2021 | 2020 | 2022 |
| | Simuliidae | - | (i/d) | 624 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Tabanidae | - | *Chrysops sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| | Tipulidae | - | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Dicranota sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Erioptera sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 8 | 0 | 0 | 0 |
| | | | *Hexatoma sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Limnophila sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | *Pilaria sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 8 | 16 | 0 | 0 |
| **TOTAL** | | | | **4,944** | **1,760** | **384** | **1,794** | **1,154** | **616** | **1,120** | **544** | **592** | **96** | **513** | **1,385** | **389** | **640** | **882** | **912** | **885** | **1,088** | **1,248** | **928** | **664** | **396** | **1,568** | **5,802** | **636** | **68** | **320** | **544** | **794** | **378** | **259** | **92** | **448** | **1,219** | **1,228** | **731** | **539** | **672** | **1,360** | **1,249** |

Note: - = not identified to this level or taxonomic level not applicable; i/d = immature, indeterminate, or damaged organism.

Data are displayed by Route Alternative (i.e.,RA1) , site (i.e., 2) and year (i.e., 2021).

**Annex A, Table A-2B. Quality Control Data for Re-sorted Benthic Invertebrate Samples**

| Station | Year | Number of Organisms Recovered (initial sort) | Number of Organisms in Re-sort | Percent Recovery |
|---|---|---|---|---|
| RA1-4WC-35 | 2020 | 78 | 83 | 94.0% |
| RA4-WC-18 | 2020 | 155 | 160 | 96.9% |
| RA1-4WC-01 | 2021 | 68 | 69 | 98.6% |
| RA1-WC-01 | 2022 | 299 | 309 | 96.8% |

**Annex A, Table A-3: Summary Statistics for Benthic Invertebrate Community Variables for Depositional Habitat, Martin Falls First Nation Community Access Road, 2020 to 2022**

| Route Alternative | Station | Total Density (org/m$^2$) | Richness (taxa/station) | EPT Density (org/m$^2$) | EPT Richness | Simpson's Diversity Index | Simpson's Evenness Index |
|---|---|---|---|---|---|---|---|
| RA1 | 2 | 24,828 | 16 | 2,759 | 3 | 0.89 | 0.56 |
| | 9 | 5,287 | 9 | 0 | 0 | 0.77 | 0.49 |
| | 14 (2020) | 25,776 | 17 | 920 | 2 | 0.71 | 0.20 |
| | 14 (2022) | 16,580 | 15 | 1,839 | 3 | 0.85 | 0.43 |
| | 22 | 8,851 | 11 | 1,839 | 2 | 0.85 | 0.59 |
| | 23 | 12,874 | 16 | 1,839 | 1 | 0.91 | 0.72 |
| | 26 | 6,897 | 6 | 0 | 0 | 0.44 | 0.30 |
| | 28 | 1,149 | 4 | 0 | 0 | 0.70 | 0.83 |
| | 30 | 7,141 | 18 | 474 | 3 | 0.92 | 0.68 |
| | 32 | 19,440 | 16 | 1,049 | 2 | 0.90 | 0.61 |
| | 41 | 4,899 | 18 | 690 | 2 | 0.94 | 0.87 |
| | 51 | 7,356 | 13 | 920 | 2 | 0.90 | 0.82 |
| | 57 | 12,672 | 19 | 2,543 | 4 | 0.86 | 0.38 |
| | 66 | 12,874 | 17 | 0 | 0 | 0.86 | 0.41 |
| | 67 | 12,486 | 23 | 489 | 4 | 0.90 | 0.45 |
| RA1-4 | 1 | 15,632 | 16 | 230 | 1 | 0.87 | 0.49 |
| | 7 | 16,552 | 12 | 0 | 0 | 0.86 | 0.61 |
| | 33 | 12,644 | 15 | 230 | 1 | 0.87 | 0.52 |
| | 35 | 9,310 | 16 | 230 | 2 | 0.86 | 0.45 |
| | 36 | 5,690 | 28 | 1,480 | 7 | 0.85 | 0.23 |
| | 37 | 18,851 | 15 | 0 | 0 | 0.74 | 0.25 |
| Mean | | 12,276 | 15 | 835 | 2 | 0.83 | 0.52 |
| Median | | 12,644 | 16 | 489 | 2 | 0.86 | 0.49 |
| Minimum | | 1,149 | 4 | 0 | 0 | 0.44 | 0.20 |
| Maximum | | 25,776 | 28 | 2,759 | 7 | 0.94 | 0.87 |
| Count | | 21 | 21 | 21 | 21 | 21 | 21 |
| SD | | 6,534 | 5 | 885 | 1.8 | 0.11 | 0.19 |
| SE | | 1,426 | 1.1 | 193 | 0.4 | 0.02 | 0.04 |
| RA4 | 00 | 81,523 | 38 | 5,977 | 3 | 0.91 | 0.30 |
| | 2 | 8,908 | 30 | 3,032 | 8 | 0.91 | 0.37 |
| | 21 | 6,897 | 8 | 460 | 1 | 0.85 | 0.85 |
| | 37 | 6,437 | 6 | 0 | 0 | 0.73 | 0.63 |
| | 42 | 16,365 | 22 | 1,839 | 3 | 0.90 | 0.45 |
| | 45 | 17,069 | 20 | 57 | 1 | 0.73 | 0.19 |
| | 55 | 10,330 | 22 | 72 | 2 | 0.86 | 0.33 |
| | 55 | 7,629 | 21 | 345 | 2 | 0.64 | 0.15 |
| | 57 | 9,655 | 14 | 230 | 1 | 0.77 | 0.32 |
| | 58 | 19,080 | 24 | 690 | 1 | 0.87 | 0.33 |
| RA1-4 | 1 | 15,632 | 16 | 230 | 1 | 0.87 | 0.49 |
| | 7 | 16,552 | 12 | 0 | 0 | 0.86 | 0.61 |
| | 33 | 12,644 | 15 | 230 | 1 | 0.87 | 0.52 |
| | 35 | 9,310 | 16 | 230 | 2 | 0.86 | 0.45 |
| | 36 | 5,690 | 28 | 1,480 | 7 | 0.85 | 0.23 |
| | 37 | 18,851 | 15 | 0 | 0 | 0.74 | 0.25 |
| RA4B | 2 | 17,945 | 15 | 1,379 | 3 | 0.78 | 0.30 |
| Mean | | 16,501 | 19 | 956 | 2 | 0.82 | 0.40 |
| Median | | 12,644 | 16 | 230 | 1 | 0.86 | 0.33 |
| Minimum | | 5,690 | 6 | 0 | 0 | 0.64 | 0.15 |
| Maximum | | 81,523 | 38 | 5,977 | 8 | 0.91 | 0.85 |
| Count | | 17 | 17 | 17 | 17 | 17 | 17 |
| SD | | 17,395 | 8 | 1,539 | 2.3 | 0.08 | 0.18 |
| SE | | 4,219 | 2.0 | 373 | 0.5 | 0.02 | 0.04 |

Notes: SD = standard deviation; SE = standard error; EPT = Ephemeroptera, Plecoptera and Trichoptera.

**Annex A, Table A-4: Summary Statistics for Benthic Invertebrate Community Variables for Erosional Habitat, Martin Falls First Nation Community Access Road, 2020 to 2022**

| Route Alternative | Station | Total Density (org/m$^2$) | Richness (taxa/station) | EPT Density (org/m$^2$) | EPT Richness | Simpson's Diversity Index | Simpson's Evenness Index |
|---|---|---|---|---|---|---|---|
| **RA1** | **1** | 17,625 | 38 | 4,822 | 8 | 0.90 | 0.26 |
| | **27** | 2,056 | 46 | 1,084 | 17 | 0.83 | 0.14 |
| **Mean** | | 9,840 | 42 | 2,953 | 12.5 | 0.87 | 0.20 |
| **Median** | | 9,840 | 42 | 2,953 | 12.5 | 0.87 | 0.20 |
| **Minimum** | | 2,056 | 38 | 1,084 | 8.0 | 0.83 | 0.14 |
| **Maximum** | | 17,625 | 46 | 4,822 | 17.0 | 0.90 | 0.26 |
| **Count** | | 2 | 2 | 2 | 2 | 2 | 2 |
| **SD** | | - | - | - | - | - | - |
| **SE** | | - | - | - | - | - | - |
| **RA4** | **15** | 237 | 20 | 57 | 4 | 0.91 | 0.54 |
| | **18** | 1,141 | 27 | 108 | 3 | 0.85 | 0.24 |
| | **22** | 2,842 | 34 | 1,227 | 15 | 0.77 | 0.14 |
| | **26** | 1,328 | 28 | 215 | 4 | 0.94 | 0.59 |
| | **31** | 858 | 24 | 47 | 5 | 0.80 | 0.21 |
| | **34** | 327 | 15 | 68 | 2 | 0.78 | 0.28 |
| **Mean** | | 1,122 | 25 | 287 | 5.5 | 0.84 | 0.33 |
| **Median** | | 999 | 26 | 88 | 4.0 | 0.82 | 0.26 |
| **Minimum** | | 237 | 15 | 47 | 2.0 | 0.77 | 0.14 |
| **Maximum** | | 2,842 | 34 | 1,227 | 15.0 | 0.94 | 0.59 |
| **Count** | | 6 | 6 | 6 | 6 | 6 | 6 |
| **SD** | | 947 | 6.6 | 465 | 4.8 | 0.07 | 0.19 |
| **SE** | | 387 | 2.7 | 190 | 1.9 | 0.03 | 0.08 |

Notes: SD = standard deviation; SE = standard error; EPT = Ephemeroptera, Plecoptera and Trichoptera.

**Annex A, Table A-5: Presence of Benthic Invertebrates by Route Alternative, Martin Falls First Nation Community Access Road, 2020 to 2022**

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/ Species | RA1 | RA1-4 | RA4 | RA4B |
|---|---|---|---|---|---|---|---|
| Turbellaria | | | (i/d) | - | X | - | - |
| Tricladida | | | | X | - | X | - |
| Oligochaeta | Enchytraeidae | | | X | X | X | - |
| | Naididae | Naidinae | *Dero sp.* | - | - | X | - |
| | | | *Nais sp.* | - | - | X | - |
| | | | *Nais barbata* | X | - | - | - |
| | | | *Nais behningi* | X | - | - | - |
| | | | *Nais communis* | X | - | - | - |
| | | | *Nais variabilis* | X | - | X | - |
| | | | *Slavina appendiculata* | X | X | X | - |
| | | | *Specaria josinae* | - | - | X | - |
| | | | *Stylaria lacustris* | X | - | - | - |
| | | | *Vejdovskyella comata* | X | - | X | - |
| | | Pristininae | *Pristina sp.* | X | - | X | - |
| | | Tubificinae | (i/d) | X | X | X | - |
| | | | *Aulodrilus americanus* | - | X | X | - |
| | | | *Limnodrilus udekemianus* | X | X | X | - |
| | | | *Varichaetadrilus harmani* | - | - | X | - |
| | Lumbricidae | | (i/d) | - | - | X | - |
| | Lumbriculidae | | *Lumbriculus sp.* | X | X | X | - |
| Hirudinea | Erpobdellidae | | (i/d) | - | X | X | X |
| | Glossiphoniidae | | *Glossiphonia complanata* | - | - | X | - |
| | | | *Helobdella stagnalis* | X | X | X | X |
| Acari | Arrenuridae | | *Arrenurus sp.* | X | - | - | - |
| | Hygrobatidae | | *Hygrobates sp.* | X | - | X | - |
| | Lebertiidae | | *Lebertia sp.* | X | - | X | - |
| | Limnesiidae | | *Tyrrellia sp.* | - | - | X | - |
| | Pionidae | | (i/d) | - | - | X | - |
| | Sperchontidae | | *Sperchon sp.* | X | X | - | - |
| Ostracoda | | | | X | X | X | - |
| Amphipoda | Hyalellidae | | *Hyalella sp.* | X | - | X | - |
| Gastropoda | Ancylidae | | *Ferrissia sp.* | X | - | X | - |
| | Hydrobiidae | | *Amnicola sp.* | X | X | X | - |
| | Lymnaeidae | | (i/d) | X | - | X | - |
| | | | *Bulimnea megasoma* | X | - | - | - |
| | Physidae | | *Physella sp.* | X | X | - | - |
| | Planorbidae | | *Armiger crista* | - | - | X | - |
| | | | *Gyraulus sp.* | X | X | X | - |
| | | | *Helisoma anceps* | X | - | X | - |
| | | | *Planorbella trivolvis* | - | - | X | - |
| | Valvatidae | | *Valvata sp.* | X | X | - | - |
| | | | *Valvata lewisi/sincera* | X | X | X | - |
| | | | *Valvata tricarinata* | - | - | X | - |
| Bivalvia | Sphaeriidae | | (i/d) | - | - | - | - |
| | | | *Pisidium/Cyclocalyx* | X | X | X | X |
| | | | *Pyganodon sp.* | X | - | - | - |
| | | | *Sphaerium (Amesoda) simile* | X | X | X | - |
| | | | *Sphaerium (Musculium) sp.* | X | X | X | - |
| | | | *Sphaerium (Musculium) lacustre* | X | - | - | - |
| | | | *Sphaerium (Herringtonium) rhomboideum* | X | - | X | - |
| Ephemeroptera | Baetidae | | (i/d) | X | - | - | - |
| | | | *Acerpenna pygmaea* | X | - | - | - |
| | | | *Baetis sp.* | X | - | - | - |
| | | | *Baetis tricaudatus* | X | - | - | - |
| | | | *Callibaetis sp.* | X | - | X | - |
| | | | *Labiobaetis propinquus* | - | X | - | - |
| | Caenidae | | *Caenis sp.* | X | - | X | X |
| | Ephemeridae | | *Ephemera sp.* | X | X | X | - |
| | | | *Hexagenia sp.* | X | - | - | - |
| | Ephemerellidae | | *Ephemerella sp.* | X | - | - | - |
| | | | *Eurylophella sp.* | - | - | X | - |
| | | | *Serratella sp.* | X | - | - | - |
| | | | (i/d) | X | - | X | - |
| | | | *Hexagenia sp.* | - | X | - | - |

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/ Species | RA1 | RA1-4 | RA4 | RA4B |
|---|---|---|---|---|---|---|---|
| | Heptageniidae | | *Leucrocuta sp.* | X | - | X | - |
| | | | *Maccaffertium sp.* | X | - | - | - |
| | | | *Maccaffertium vicarium* | X | - | X | - |
| | Isonychiidae | | *Isonychia sp.* | X | - | - | - |
| | Leptophlebiidae | | (i/d) | - | X | X | - |
| | | | *Leptophlebia sp.* | X | X | X | - |
| | | | *Paraleptophlebia sp.* | X | - | X | - |
| Odonata - Zygoptera | Coenagrionidae | | (i/d) | - | - | X | - |
| Odonata - Anisoptera | Aeshnidae | | *Aeshna sp.* | - | - | X | - |
| | Corduliidae | | (i/d) | - | - | X | - |
| | | | *Epitheca sp.* | - | - | X | - |
| | | | *Somatochlora sp.* | - | - | X | - |
| | Gomphidae | | (i/d) | X | - | - | - |
| | | | *Gomphus sp.* | - | - | X | - |
| | | | *Phanogomphus sp.* | - | - | X | - |
| Plecoptera | Capniidae | | (i/d) | - | - | X | - |
| | | | *Allocapnia sp.* | - | - | X | - |
| | | | *Paracapnia sp.* | X | - | X | - |
| | Chloroperlidae | | (i/d) | X | - | - | - |
| | Leuctridae | | *Leuctra sp.* | - | - | X | - |
| | Perlidae | | *Acroneuria sp.* | - | - | X | - |
| | Perlodidae | | (i/d) | X | - | - | - |
| | Taeniopterygidae | | (i/d) | - | - | - | - |
| | | | *Oemopteryx sp.* | - | - | X | - |
| Megaloptera | Sialidae | | *Sialis sp.* | X | X | X | - |
| Trichoptera | Dipseudopsidae | | *Phylocentropus sp.* | X | X | X | - |
| | Helicopsychidae | | *Helicopsyche sp.* | - | - | X | - |
| | Hydropsychidae | | (i/d) | - | - | - | - |
| | | | *Cheumatopsyche sp.* | X | - | X | - |
| | | | *Diplectrona modesta* | - | - | X | - |
| | | | *Hydropsyche betteni* | X | - | X | - |
| | Hydroptilidae | | *Hydroptila sp.* | - | X | - | - |
| | | | *Oxyethira sp.* | X | X | X | - |
| | Lepidostomatidae | | *Lepidostoma sp.* | X | - | X | - |
| | Leptoceridae | | *Ceraclea sp.* | X | - | - | - |
| | | | *Mystacides sp.* | X | X | X | X |
| | | | *Oecetis sp.* | X | X | X | X |
| | | | *Triaenodes sp.* | - | - | X | - |
| | Limnephilidae | | (i/d) | X | - | X | - |
| | | | *Glyphopsyche sp.* | X | - | - | - |
| | | | *Pycnopsyche sp.* | - | - | X | - |
| | Odontoceridae | | *Psilotreta sp.* | - | - | X | - |
| | Philopotamidae | | *Chimarra sp.* | - | - | X | - |
| | Phryganeidae | | (i/d) | X | - | - | - |
| | | | *Ptilostomis* | X | - | - | - |
| | Polycentropodidae | | (i/d) | X | - | - | - |
| | | | *Polycentropus sp.* | X | - | X | - |
| | Rhyacophilidae | | *Rhyacophila sp.* | X | - | - | - |
| | Uenoidae | | *Neophylax sp.* | - | - | X | - |
| Coleoptera | Chrysomelidae | | *Donacia sp.* | X | - | - | - |
| | Elmidae | | (i/d) | X | - | X | - |
| | | | *Dubiraphia sp.* | X | - | - | - |
| | | | *Optioservus fastiditus* | - | - | X | - |
| | | | *Promoresia sp.* | X | - | - | - |
| | Haliplidae | | *Haliplus sp.* | - | - | X | - |
| | Staphylinidae | | | X | X | - | - |
| Diptera | Ceratopogonidae | | *Bezzia sp.* | X | X | X | X |
| | | | *Ceratopogon sp.* | X | - | X | - |
| | | | *Culicoides sp.* | X | X | X | - |
| | | | *Dasyhelea sp.* | X | X | X | - |
| | | | *Mallochohelea sp.* | X | X | X | - |
| | | | *Probezzia sp.* | X | X | X | X |
| | | | *Serromyia sp.* | X | - | X | - |
| | Chironomidae | - | (i/d) | - | - | - | - |
| | | Chironominae | *Chironomus sp.* | X | X | X | - |

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/ Species | RA1 | RA1-4 | RA4 | RA4B |
|---|---|---|---|---|---|---|---|
| | | | *Cladopelma sp.* | X | X | X | - |
| | | | *Cladotanytarsus sp.* | X | - | X | - |
| | | | *Constempellina sp.* | - | - | X | - |
| | | | *Cryptochironomus sp.* | X | X | X | - |
| | | | *Demicryptochironomus sp.* | X | - | X | - |
| | | | *Dicrotendipes sp.* | X | X | X | - |
| | | | *Glyptotendipes sp.* | - | - | X | - |
| | | | *Lauterborniella sp.* | - | - | X | - |
| | | | *Micropsectra sp.* | X | X | X | - |
| | | | *Microtendipes sp.* | X | X | X | X |
| | | | *Neostempellina sp.* | X | - | X | - |
| | | | *Pagastiella sp.* | X | - | - | X |
| | | | *Parachironomus sp.* | X | X | X | - |
| | | | *Paratanytarsus sp.* | X | X | X | - |
| | | | *Paratendipes sp.* | - | X | X | - |
| | | | *Phaenopsectra sp.* | X | - | X | - |
| | | | *Polypedilum sp.* | X | - | X | - |
| | | | *Polypedilum flavum* | - | - | X | - |
| | | | *Polypedilum halterale* | X | X | X | - |
| | | | *Polypedilum scalaenum* | X | X | X | - |
| | | | *Rheotanytarsus sp.* | X | X | X | - |
| | | | *Saetheria sp.* | X | - | X | - |
| | | | *Stempellinella sp.* | - | - | - | X |
| | | | *Stictochironomus sp.* | X | - | X | - |
| | | | *Tanytarsus sp.* | X | X | X | X |
| | | | *Tribelos sp.* | X | X | X | - |
| | | Diamesinae | (i/d) | X | - | - | - |
| | | | *Pagastia sp.* | X | - | - | - |
| | | | *Potthastia sp.* | X | - | X | - |
| | | Orthocladiinae | (i/d) | - | - | - | - |
| | | | *Corynoneura sp.* | X | X | - | - |
| | | | *Cricotopus sp.* | - | X | X | - |
| | | | *Cricotopus bicinctus* | - | - | X | - |
| | | | *Cricotopus/Orthocladius* | X | - | X | - |
| | | | *Epoicocladius sp.* | X | - | - | - |
| | | | *Eukiefferiella sp.* | - | - | - | - |
| | | | *Eukiefferiella devonica group* | X | - | - | - |
| | | | *Heterotrissocladius sp.* | - | X | - | - |
| | | | *Hydrobaenus sp.* | - | - | X | - |
| | | | *Lopescladius sp.* | X | - | X | - |
| | | | *Nanocladius sp.* | X | - | - | - |
| | | | *Orthocladiinae* Species C | X | - | - | - |
| | | | *Orthocladius annectens* | - | - | X | - |
| | | | *Parakiefferiella sp.* | X | X | X | - |
| | | | *Parametriocnemus sp.* | X | - | - | - |
| | | | *Psectrocladius sp.* | X | - | X | - |
| | | | *Rheosmittia sp.* | X | - | - | - |
| | | | *Smittia sp.* | - | - | X | - |
| | | | *Synorthocladius sp.* | X | - | - | - |
| | | | *Thienemanniella sp.* | X | - | - | - |
| | | | *Tvetenia sp.* | X | - | - | - |
| | | | *Zalutschia sp.* | X | X | X | - |
| | | Tanypodinae | (i/d) | - | - | - | - |
| | | | *Ablabesmyia sp.* | X | X | X | X |
| | | | *Djalmabatista sp.* | X | - | - | - |
| | | | *Guttipelopia sp.* | - | X | X | - |
| | | | *Helopelopia sp.* | X | - | X | - |
| | | | *Labrudinia sp.* | - | - | X | - |
| | | | *Larsia sp.* | X | X | X | X |
| | | | *Natarsia sp.* | - | X | - | - |
| | | | *Paramerina sp.* | - | - | X | - |
| | | | *Procladius sp.* | X | X | X | X |
| | | | *Thienemannimyia* complex | X | X | X | - |
| | | | *Trissopelopia sp.* | X | - | - | - |
| | | | *Zavrelimyia sp.* | X | - | - | - |

| Major Taxonomic Group | Family | Subfamily/ Tribe | Genus/ Species | RA1 | RA1-4 | RA4 | RA4B |
|---|---|---|---|---|---|---|---|
| | Empididae | | *Chelifera/Metachela* | **X** | - | - | - |
| | | | *Hemerodromia sp.* | **X** | - | - | - |
| | Simuliidae | | (i/d) | **X** | - | **X** | - |
| | Tabanidae | | *Chrysops sp.* | **X** | **X** | **X** | - |
| | Tipulidae | | (i/d) | - | **X** | - | - |
| | | | *Dicranota sp.* | - | - | **X** | - |
| | | | *Erioptera sp.* | - | **X** | **X** | - |
| | | | *Hexatoma sp.* | **X** | - | - | - |
| | | | *Limnophila sp.* | - | - | **X** | - |
| | | | *Pilaria sp.* | **X** | - | **X** | - |
| **TOTAL TAXA** | | | | **137** | **64** | **137** | **15** |

Notes: **X** = present; - = not collected; i/d = immature/damaged.

# Attachment D – Undefined Crossings

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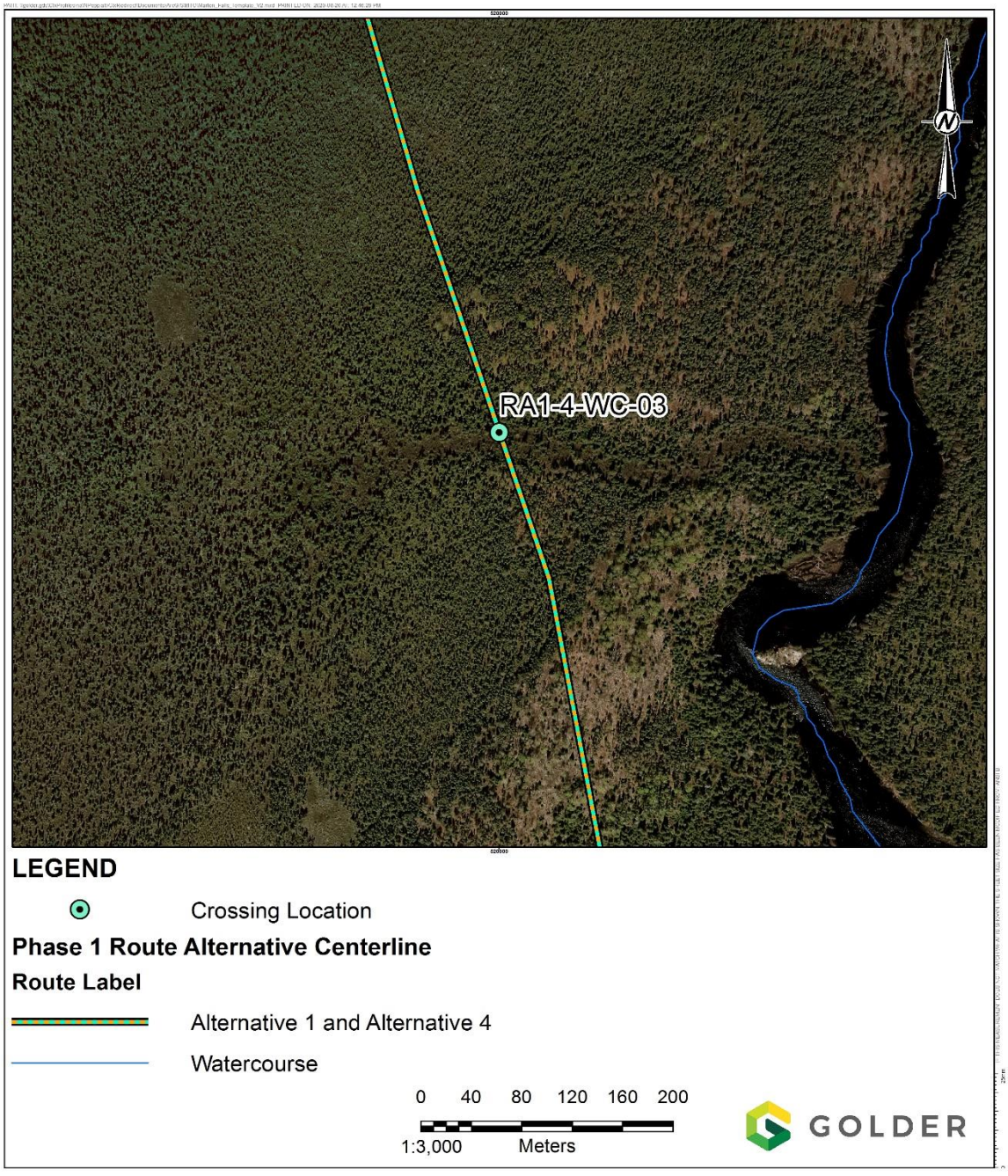
| **CROSSING ID: RA1-4-WC-03** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 520000E 5677586N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-03 | Aerial photograph of crossing RA1-4-WC-03 |

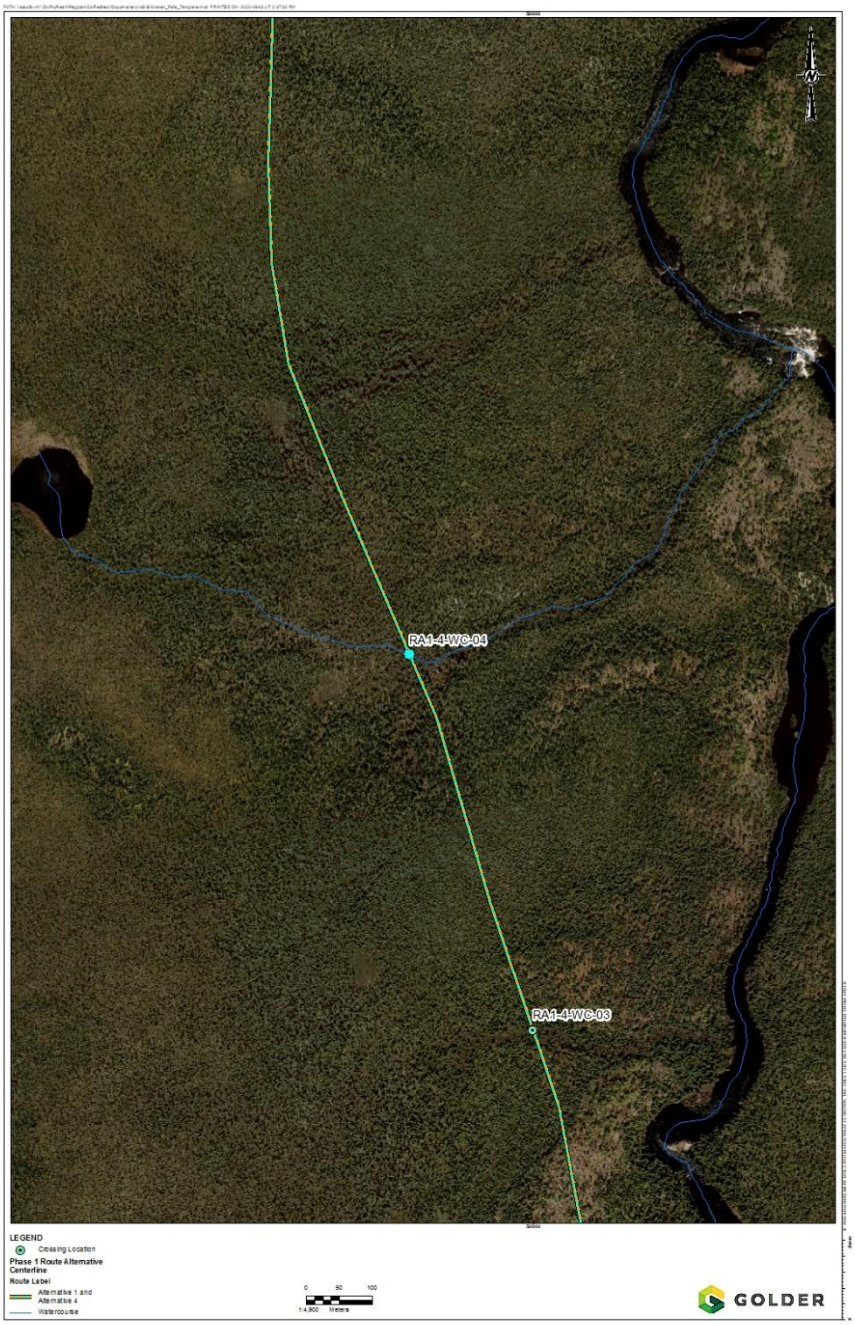
| **CROSSING ID: RA1-4-WC-03** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 520000E 5677586N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-03

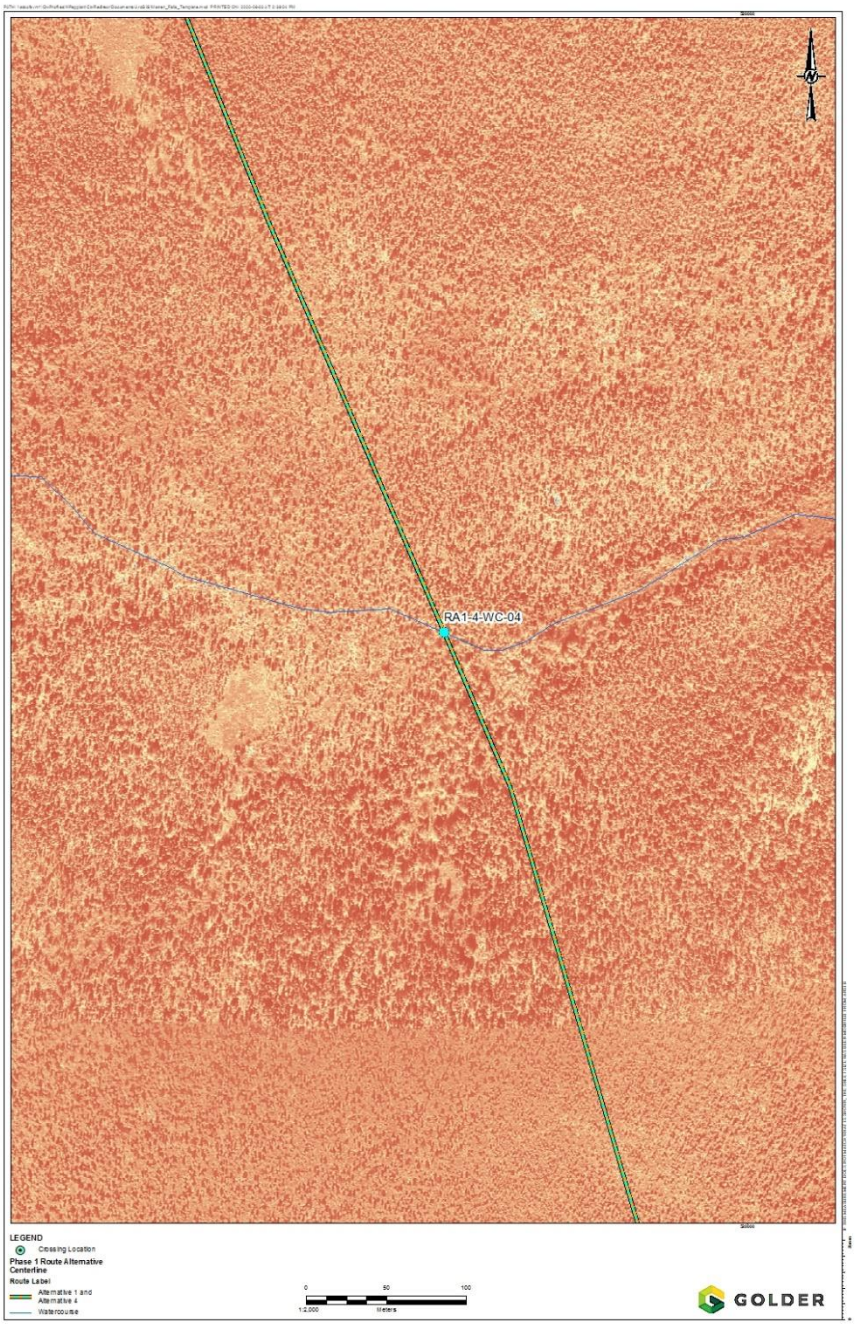
| **CROSSING ID: RA1-4-WC-04** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 519811E 5678161N | |
| **DATA SOURCE:** Aerial Reconnaissance (5 September 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-04 | Aerial photograph of crossing RA1-4-WC-04 |

| **CROSSING ID: RA1-4-WC-04** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519811E 5678161N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-04

| **CROSSING ID: RA1-4-WC-04** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519811E 5678161N |
| **DATA SOURCE:** LiDAR Imagery |



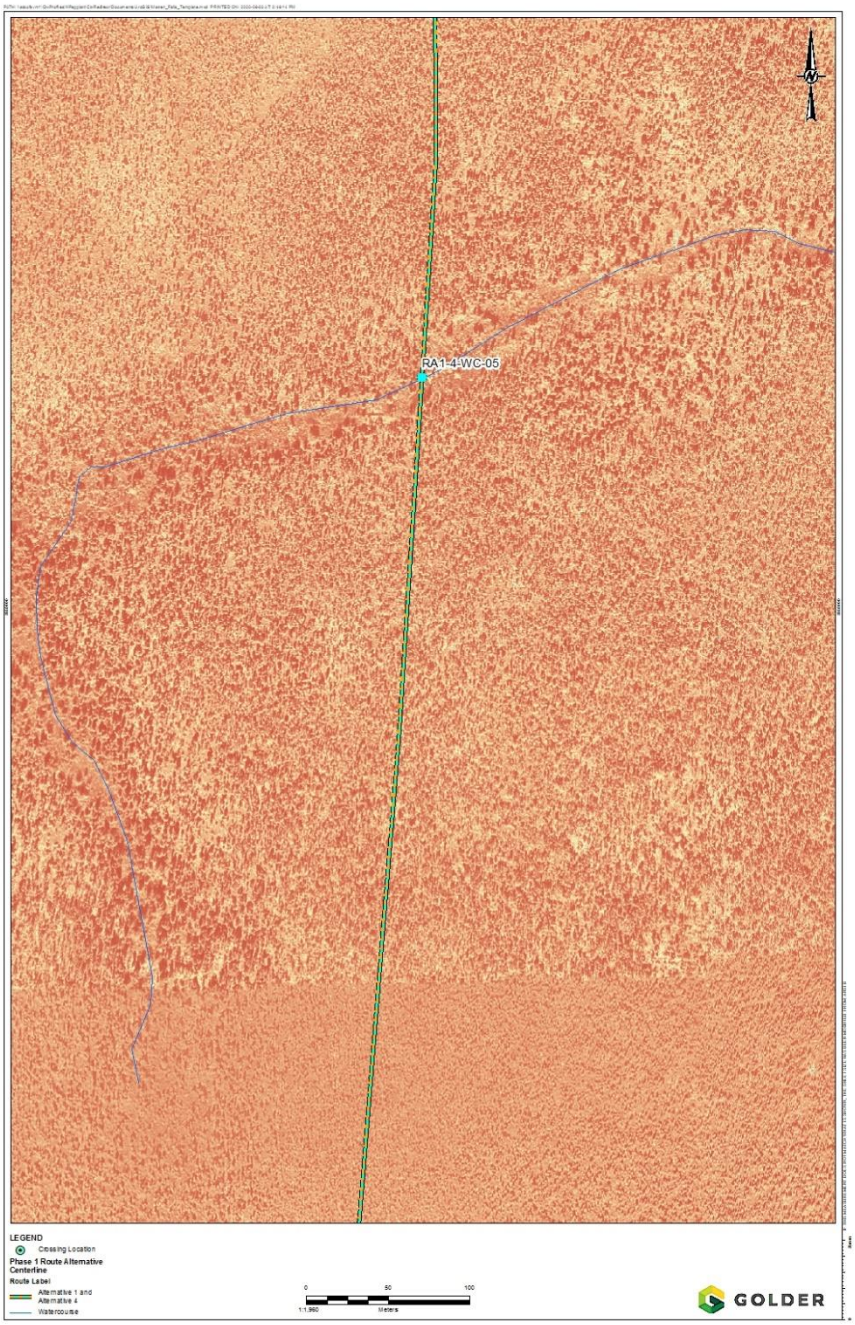

LiDAR imagery at crossing RA1-4-WC-04; red/blue contrast

| **CROSSING ID: RA1-4-WC-05** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 519666E 5680140N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-05 | Aerial photograph of crossing RA1-4-WC-05 |

| **CROSSING ID: RA1-4-WC-05** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519666E 5680140N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-4-WC-05

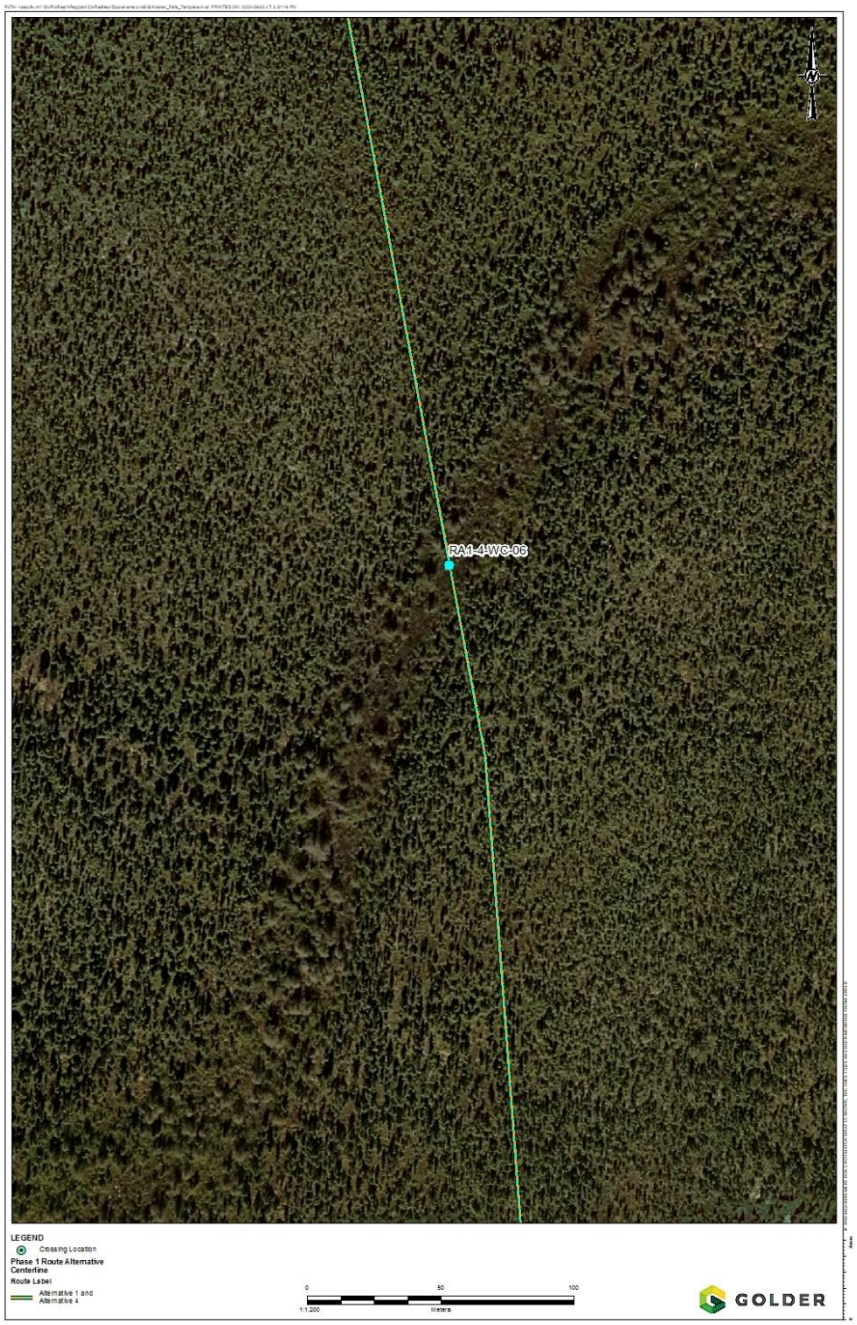
| **CROSSING ID: RA1-4-WC-05** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519666E 5680140N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-05; red/blue contrast

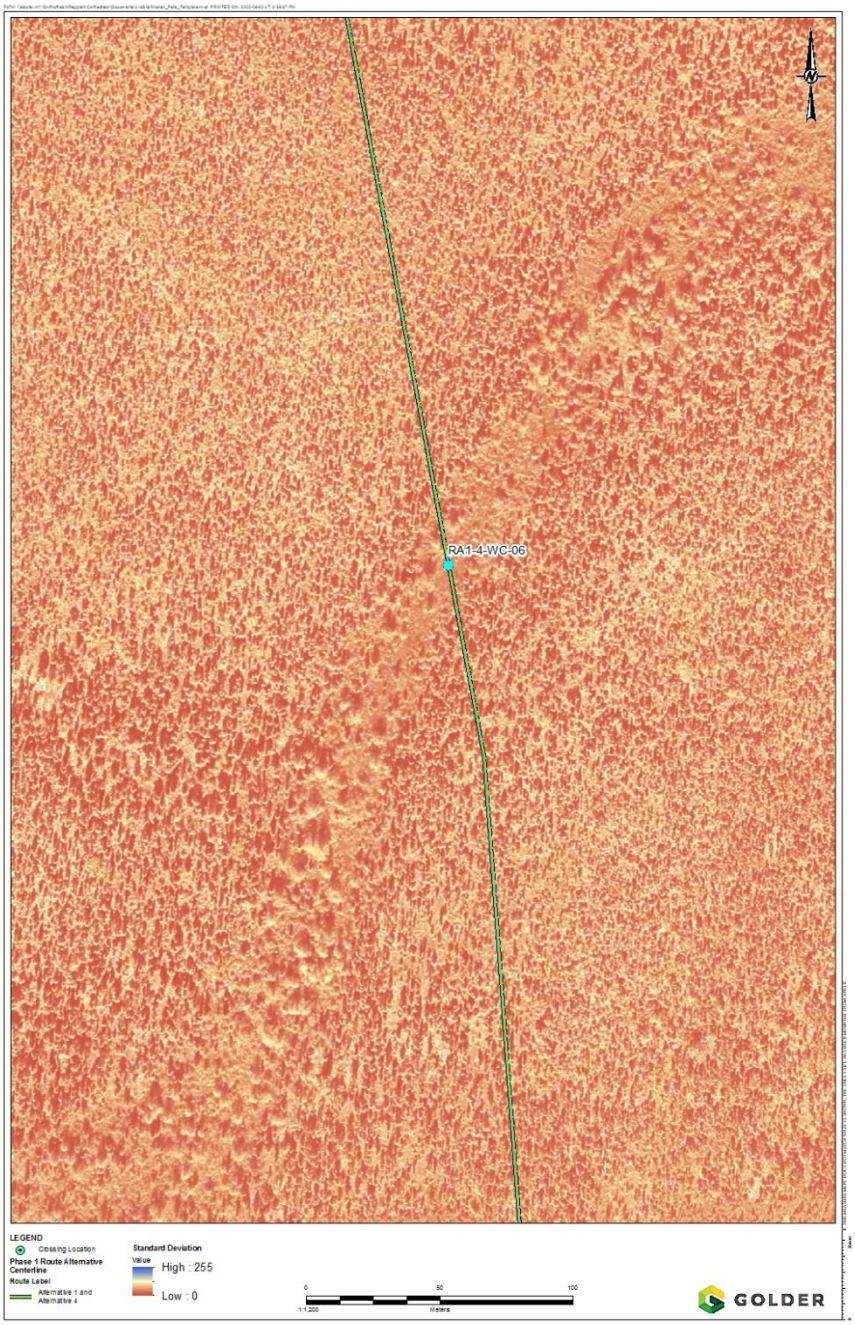
| **CROSSING ID: RA1-4-WC-06** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 519637E 5680917N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-06 | Aerial photograph of crossing RA1-4-WC-06 |

| **CROSSING ID: RA1-4-WC-06** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519637E 5680917N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-06

| **CROSSING ID: RA1-4-WC-06** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519637E 5680917N |
| **DATA SOURCE:** LiDAR Imagery |



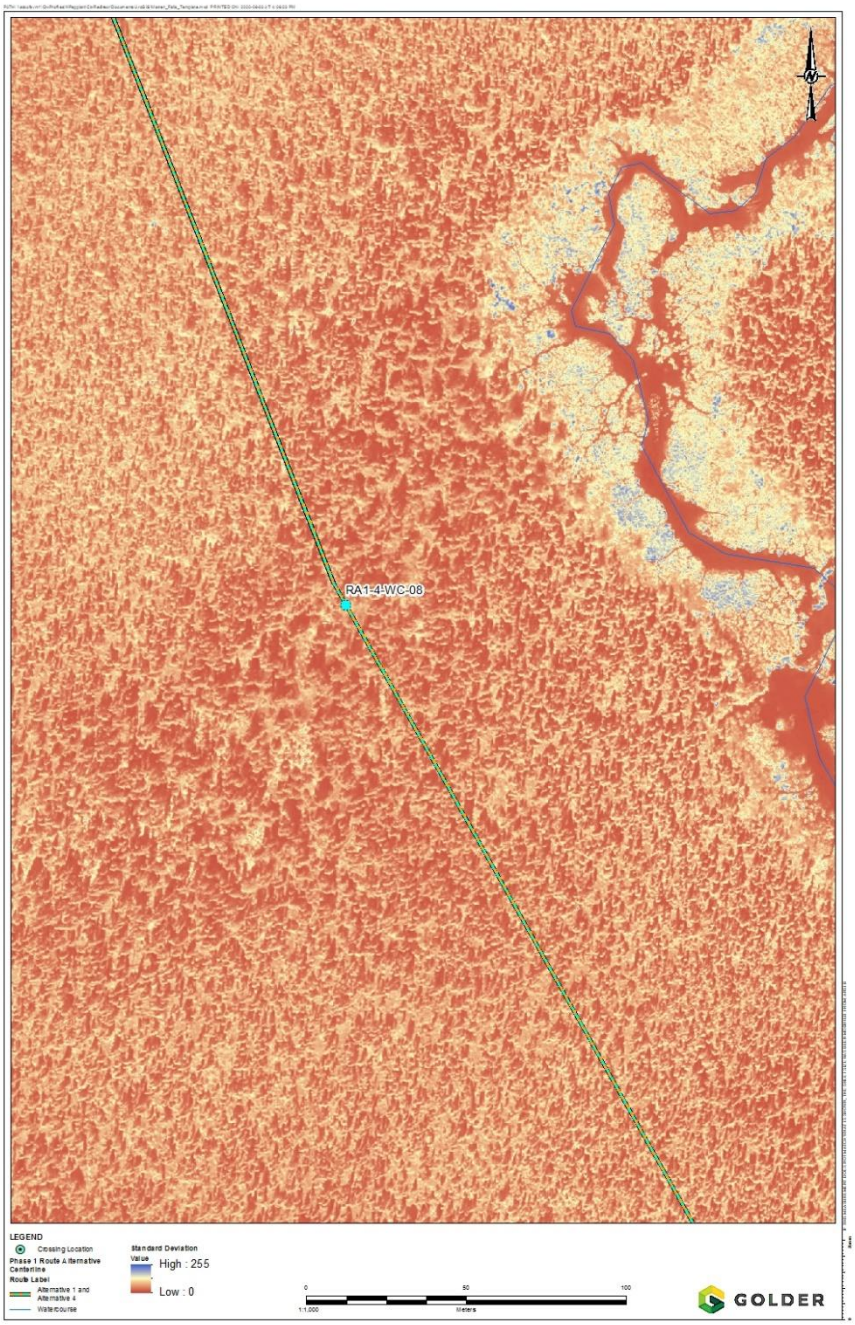

LiDAR imagery at crossing RA1-4-WC-06; red/blue contrast

| **CROSSING ID: RA1-4-WC-08** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 518949E 5682735N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-08 | Aerial photograph of crossing RA1-4-WC-08 |

| **CROSSING ID: RA1-4-WC-08** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 518949E 5682735N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-4-WC-08

| **CROSSING ID: RA1-4-WC-08** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 518949E 5682735N |
| **DATA SOURCE:** LiDAR Imagery |



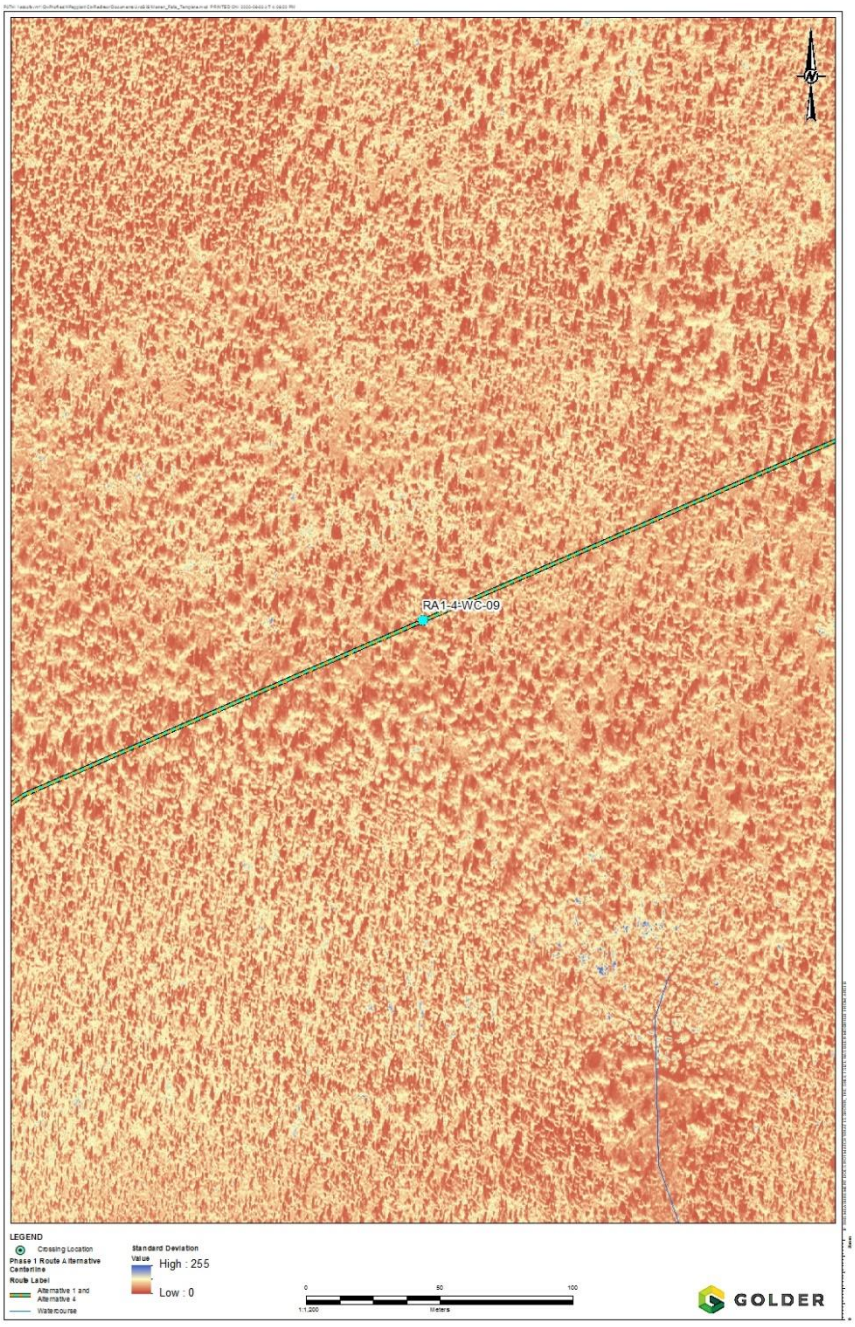

LiDAR imagery at crossing RA1-4-WC-08; red/blue contrast

| **CROSSING ID: RA1-4-WC-09** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 519730E 5684531N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-09 | Aerial photograph of crossing RA1-4-WC-09 |

| **CROSSING ID: RA1-4-WC-09** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519730E 5684531N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-4-WC-09

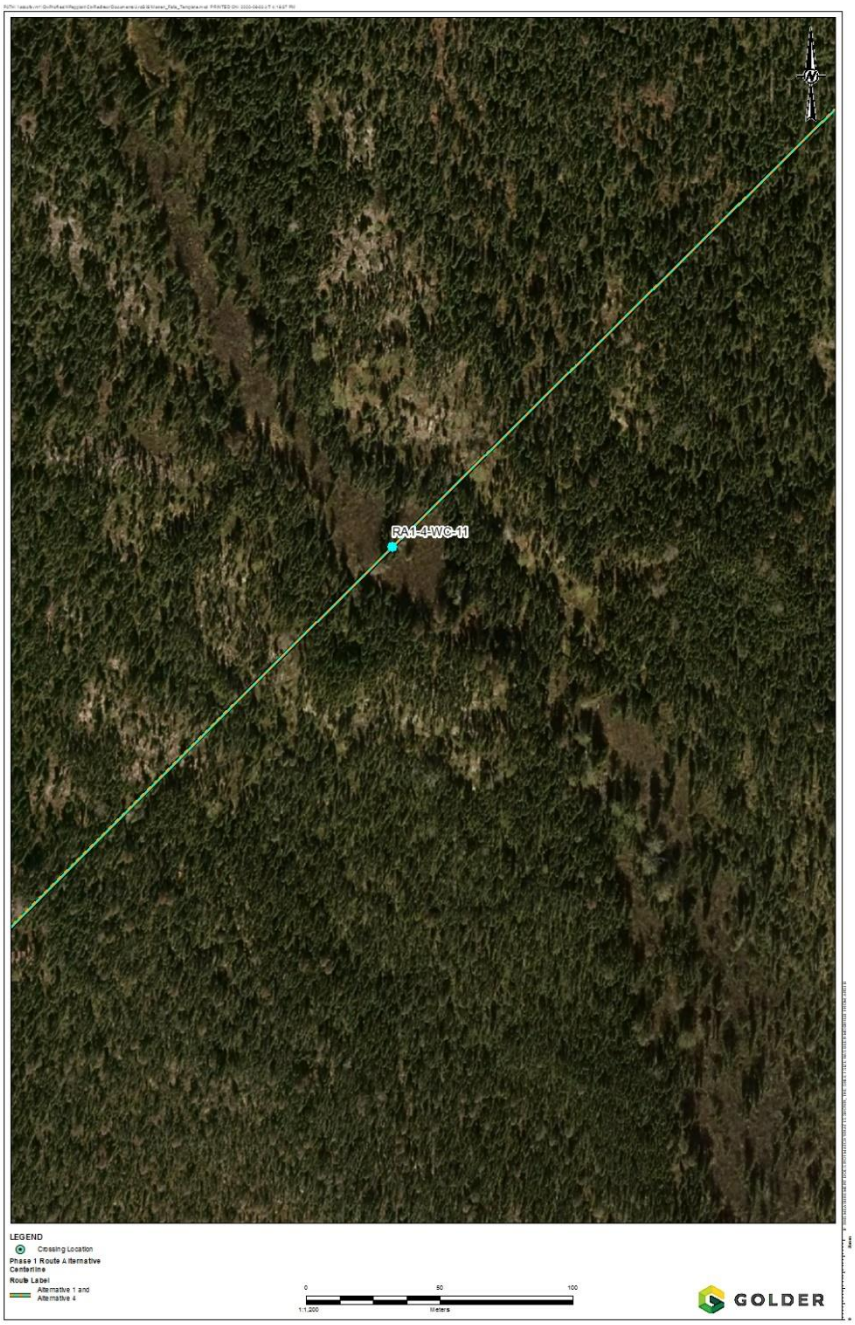
| **CROSSING ID: RA1-4-WC-09** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 519730E 5684531N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-09; red/blue contrast

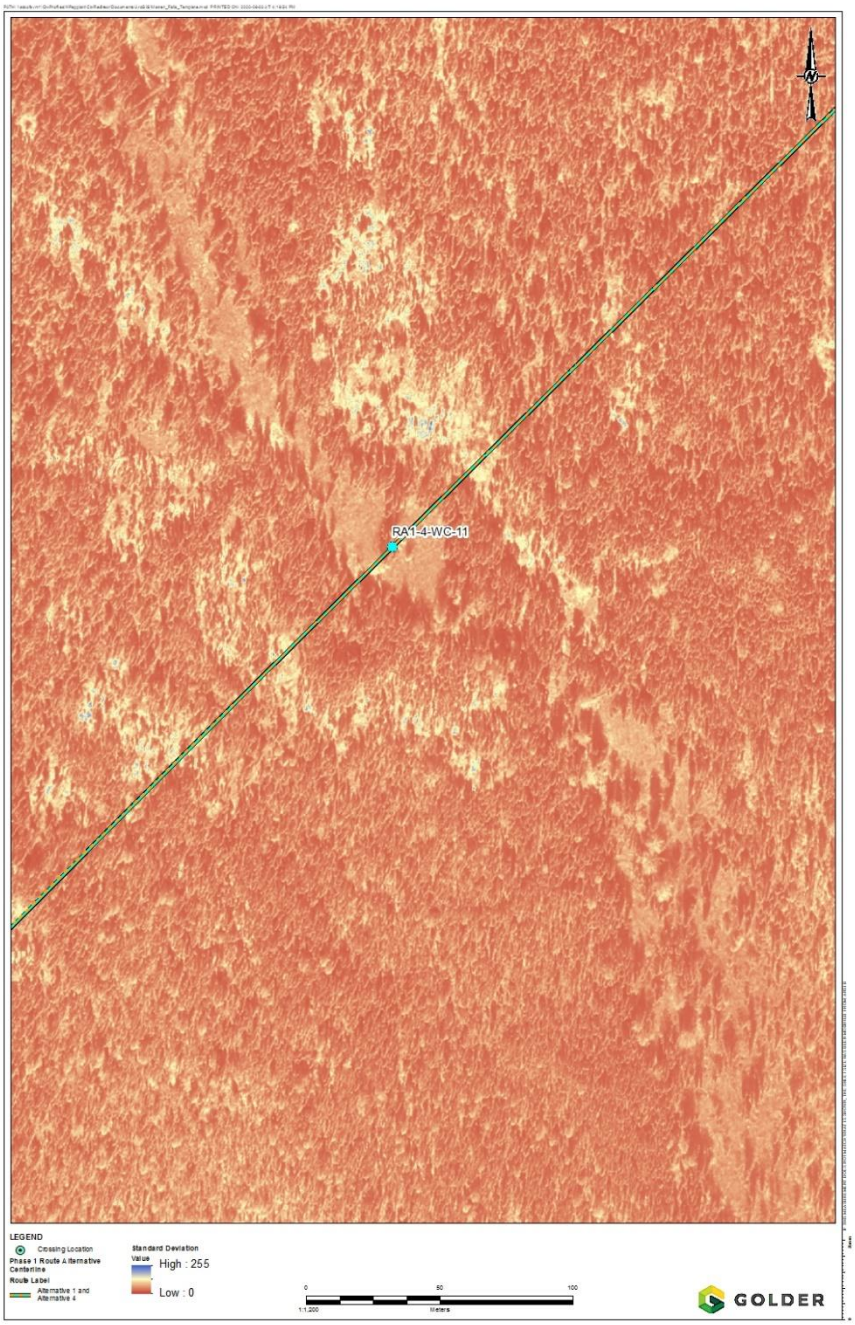
| **CROSSING ID: RA1-4-WC-11** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 541778E 5741437N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-11 | Aerial photograph of crossing RA1-4-WC-11 |

| **CROSSING ID: RA1-4-WC-11** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 541778E 5741437N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-11

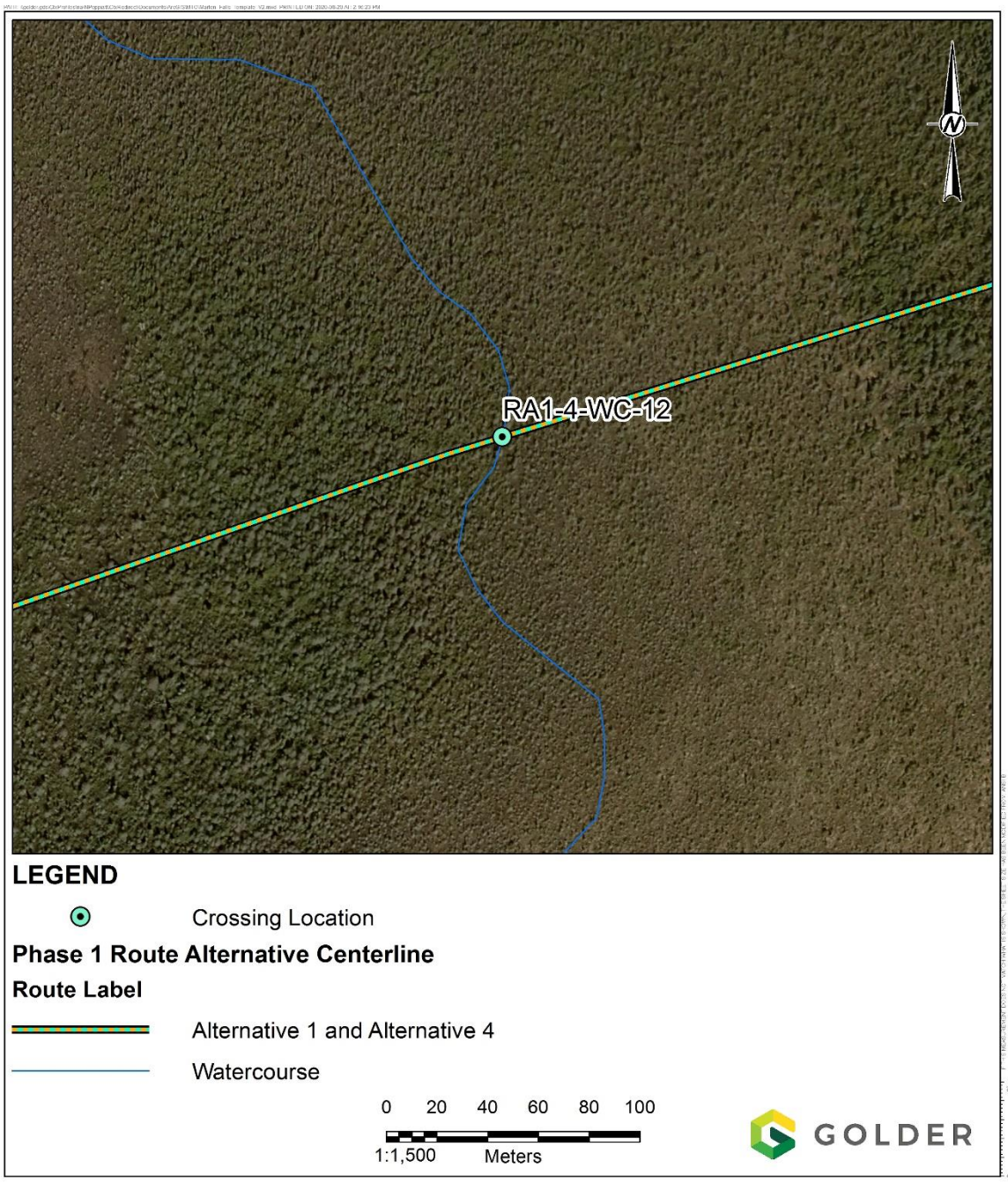
| **CROSSING ID: RA1-4-WC-11** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 541778E 5741437N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-11; red/blue contrast

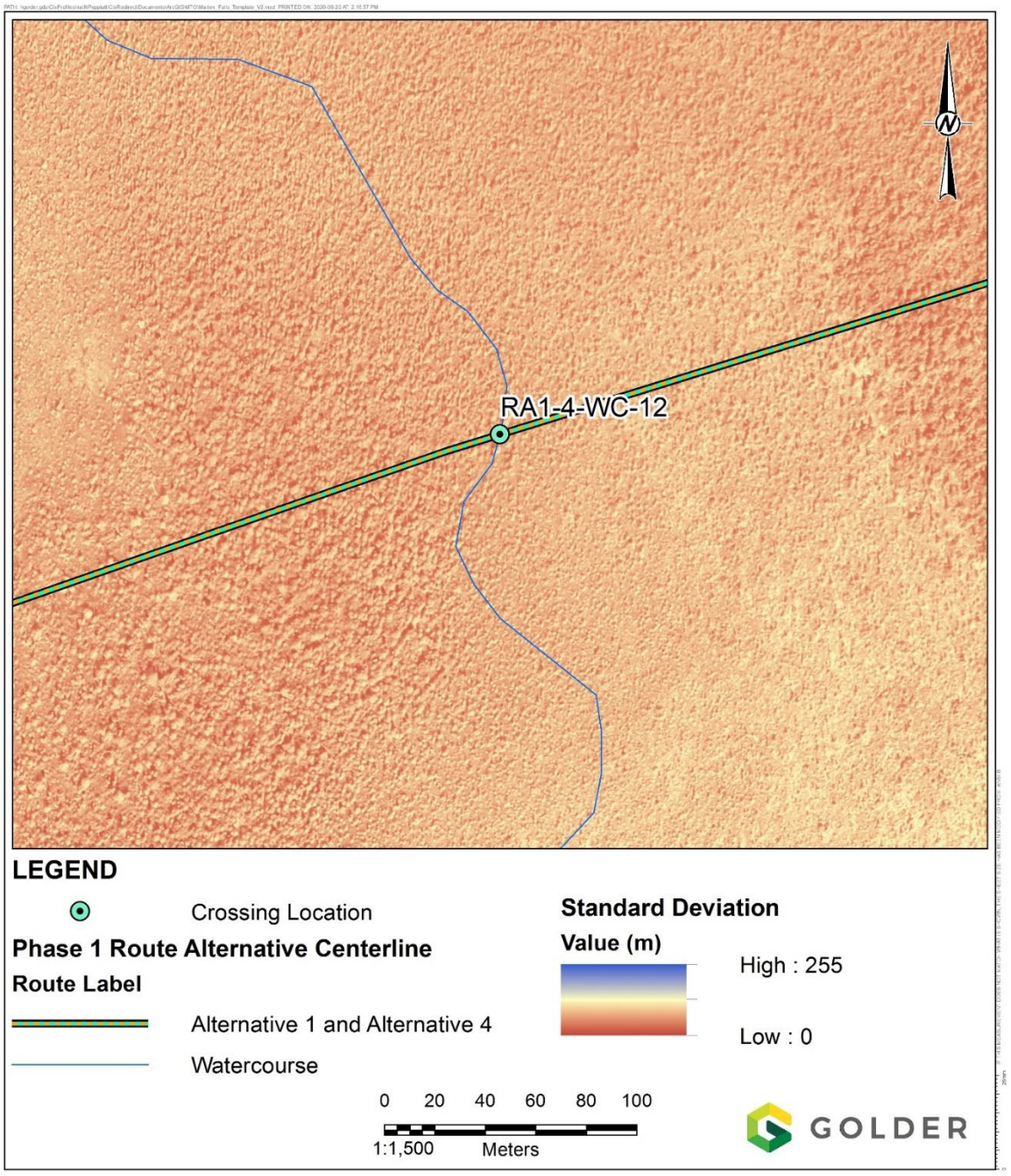
| **CROSSING ID: RA1-4-WC-12** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 5413279E 5742500N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-4-WC-12 |

| **CROSSING ID: RA1-4-WC-12** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 5413279E 5742500N |
| **DATA SOURCE:** LiDAR Imagery |

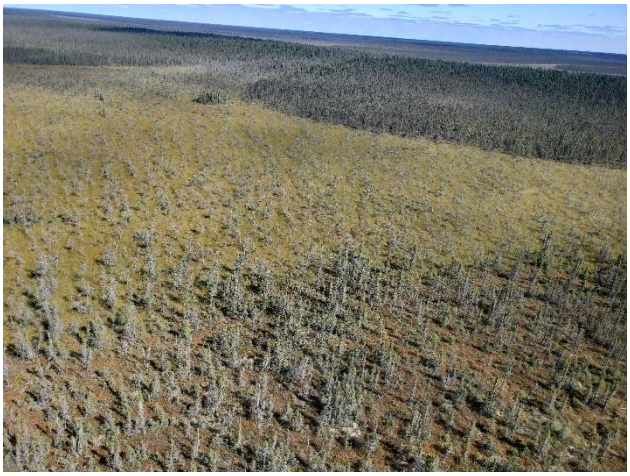



LiDAR imagery at crossing RA1-4-WC-12

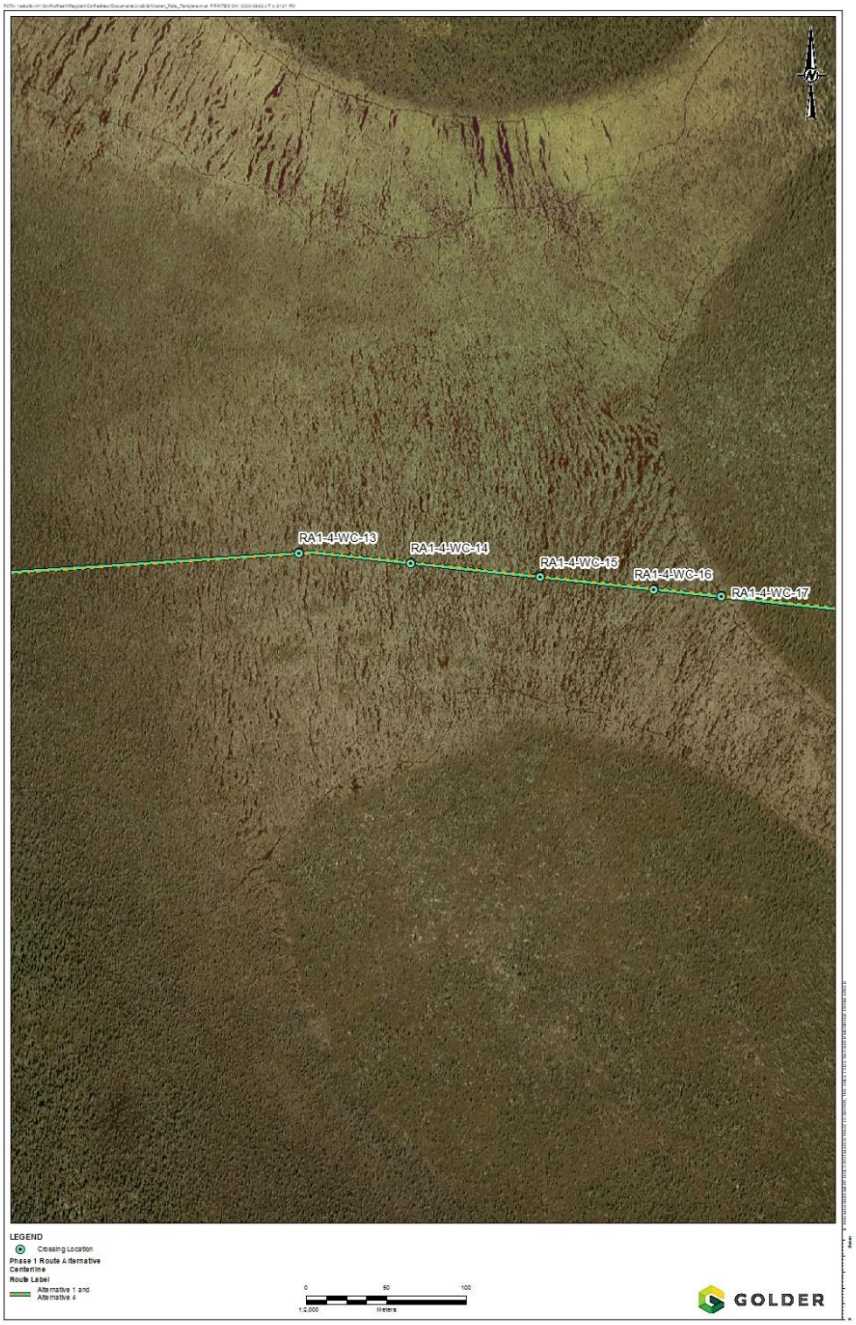
| **CROSSING ID: RA1-4-WC-12** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 5413279E 5742500N |
| **DATA SOURCE:** LiDAR Imagery |



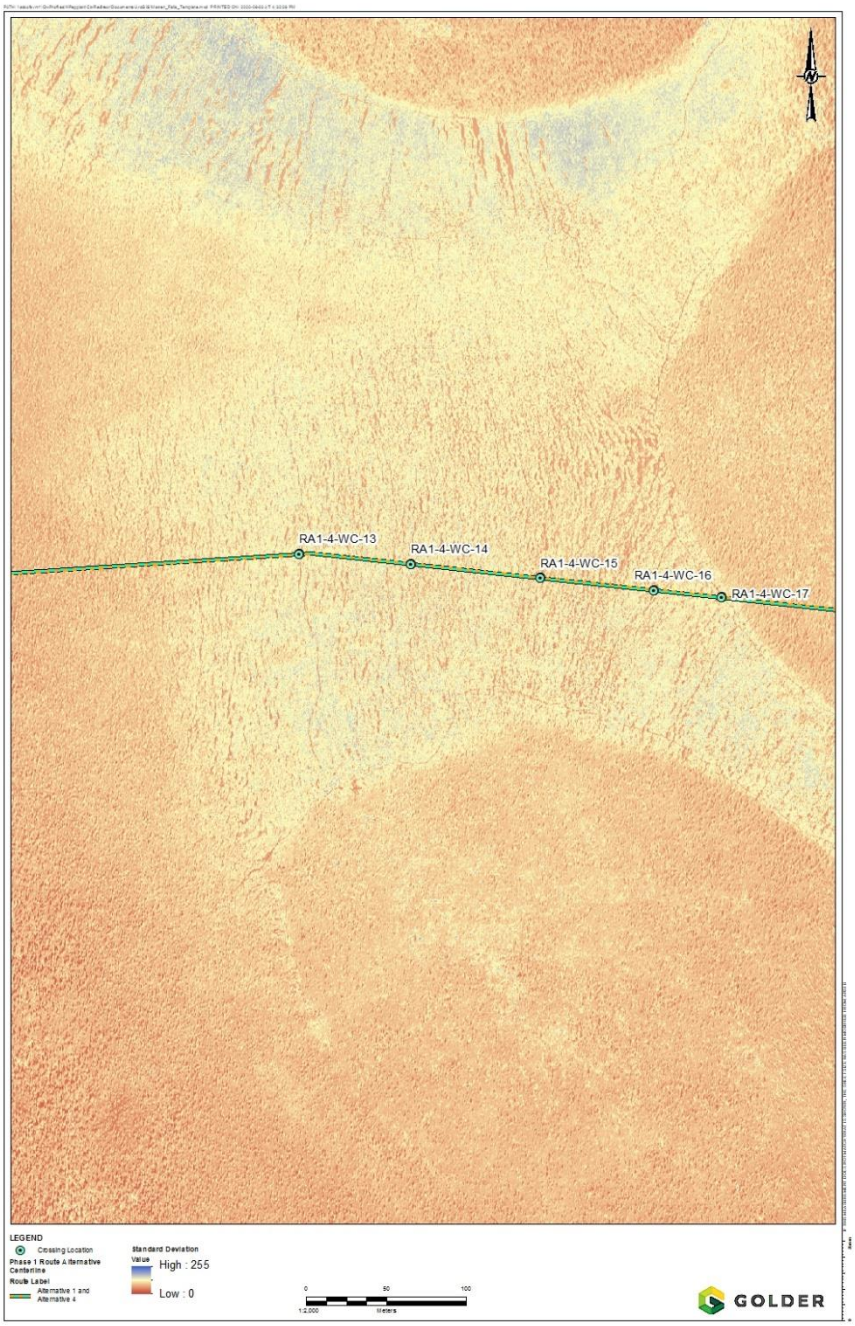

LiDAR imagery at crossing RA1-4-WC-12; red/blue contrast

| **CROSSING ID: RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 544083E 5742651N, 544153E 5742644N, 544234E 5742636N, 544305E 5742628N, 544347E 5742624N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
|  | |
| Aerial photograph of general area of crossings RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17 | Aerial photograph of general area of crossings RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17 |
| | |
| Aerial photograph of general area of crossings RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17 | |

| **CROSSING ID: RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 544083E 5742651N, 544153E 5742644N, 544234E 5742636N, 544305E 5742628N, 544347E 5742624N |
| **DATA SOURCE:** LiDAR Imagery |



| **CROSSING ID: RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 544083E 5742651N, 544153E 5742644N, 544234E 5742636N, 544305E 5742628N, 544347E 5742624N |
| **DATA SOURCE:** LiDAR Imagery |



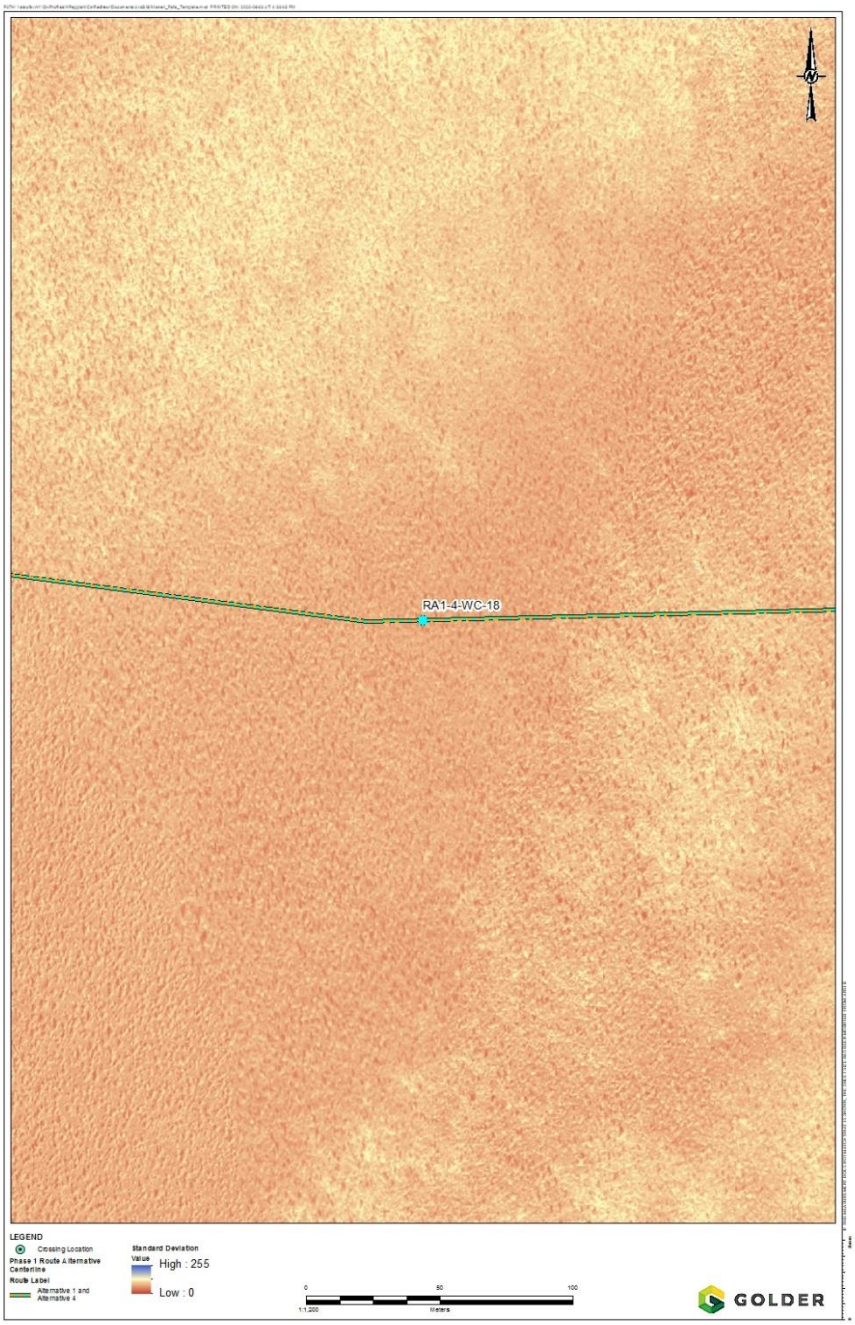

LiDAR imagery of crossings RA1-4-WC-13, RA1-4-WC-14, RA1-4-WC-15, RA1-4-WC-16, RA1-4-WC-17; red/blue contrast

| **CROSSING ID: RA1-4-WC-18** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 545375E 5742501N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-18 | Aerial photograph of crossing RA1-4-WC-18 |

| **CROSSING ID: RA1-4-WC-18** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 545375E 5742501N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-4-WC-18

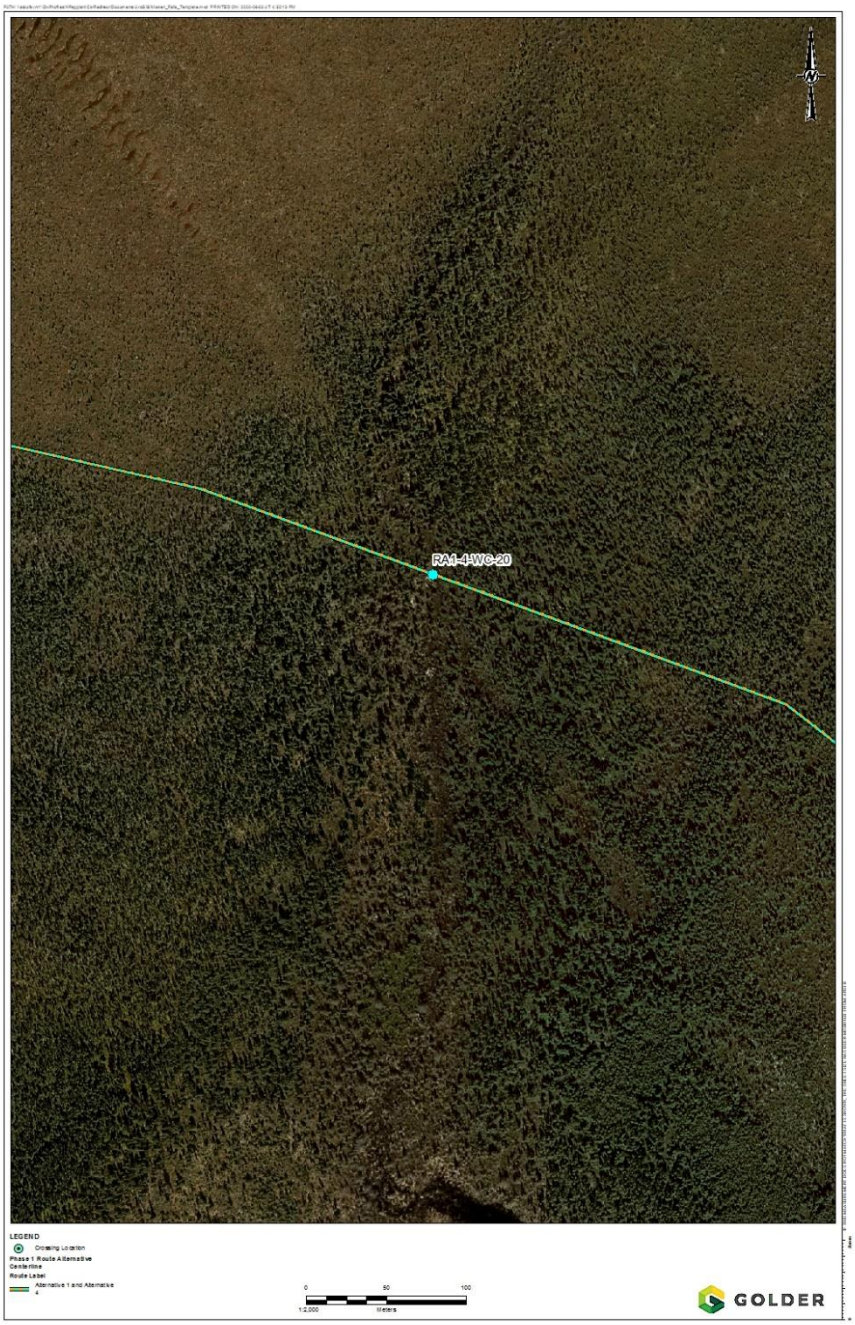
| **CROSSING ID: RA1-4-WC-18** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 545375E 5742501N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-18; red/blue contrast

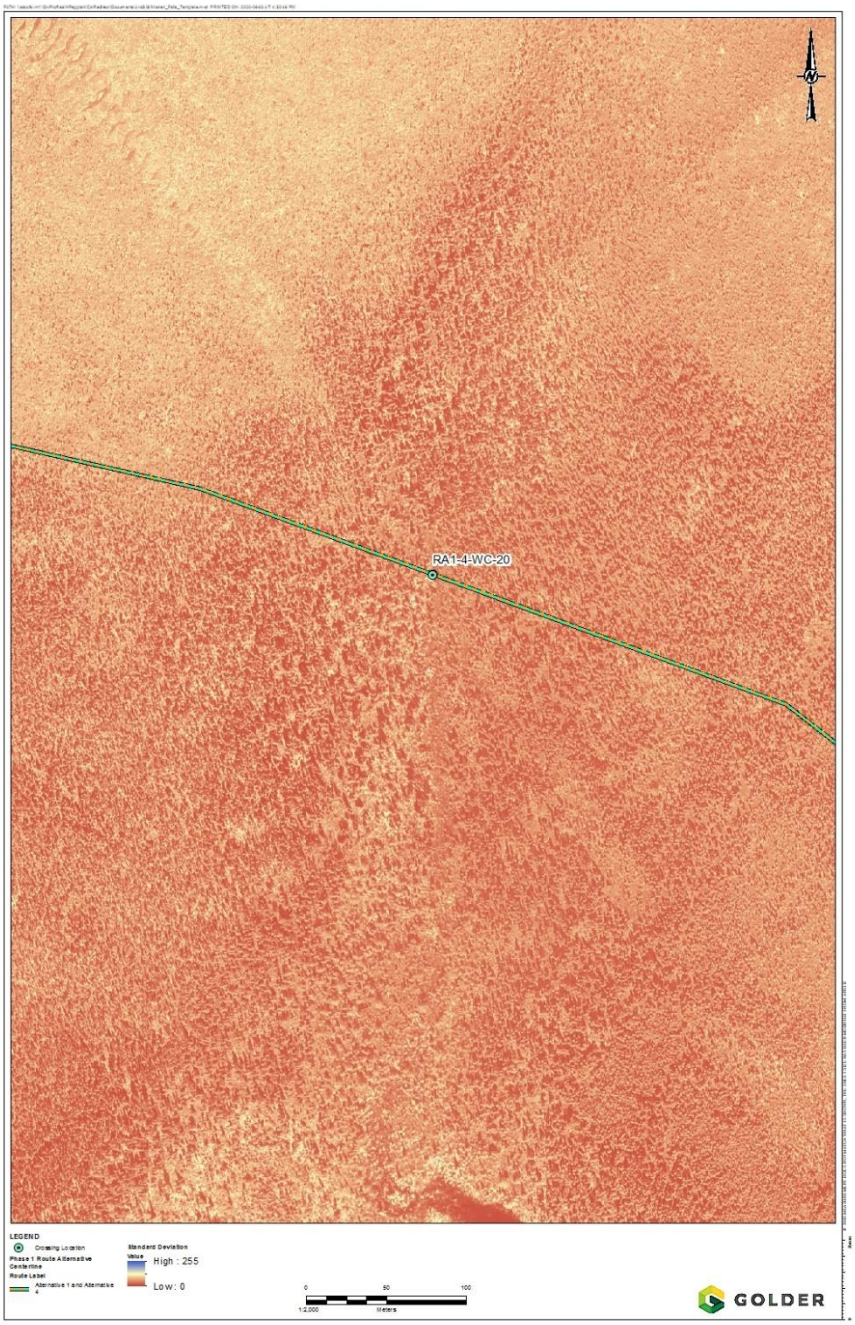
| **CROSSING ID: RA1-4-WC-20** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 548340E 5742737N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-4-WC-20 |

| **CROSSING ID: RA1-4-WC-20** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 548340E 5742737N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-20

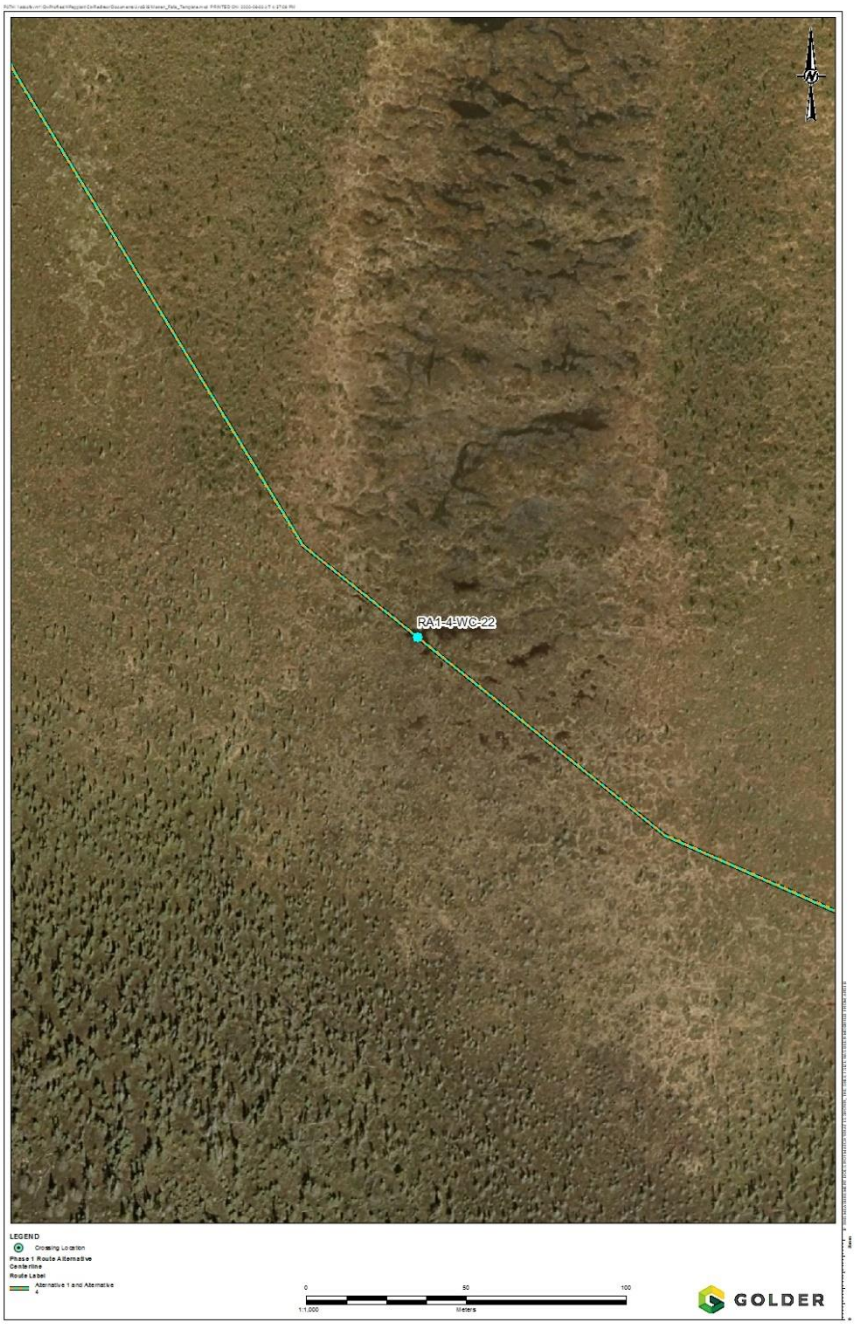
| **CROSSING ID: RA1-4-WC-20** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 548340E 5742737N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-20; red/blue contrast

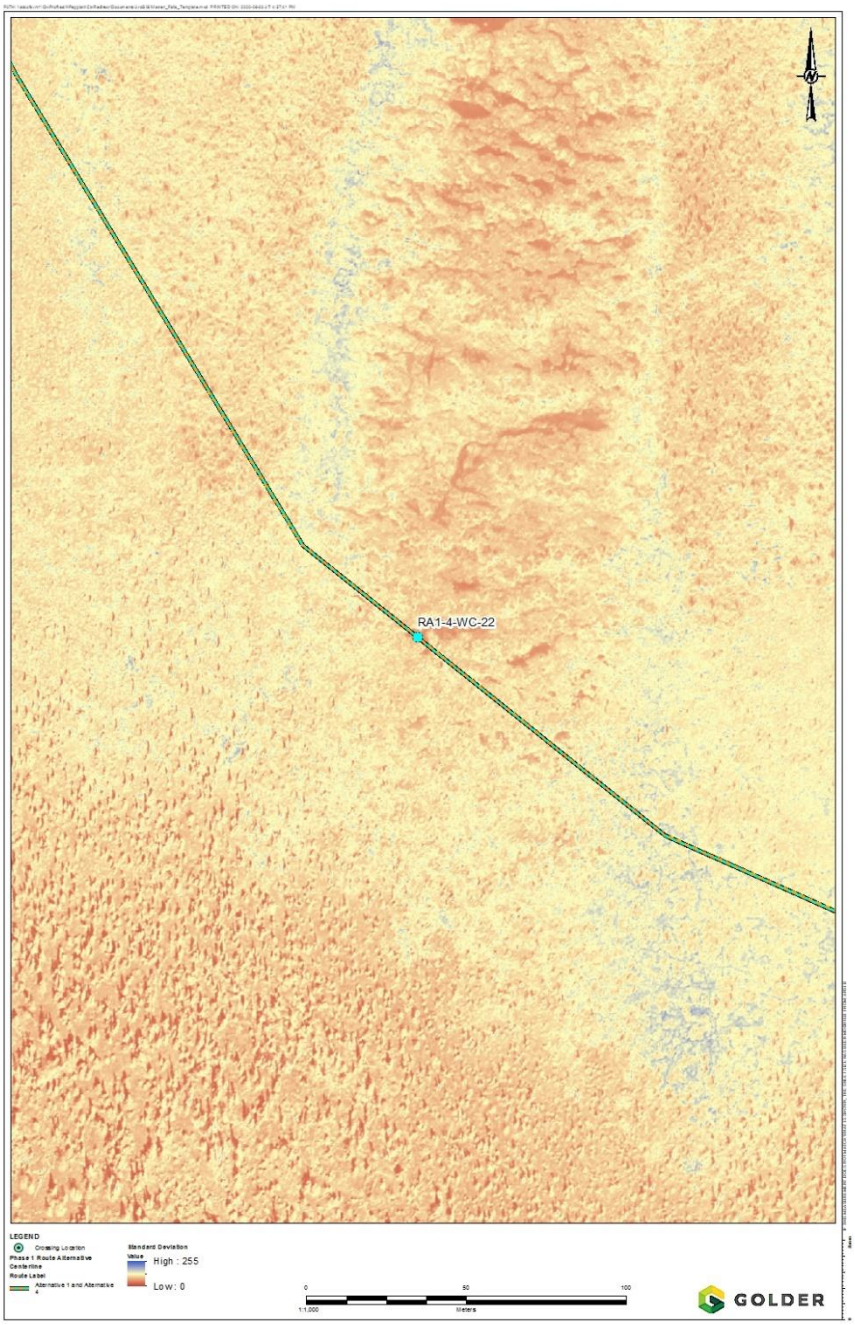
| **CROSSING ID: RA1-4-WC-22** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 552546E 57394191N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-22 | Aerial photograph of crossing RA1-4-WC-22 |

| **CROSSING ID: RA1-4-WC-22** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 552546E 57394191N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-22

| **CROSSING ID: RA1-4-WC-22** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 552546E 57394191N |
| **DATA SOURCE:** LiDAR Imagery |



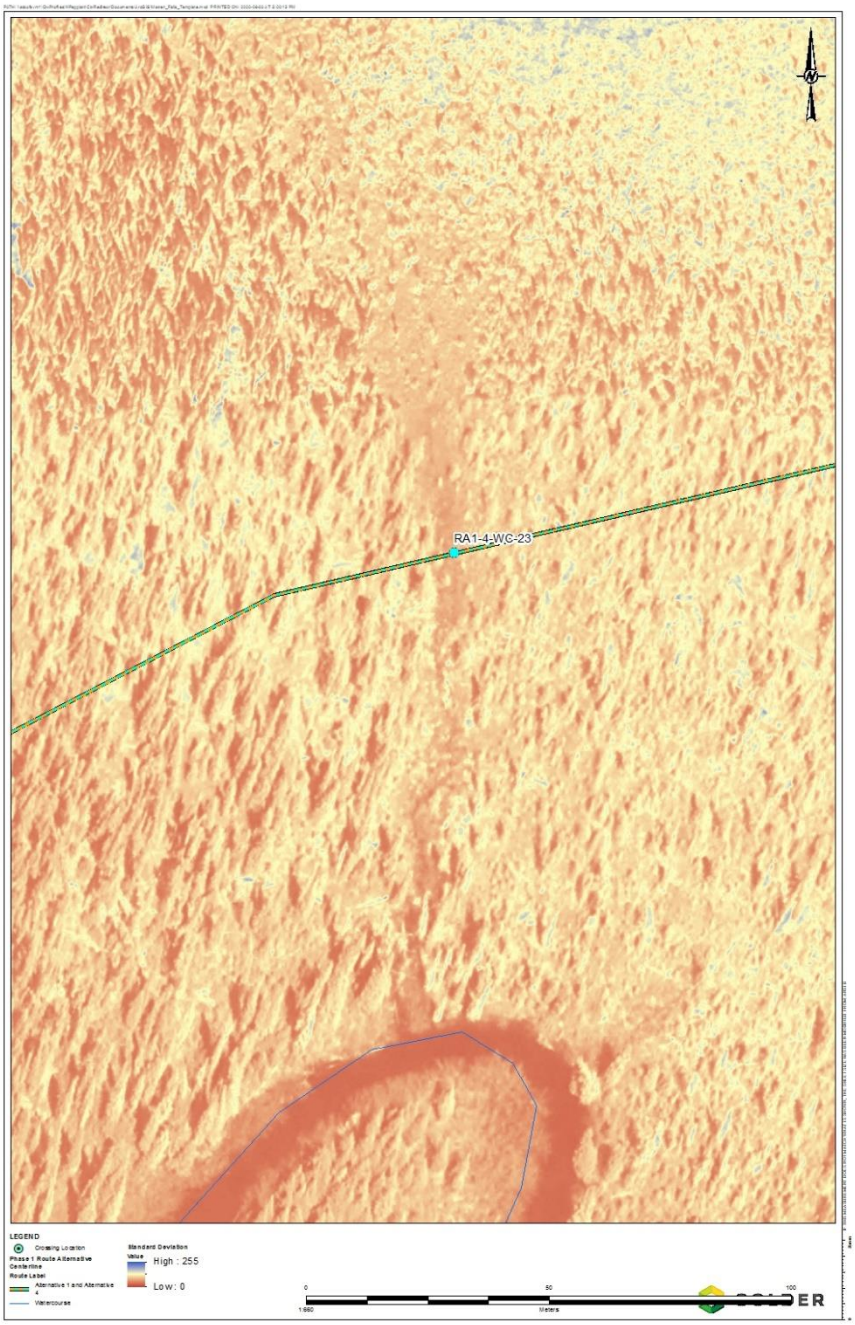

LiDAR imagery at crossing RA1-4-WC-22; red/blue contrast

| **CROSSING ID: RA1-4-WC-23** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 544544E 57394147N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-23, at bottom of photo (red arrow). | LiDAR showing location crossing RA1-4-WC-23, over 100 m from a watercourse, |

| **CROSSING ID: RA1-4-WC-23** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 544544E 57394147N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-4-WC-23

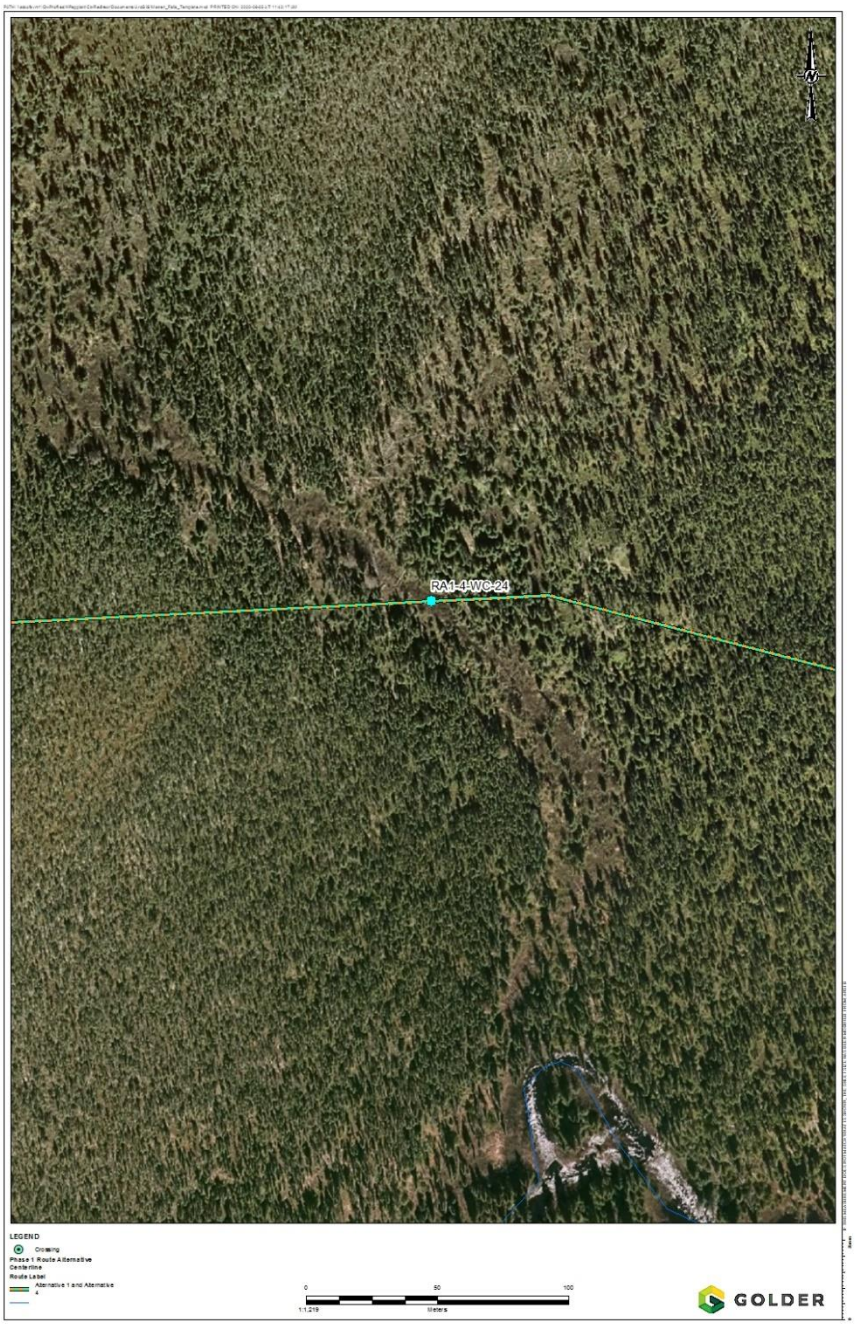
| **CROSSING ID: RA1-4-WC-23** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 544544E 57394147N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-23; red/blue contrast

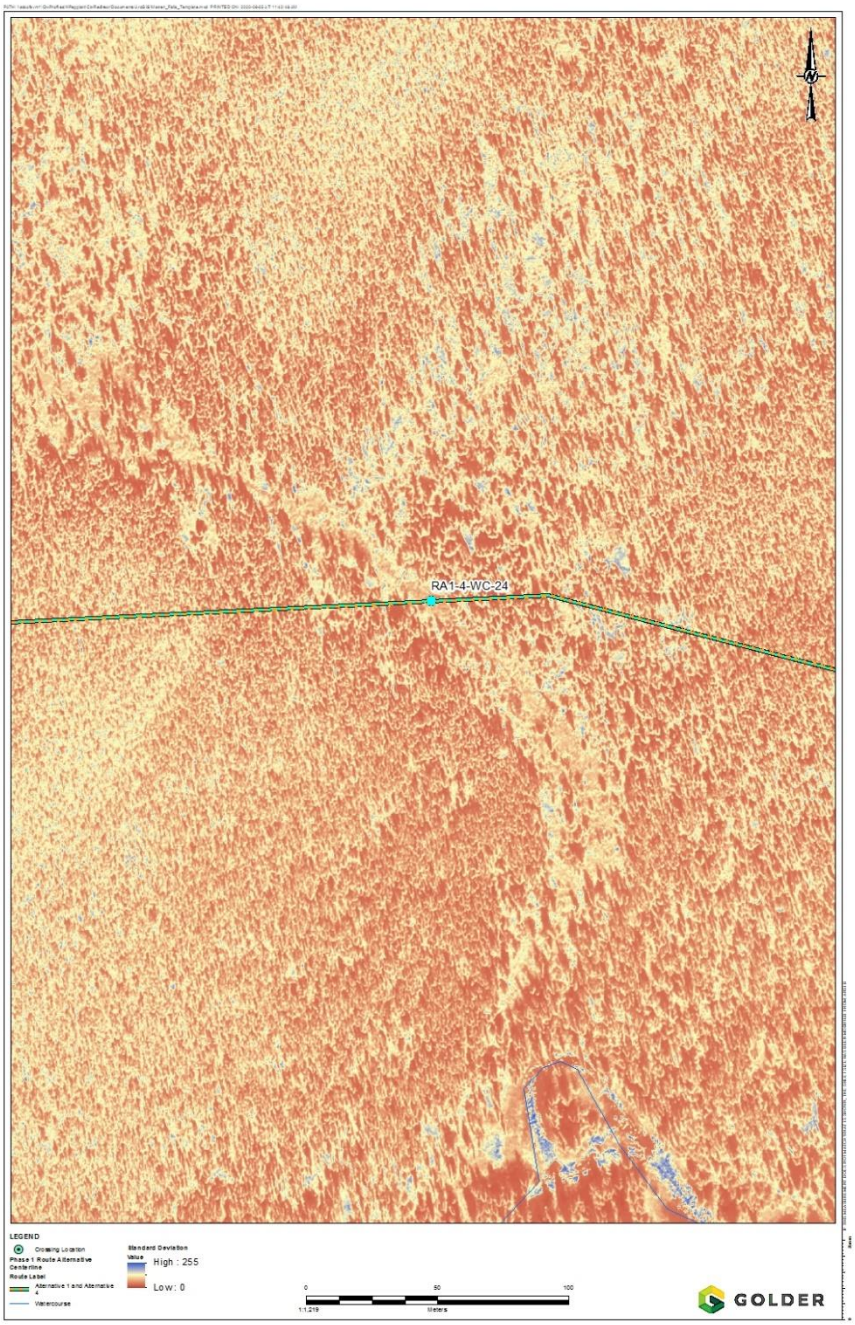
| **CROSSING ID: RA1-4-WC-24** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 555686E 5739573N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-4-WC-24 |

| **CROSSING ID: RA1-4-WC-24** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 555686E 5739573N |
| **DATA SOURCE:** LiDAR Imagery |



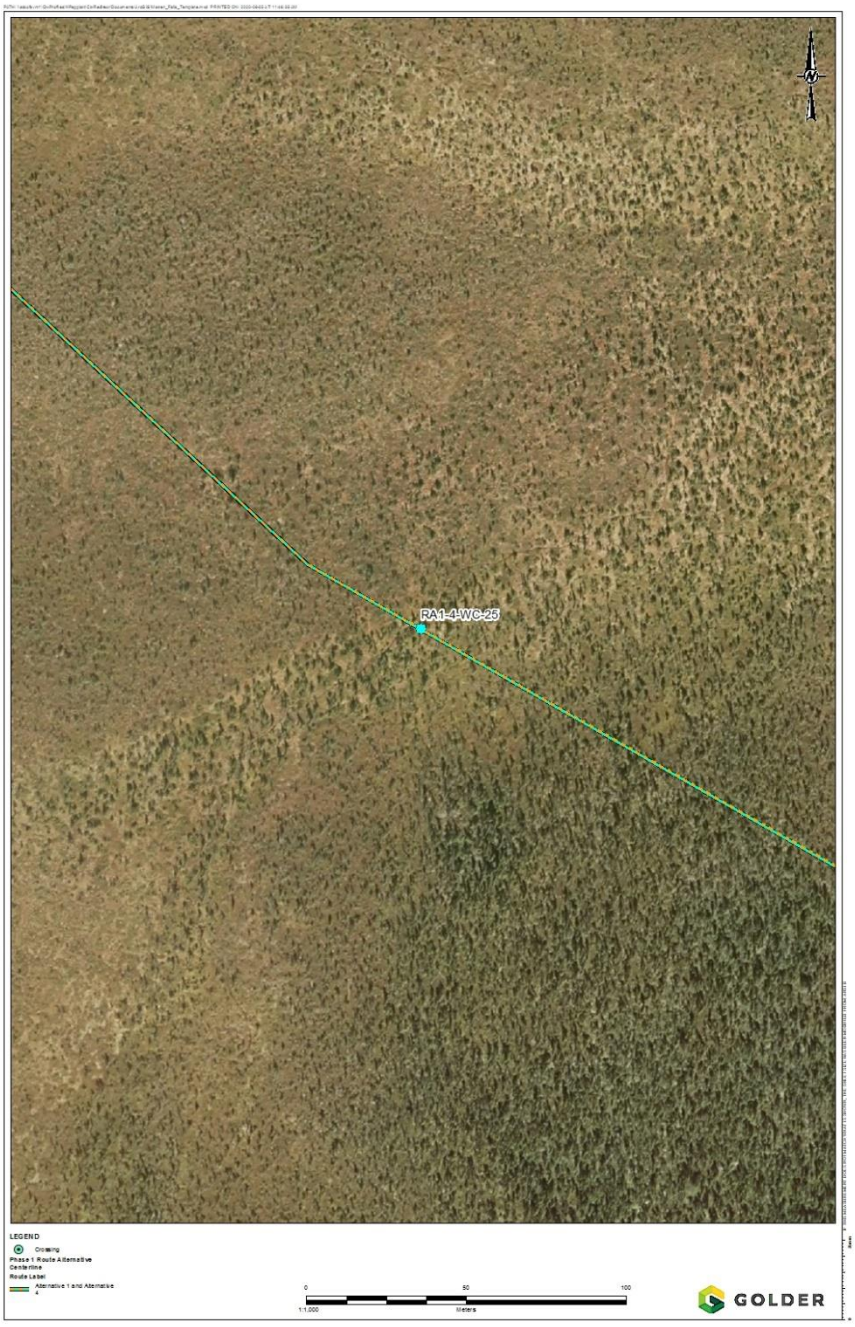

LiDAR imagery at crossing RA1-4-WC-24

| **CROSSING ID: RA1-4-WC-24** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 555686E 5739573N |
| **DATA SOURCE:** LiDAR Imagery |

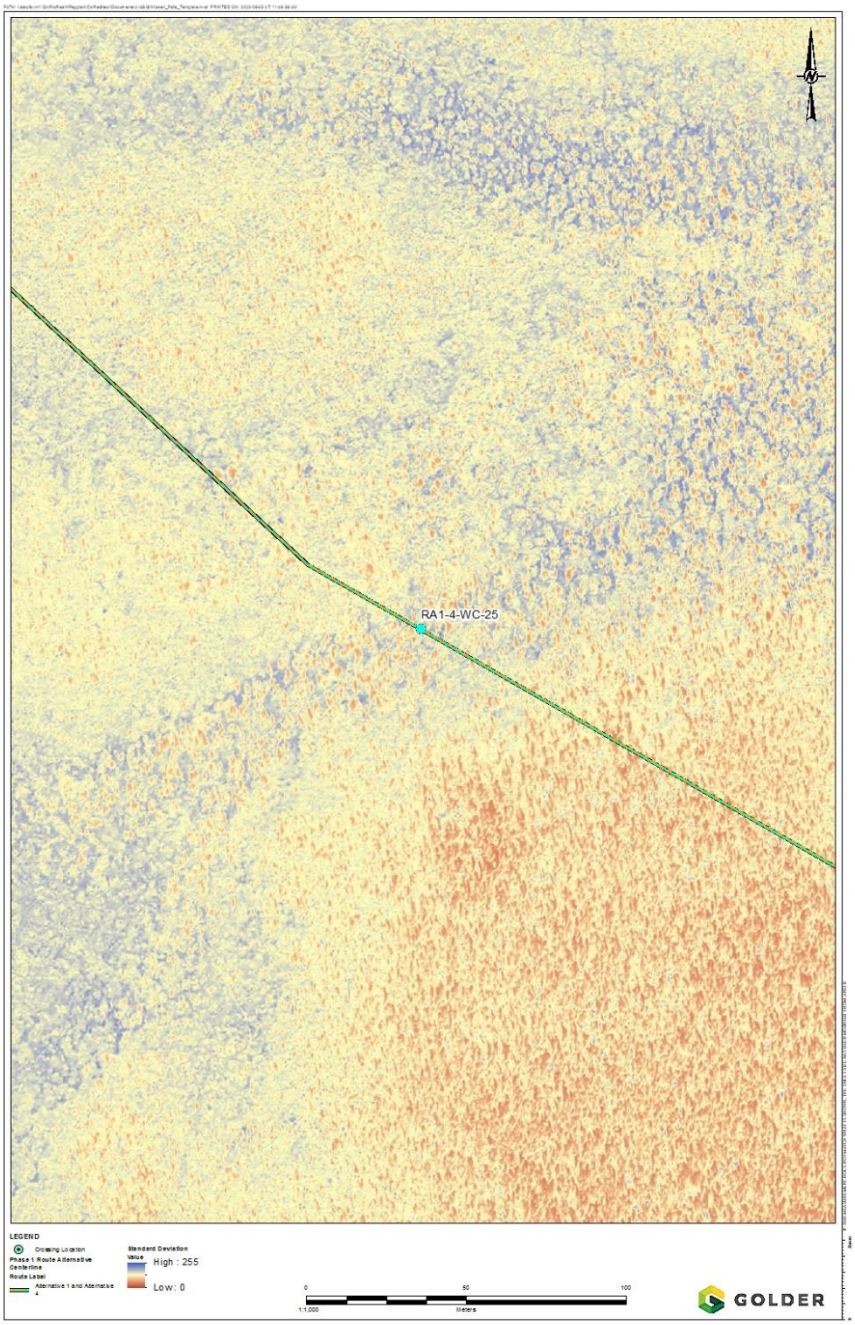



LiDAR imagery at crossing RA1-4-WC-24; red/blue contrast

| **CROSSING ID: RA1-4-WC-25** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 556921E 5738753N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-4-WC-25 |

| **CROSSING ID: RA1-4-WC-25** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 556921E 5738753N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-4-WC-25 |

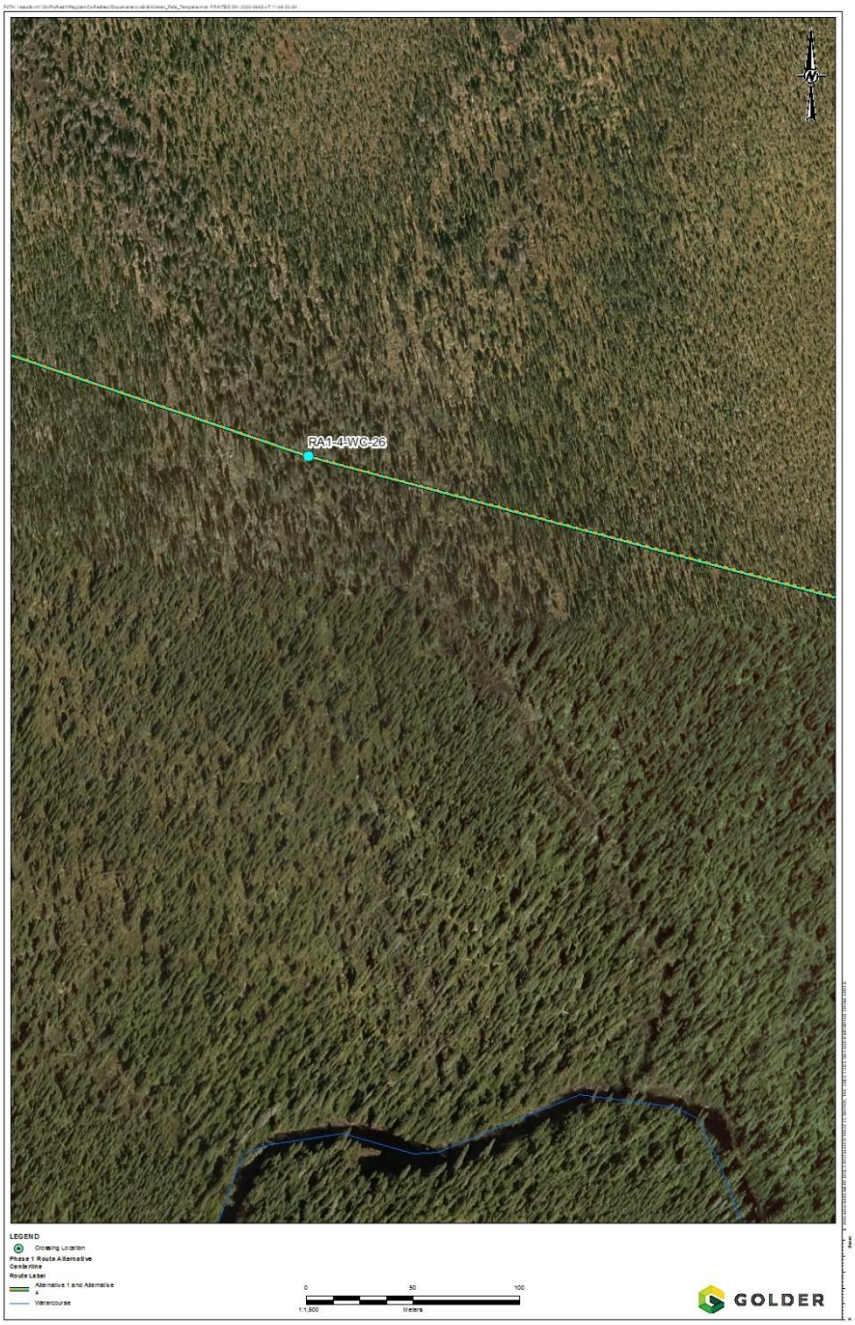
| **CROSSING ID: RA1-4-WC-25** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 556921E 5738753N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-25; red/blue contrast

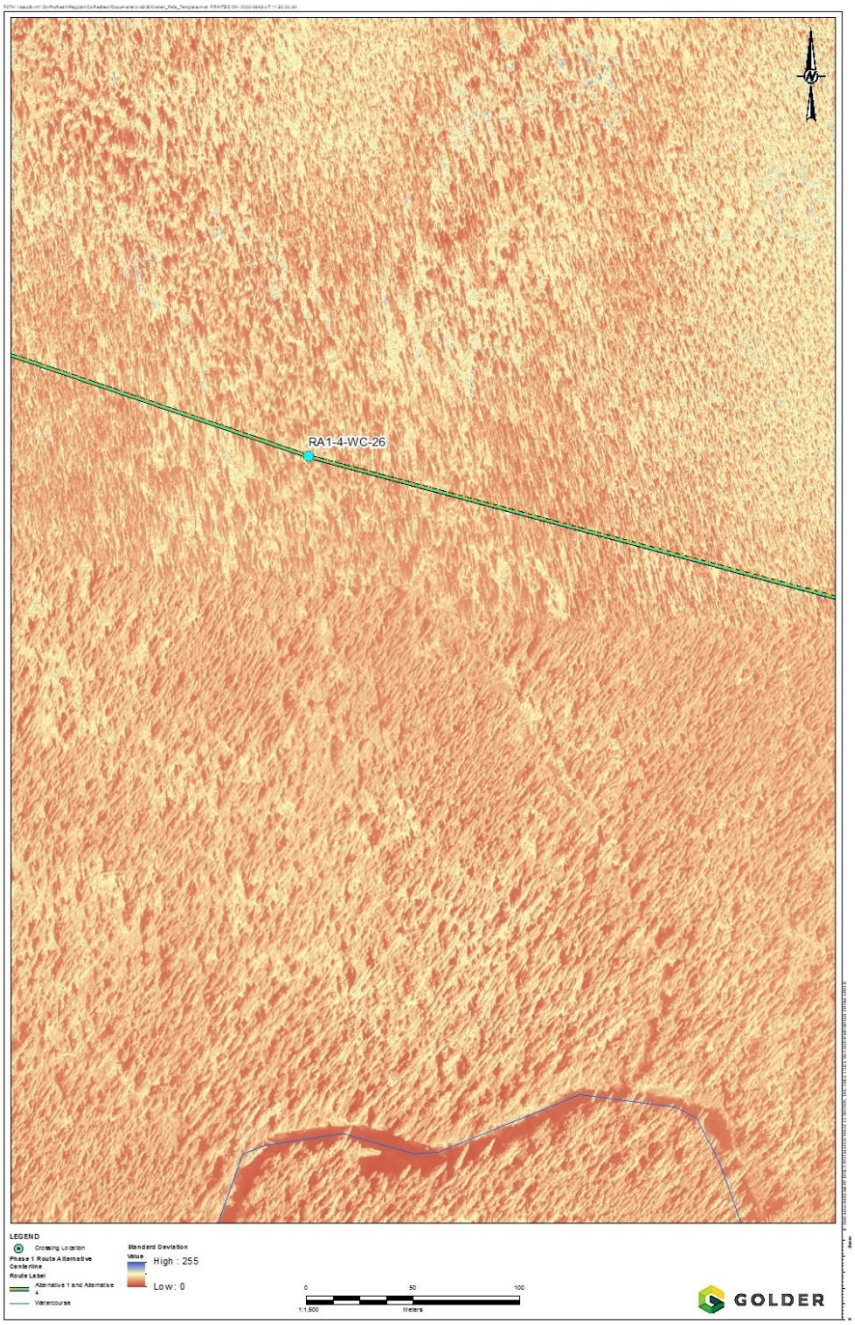
| **CROSSING ID: RA1-4-WC-26** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 558205E 57382435N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-26 | Aerial photograph of crossing RA1-4-WC-26 |

| **CROSSING ID: RA1-4-WC-26** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 558205E 57382435N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-26

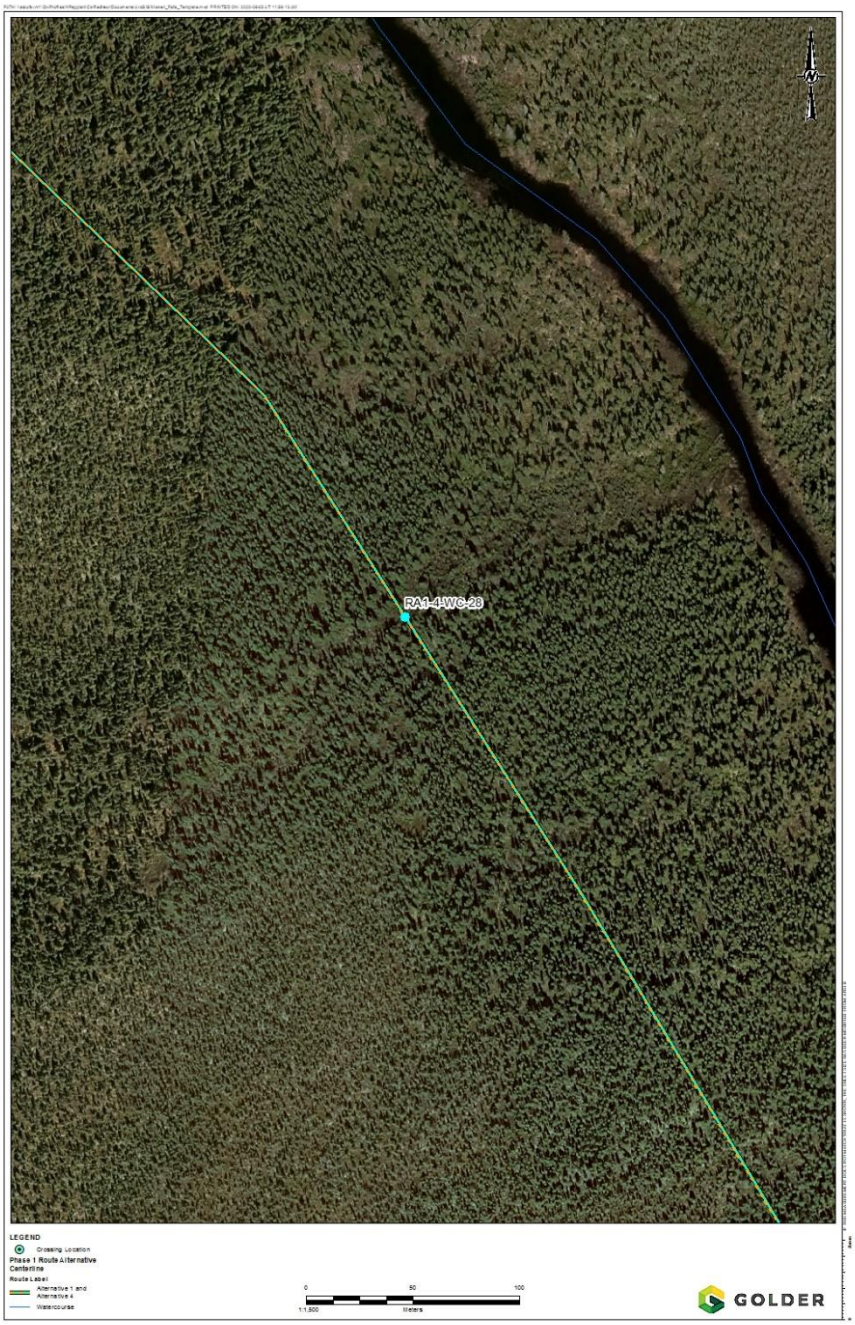
| **CROSSING ID: RA1-4-WC-26** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 558205E 57382435N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-26; red/blue contrast

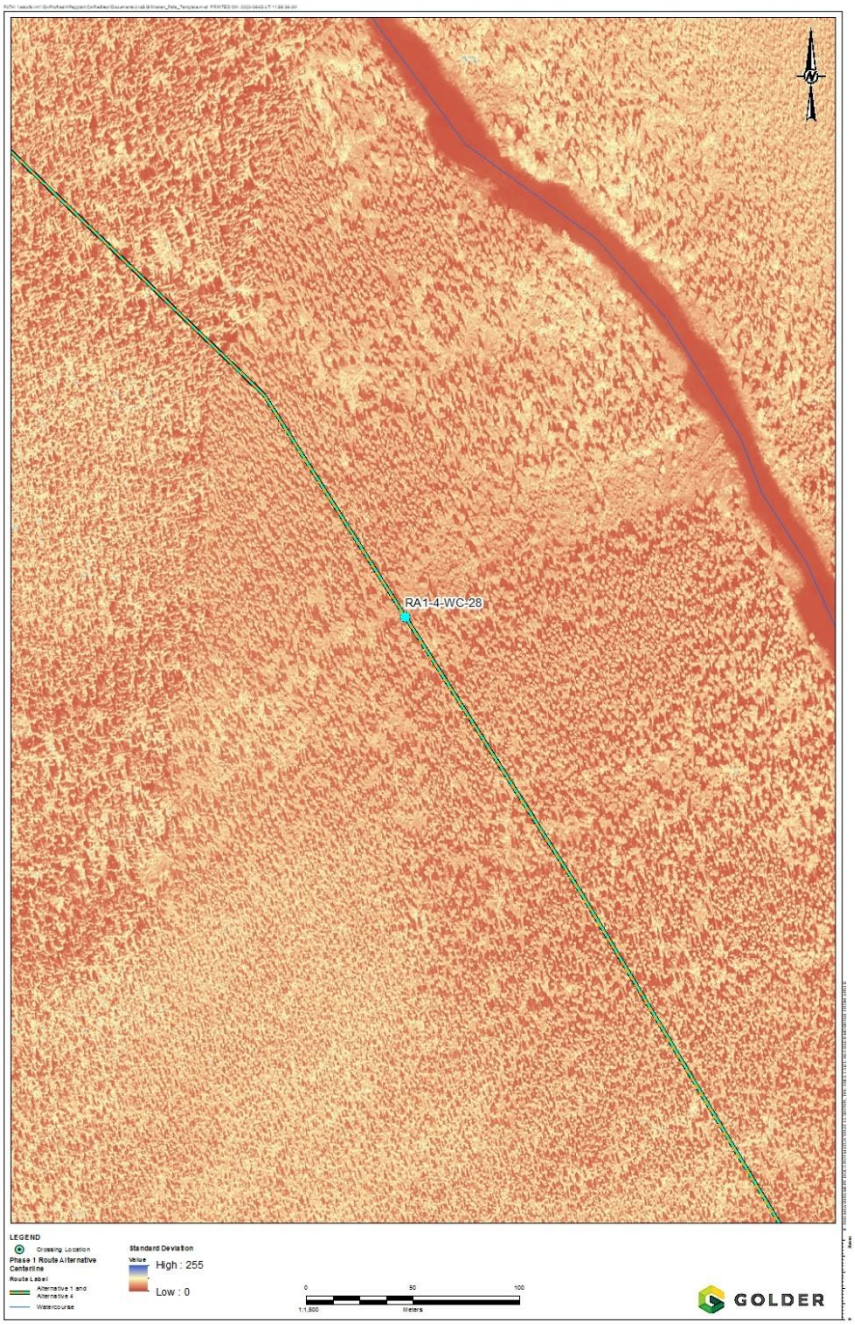
| **CROSSING ID: RA1-4-WC-28** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 563810E 5738045N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-28; red bracket showing general location of RA1-4-WC-28 | LiDAR imagery at crossing RA1-4-WC-28 |

| **CROSSING ID: RA1-4-WC-28** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 563810E 5738045N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-4-WC-28

| **CROSSING ID: RA1-4-WC-28** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 563810E 5738045N |
| **DATA SOURCE:** LiDAR Imagery |



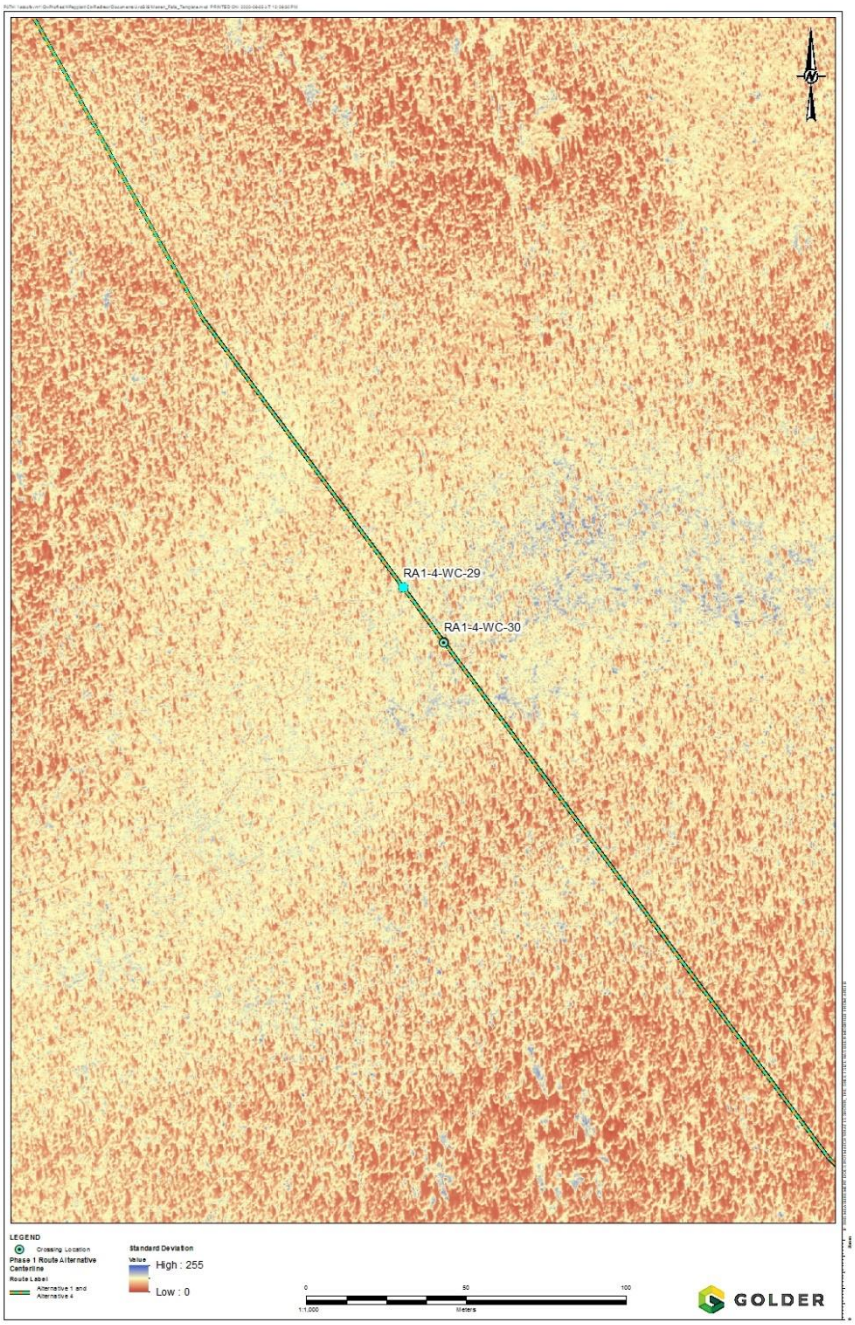

LiDAR imagery at crossing RA1-4-WC-28; red/blue contrast

| **CROSSING ID: RA1-4-WC-29, RA1-4-WC-30** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 563810E 5734170N, 563822E 5734153N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of general area of crossings RA1-4-WC-29 and RA1-4-WC-30 | Aerial photograph of general area of crossings RA1-4-WC-29 and RA1-4-WC-30 |

| **CROSSING ID: RA1-4-WC-29, RA1-4-WC-30** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 563810E 5734170N, 563822E 5734153N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery of crossings RA1-4-WC-29, RA1-4-WC-30

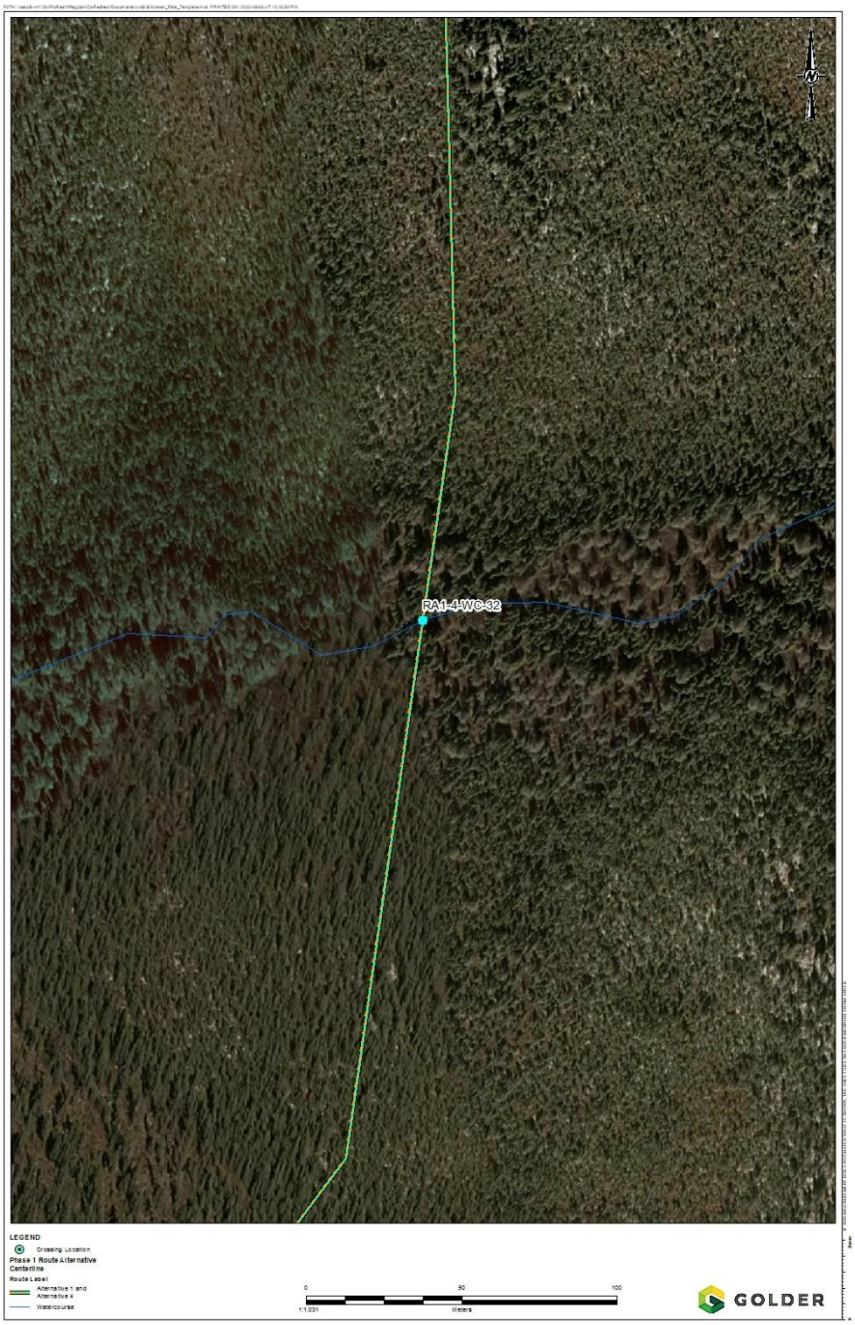
| **CROSSING ID: RA1-4-WC-29, RA1-4-WC-30** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 563810E 5734170N, 563822E 5734153N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery of crossings RA1-4-WC-29, RA1-4-WC-30; red/blue contrast

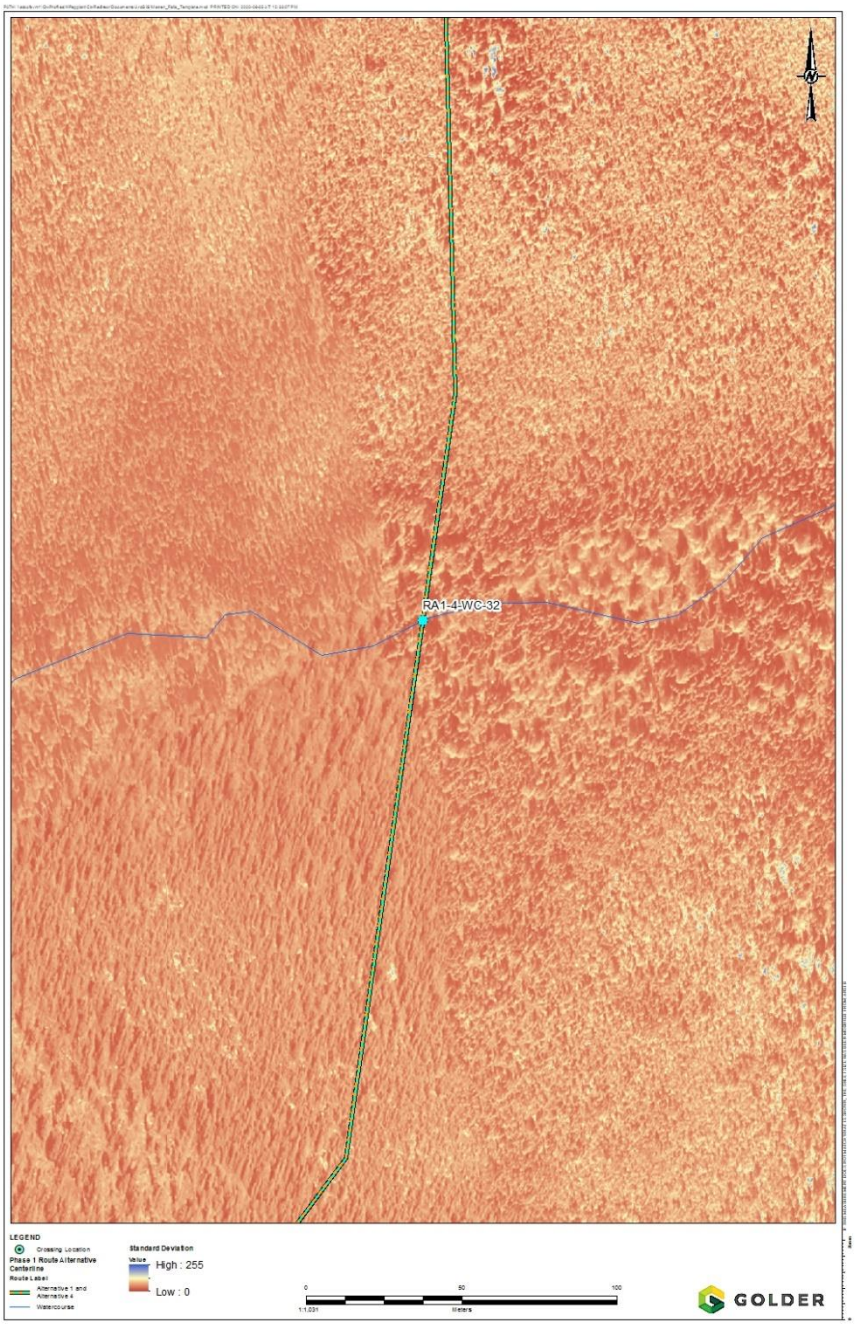
| **CROSSING ID: RA1-4-WC-32** | |
|---|---|
| **ROUTE:** Alternative 1 and 4 | |
| **UTM COORDINATES:** (Zone 16) 567922E 5732413N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-4-WC-32 | Aerial photograph of crossing RA1-4-WC-32 |

| **CROSSING ID: RA1-4-WC-32** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 567922E 5732413N |
| **DATA SOURCE:** LiDAR Imagery |



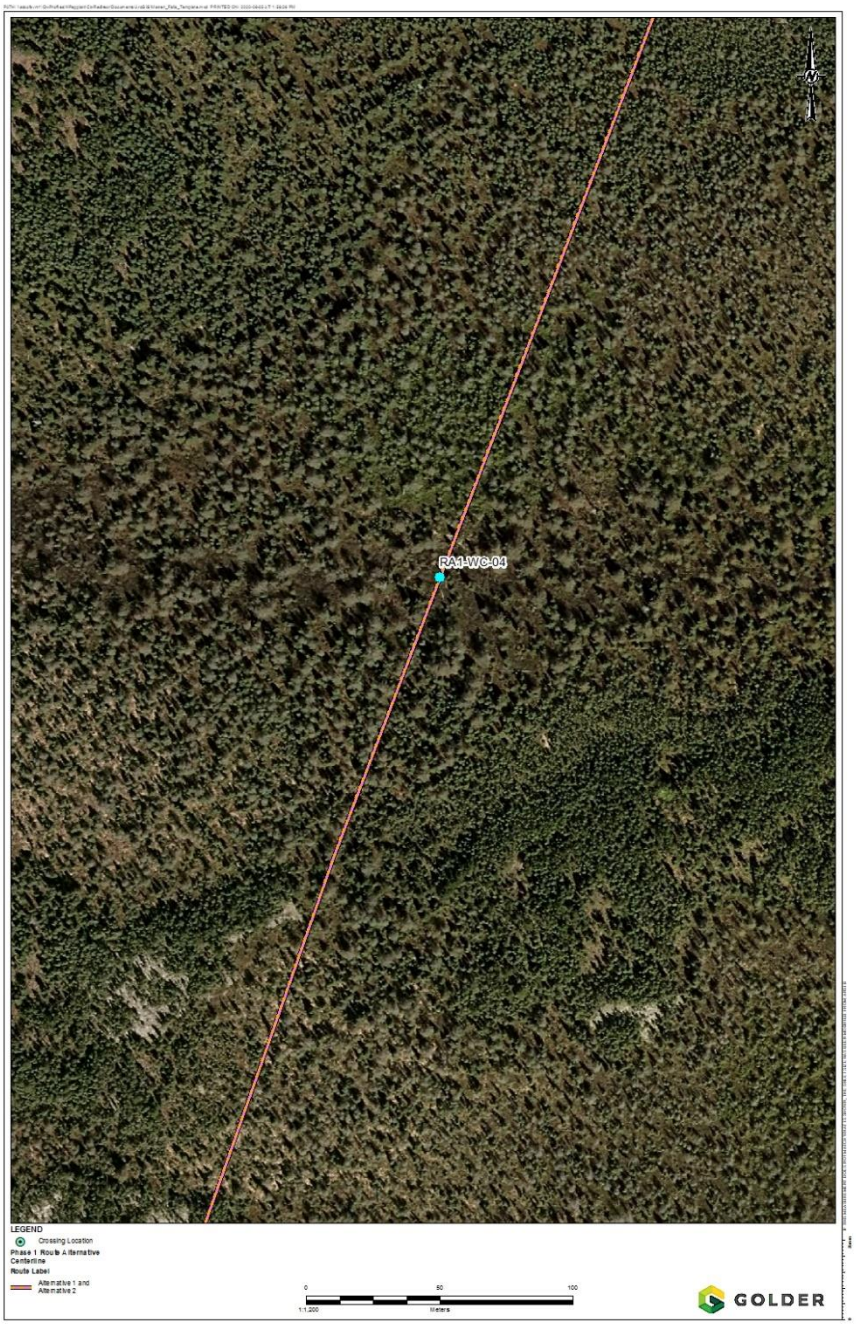

LiDAR imagery at crossing RA1-4-WC-32

| **CROSSING ID: RA1-4-WC-32** |
|---|
| **ROUTE:** Alternative 1 and 4 |
| **UTM COORDINATES:** (Zone 16) 567922E 5732413N |
| **DATA SOURCE:** LiDAR Imagery |



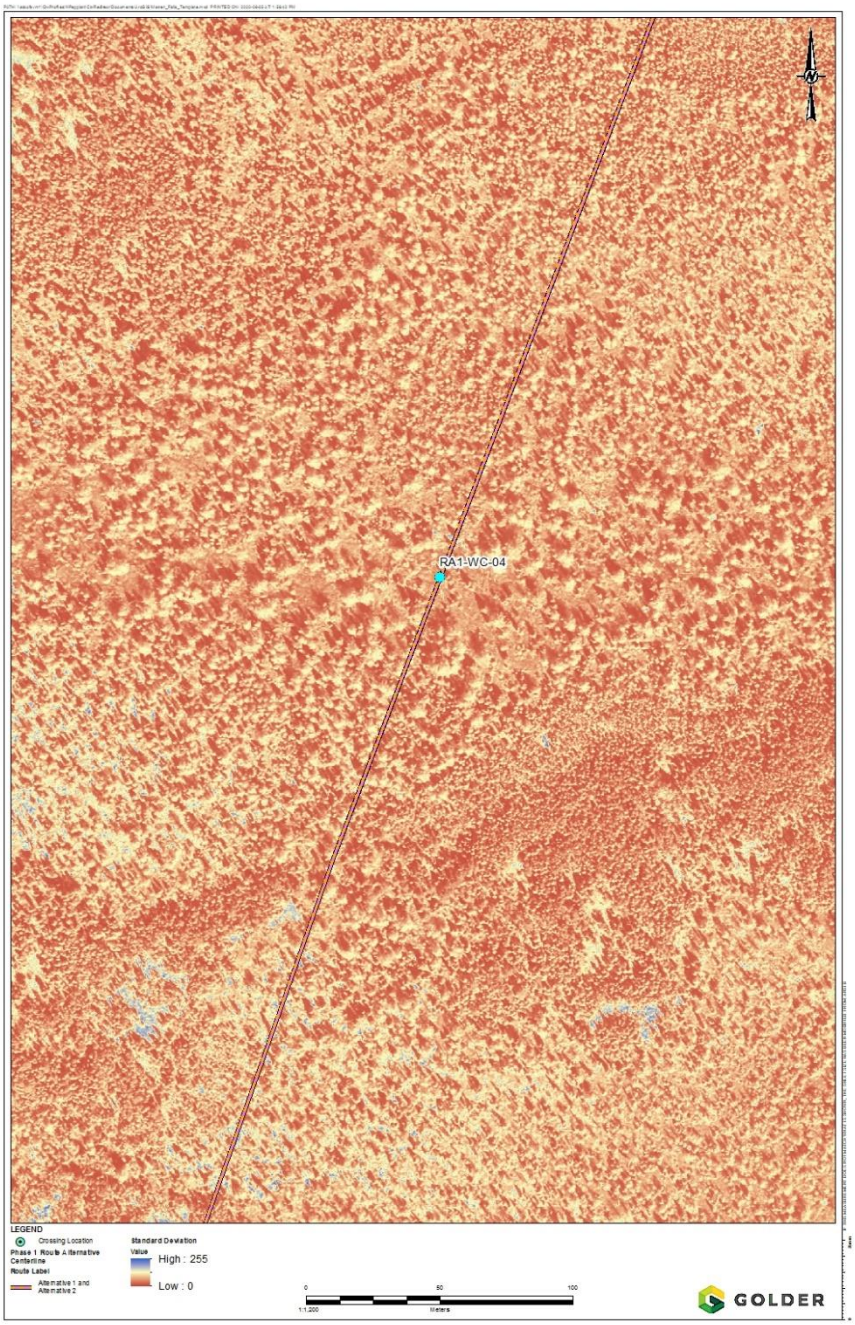

LiDAR imagery at crossing RA1-4-WC-32; red/blue contrast

| **CROSSING ID: RA1-WC-04** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 534433E 5635846N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-04

| **CROSSING ID: RA1-WC-04** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 534433E 5635846N |
| **DATA SOURCE:** LiDAR Imagery |



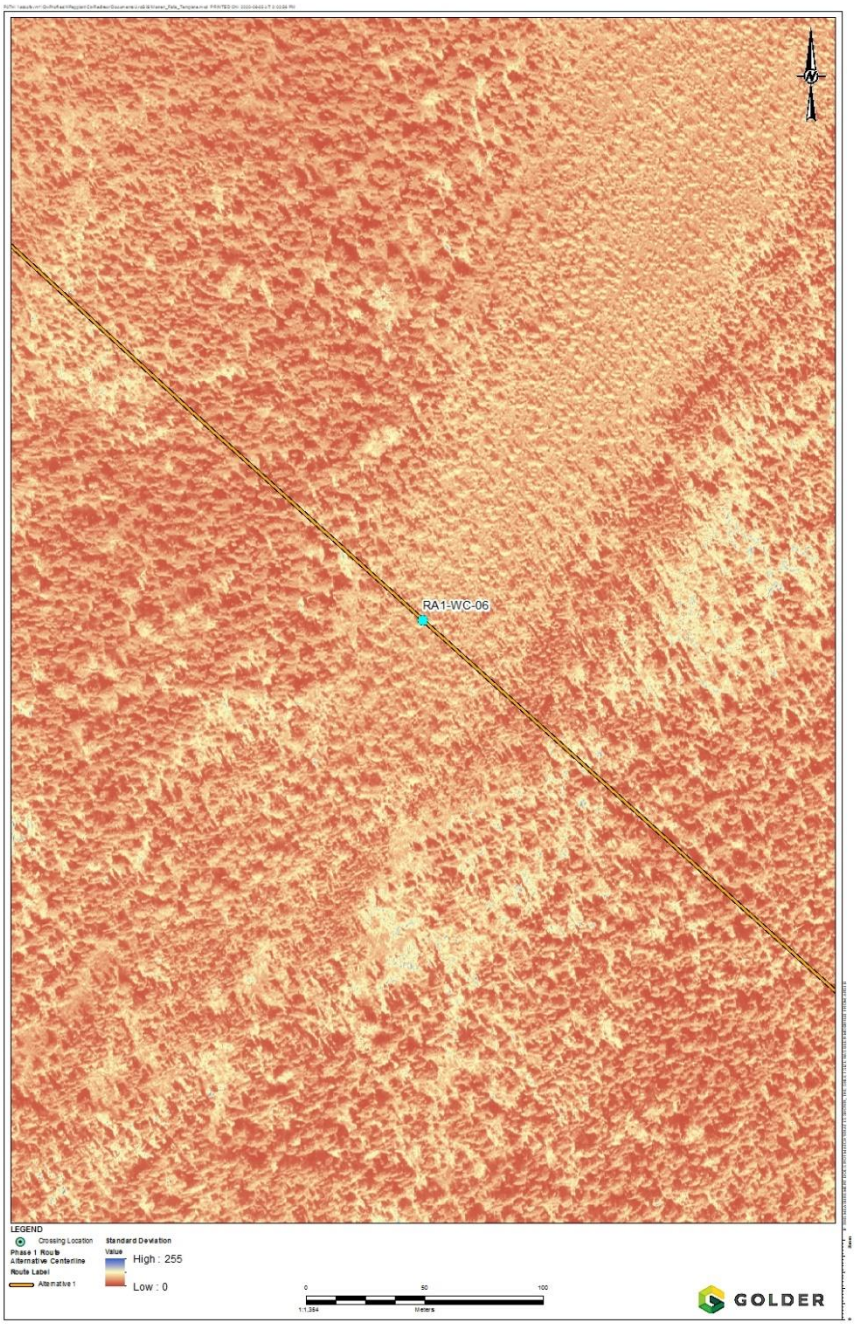

LiDAR imagery at crossing RA1-WC-04; red/blue contrast

| **CROSSING ID: RA1-WC-04** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 534433E 5635846N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-04 | Aerial photograph of crossing RA1-WC-04 |

| **CROSSING ID: RA1-WC-06** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 532919E 5639277N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-06 | Aerial photograph of crossing RA1-WC-06 |

| **CROSSING ID: RA1-WC-06** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532919E 5639277N |
| **DATA SOURCE:** LiDAR Imagery |

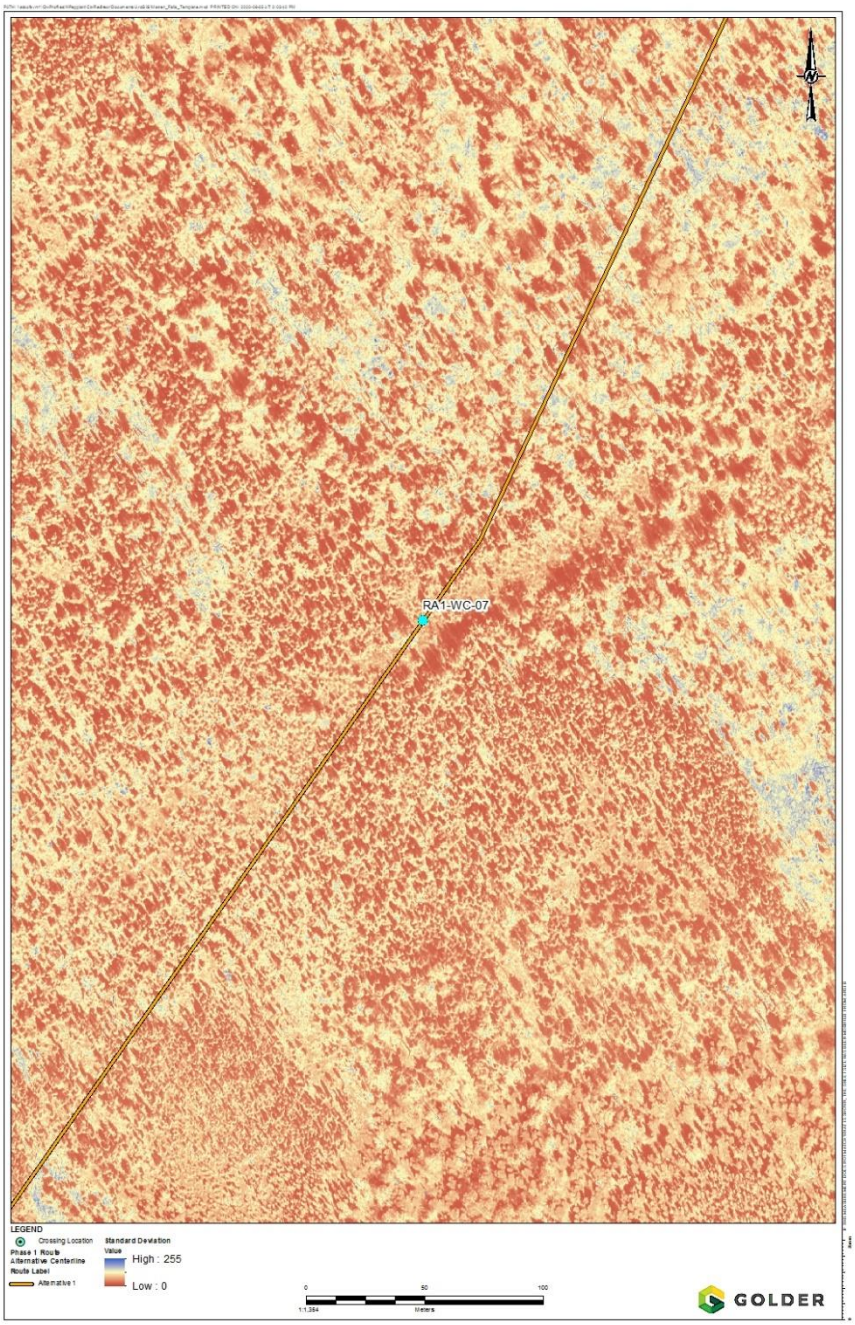
LiDAR imagery at crossing RA1-WC-06

| **CROSSING ID: RA1-WC-06** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532919E 5639277N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-06; red/blue contrast |

| **CROSSING ID: RA1-WC-07** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 532590E 5642637N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-07 | Aerial photograph of crossing RA1-WC-07 |

| **CROSSING ID: RA1-WC-07** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532590E 5642637N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-07

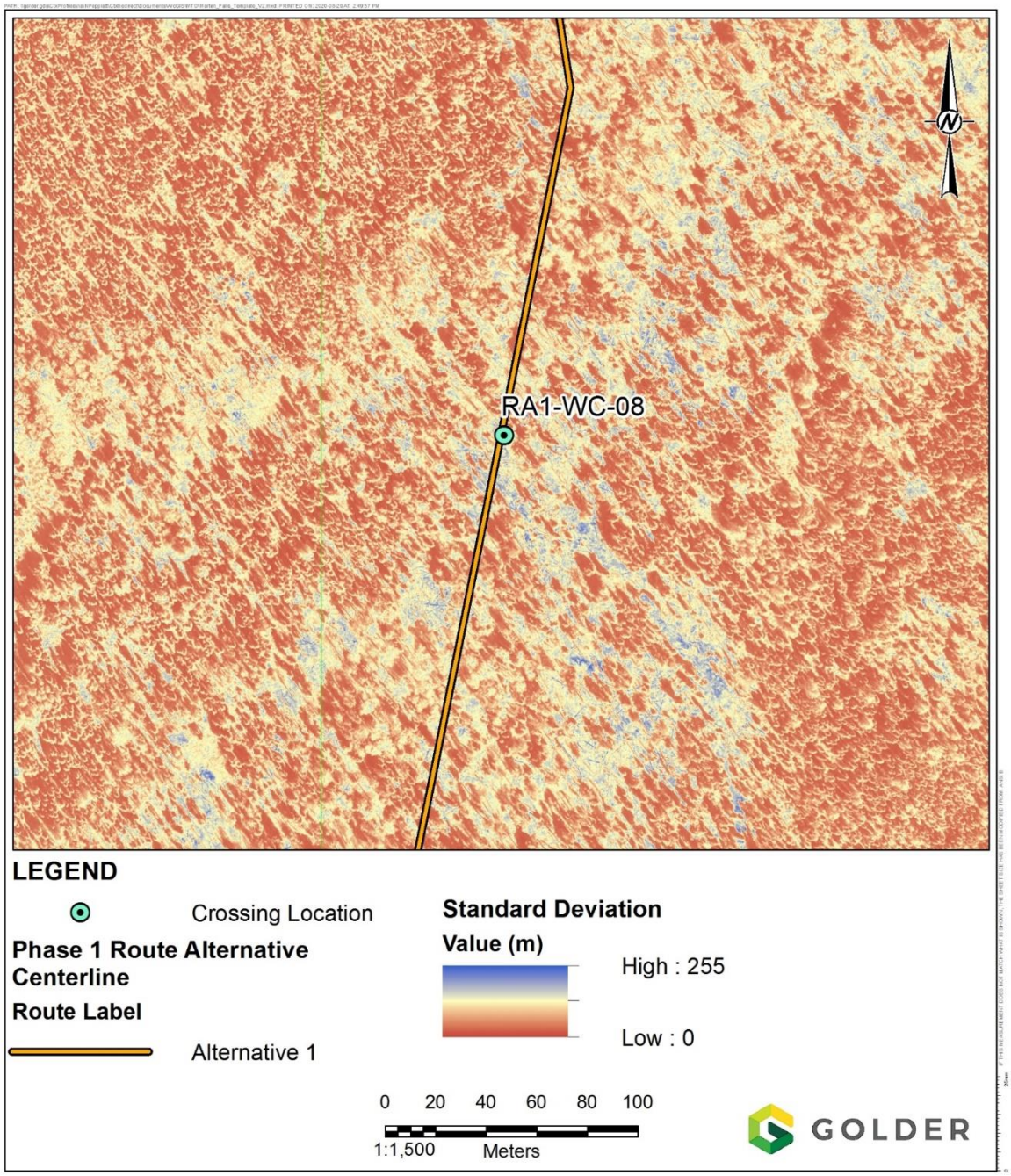
| **CROSSING ID: RA1-WC-07** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532590E 5642637N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-07; red/blue contrast |

| **CROSSING ID: RA1-WC-08** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 532911E 5643535N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-08 | Aerial photograph of crossing RA1-WC-08 |

| **CROSSING ID: RA1-WC-08** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532911E 5643535N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-08

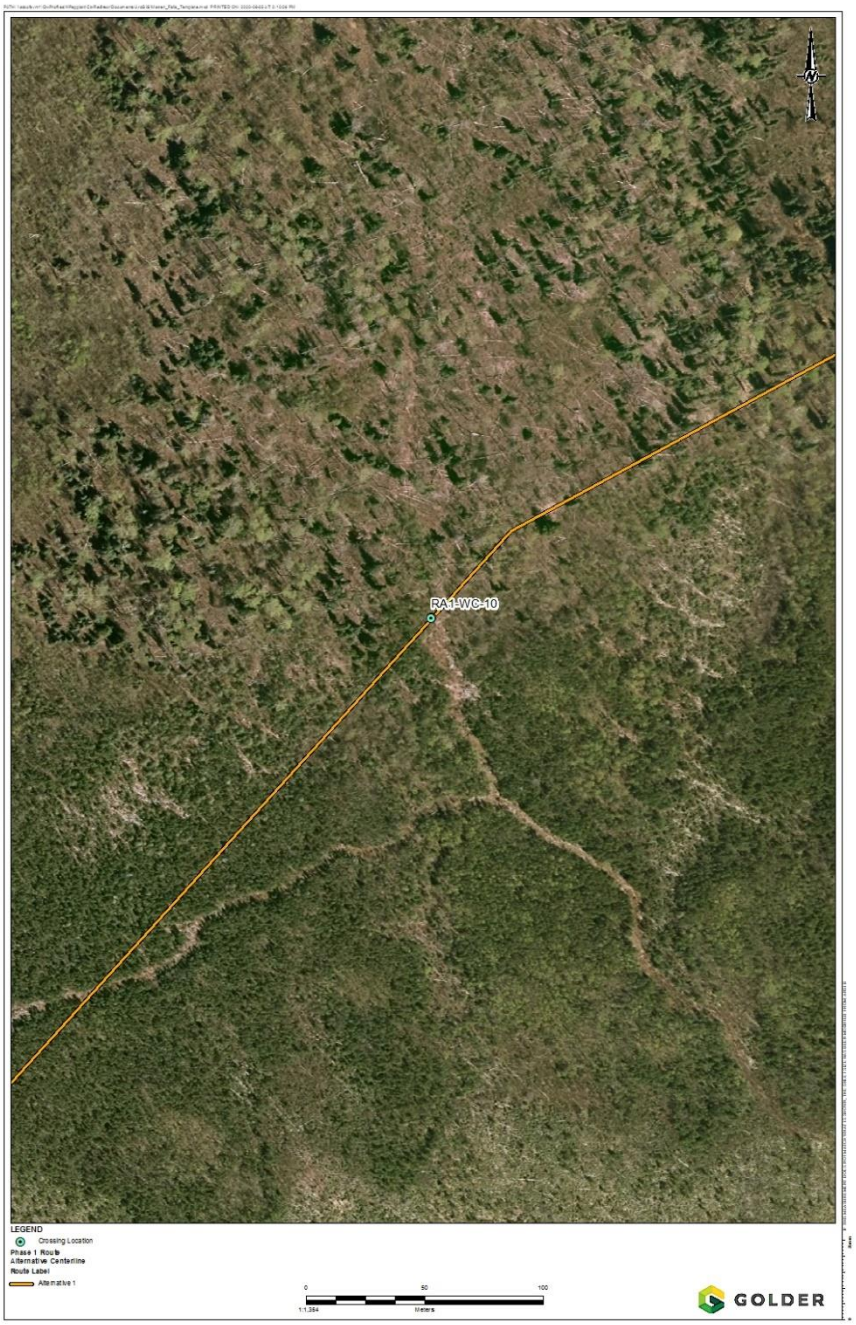
| **CROSSING ID: RA1-WC-08** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532911E 5643535N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-08; red/blue contrast

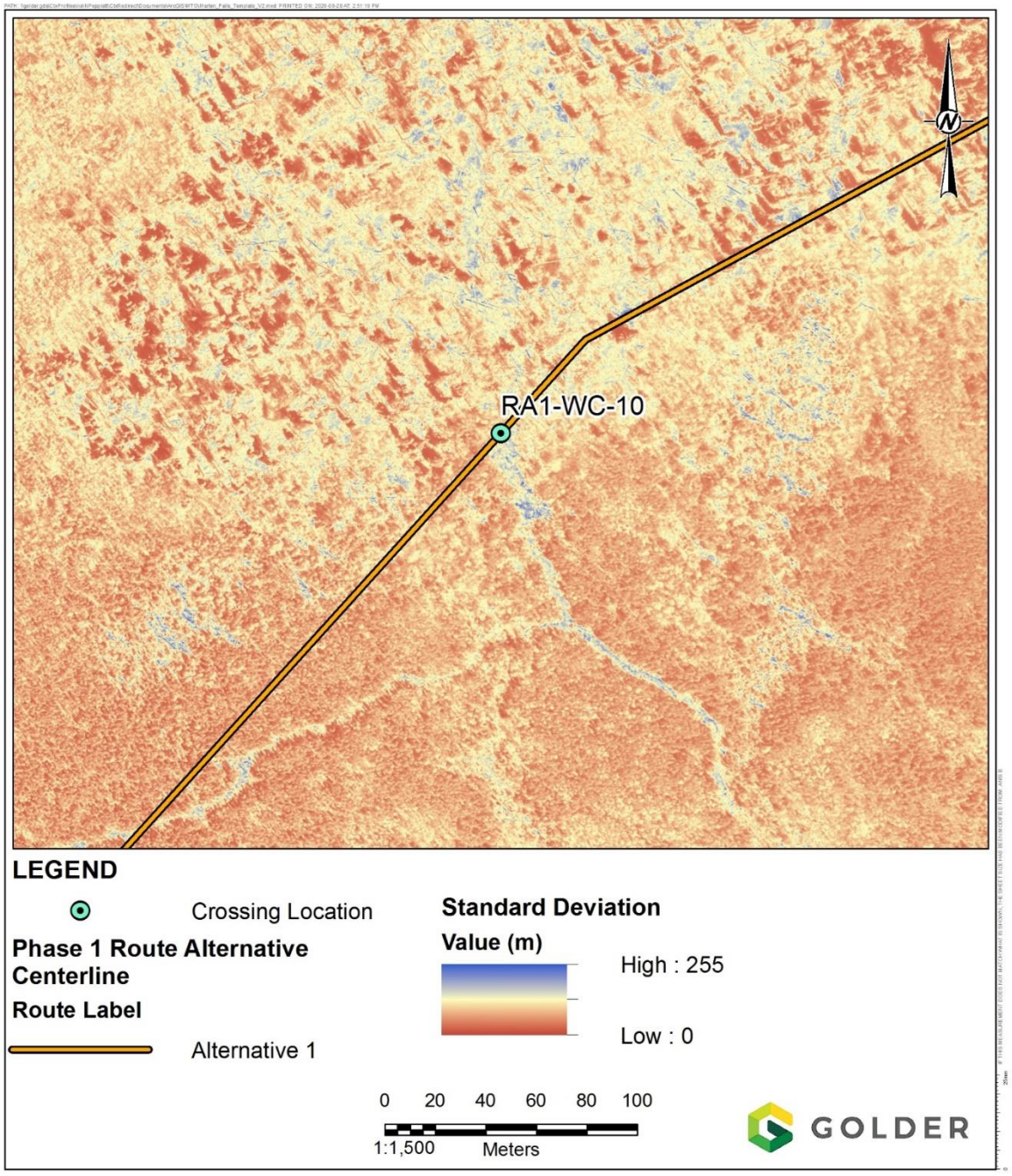
| **CROSSING ID: RA1-WC-10** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 532424E 5646501N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-10 | Aerial photograph of crossing RA1-WC-10 |

| **CROSSING ID: RA1-WC-10** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532424E 5646501N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-10

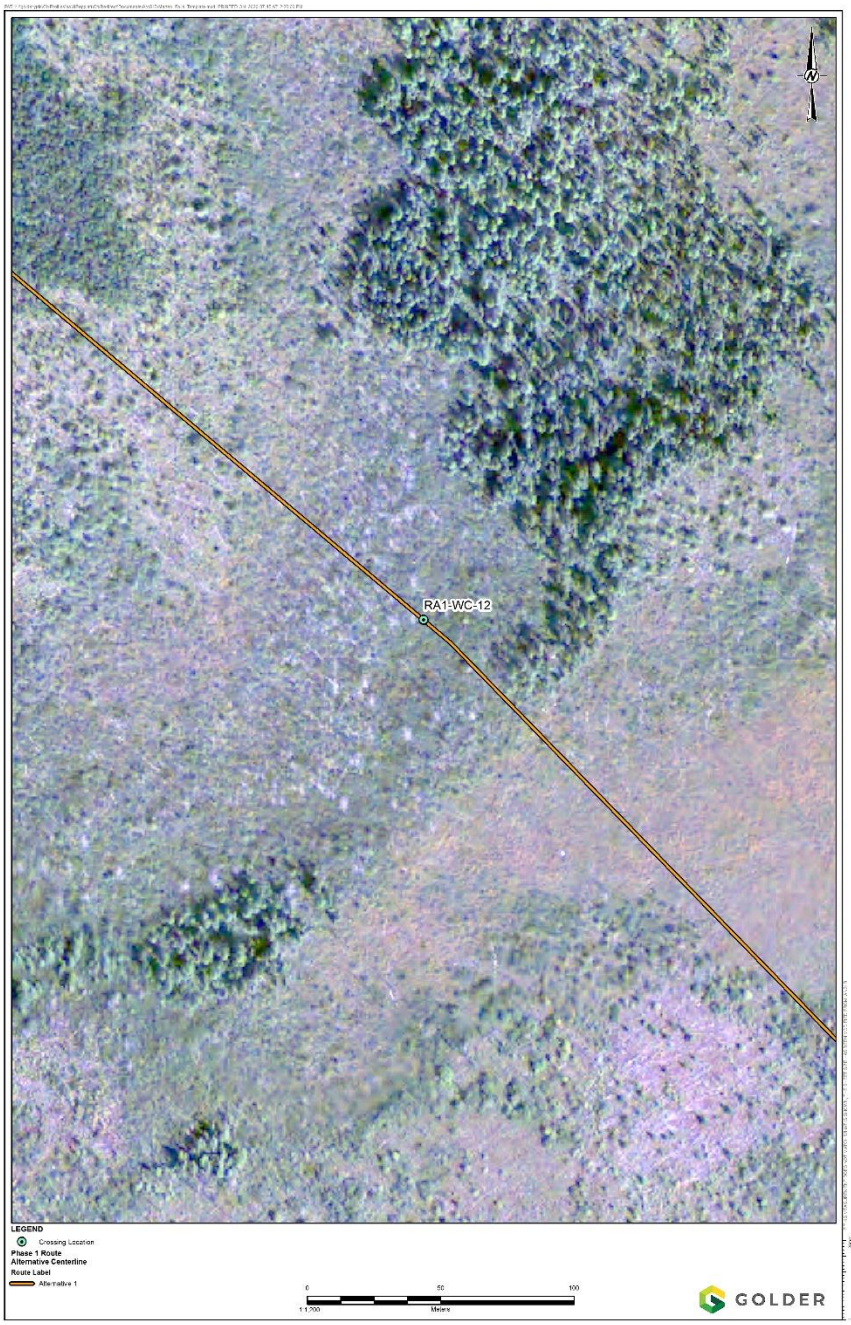
| **CROSSING ID: RA1-WC-10** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532424E 5646501N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-10; red/blue contrast

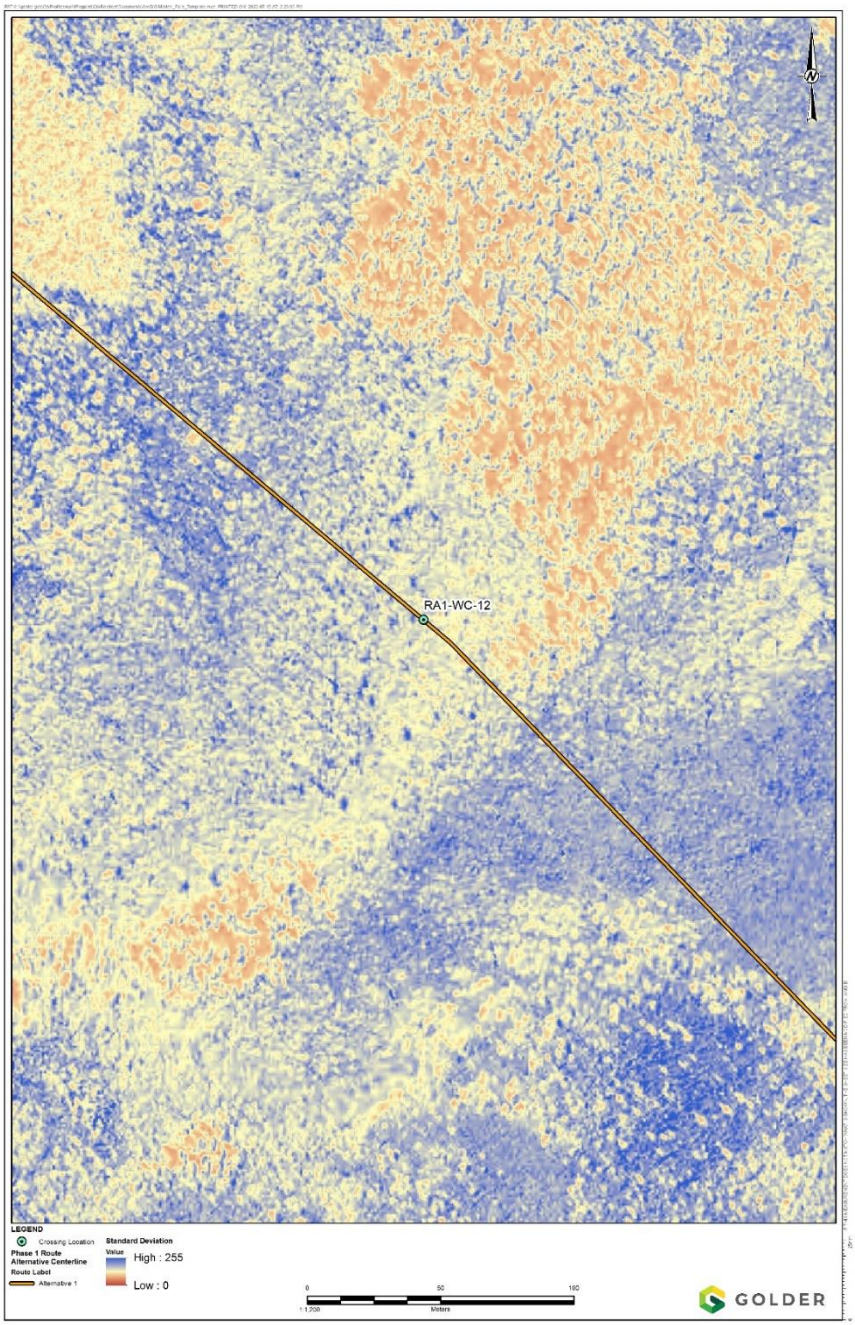
| **CROSSING ID: RA1-WC-12** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 5321441E 5653442N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-WC-12 |

| **CROSSING ID: RA1-WC-12** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 5321441E 5653442N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-12

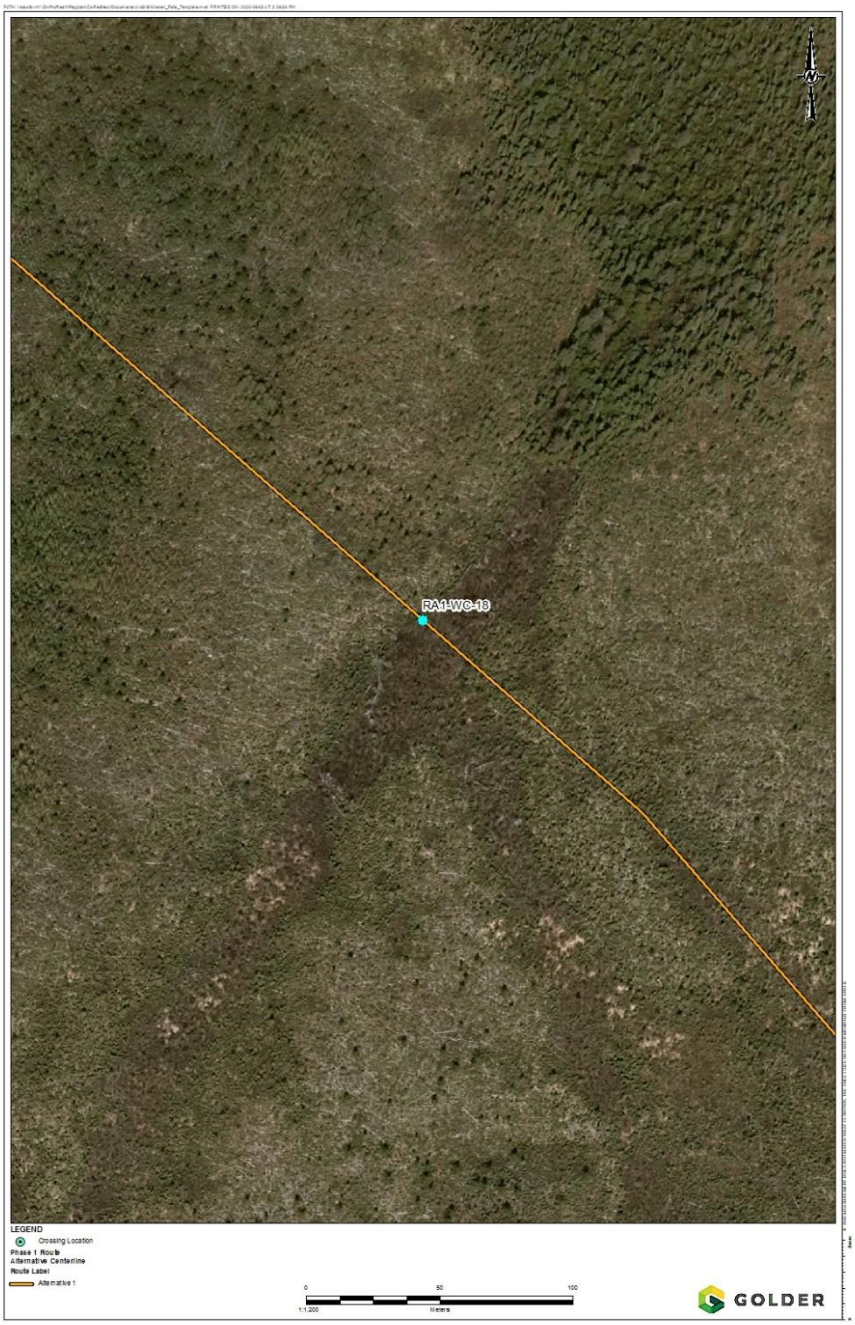
| **CROSSING ID: RA1-WC-12** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 5321441E 5653442N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-12; red/blue contrast

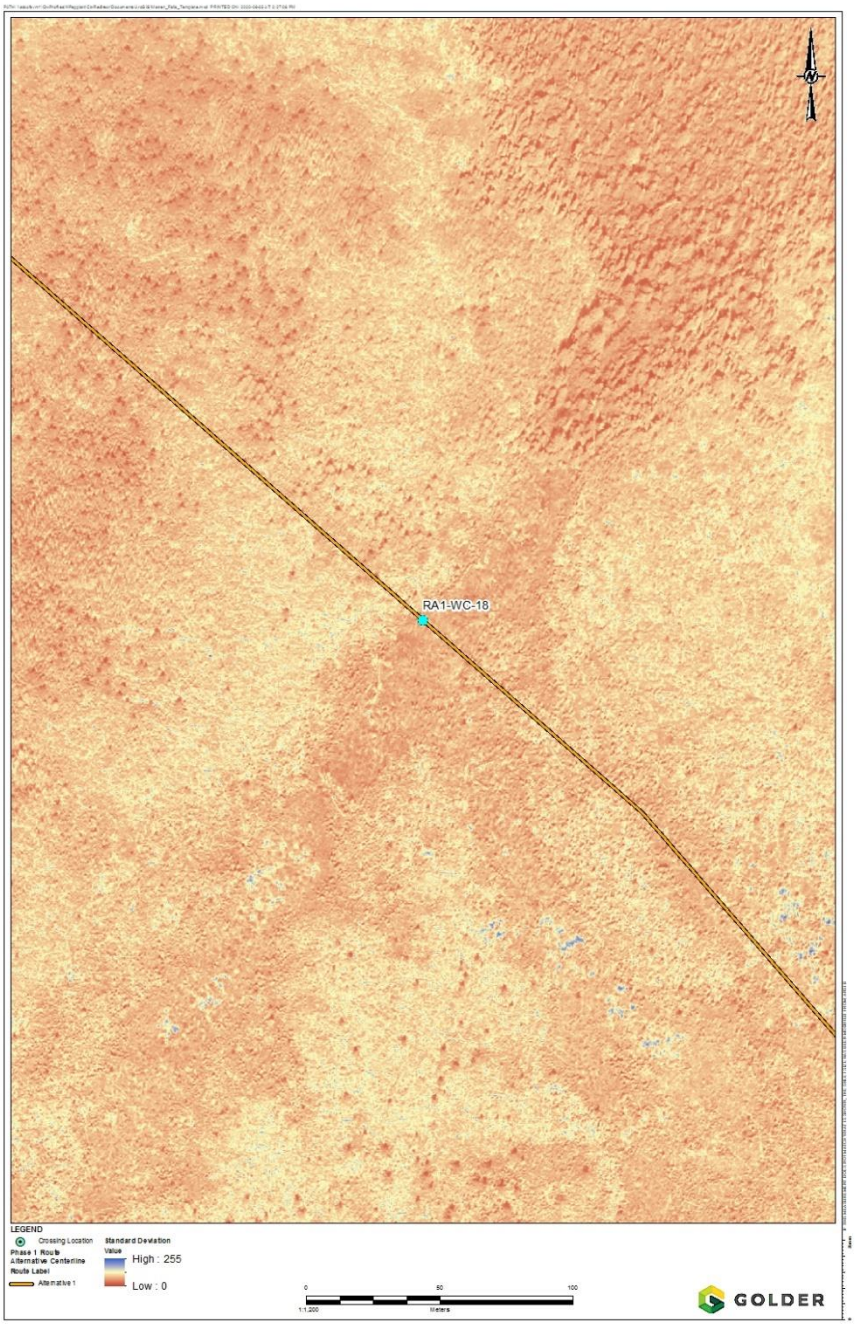
| **CROSSING ID: RA1-WC-18** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523029E 5662298N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-WC-18 |

| **CROSSING ID: RA1-WC-18** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523029E 5662298N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-18

| **CROSSING ID: RA1-WC-18** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523029E 5662298N |
| **DATA SOURCE:** LiDAR Imagery |

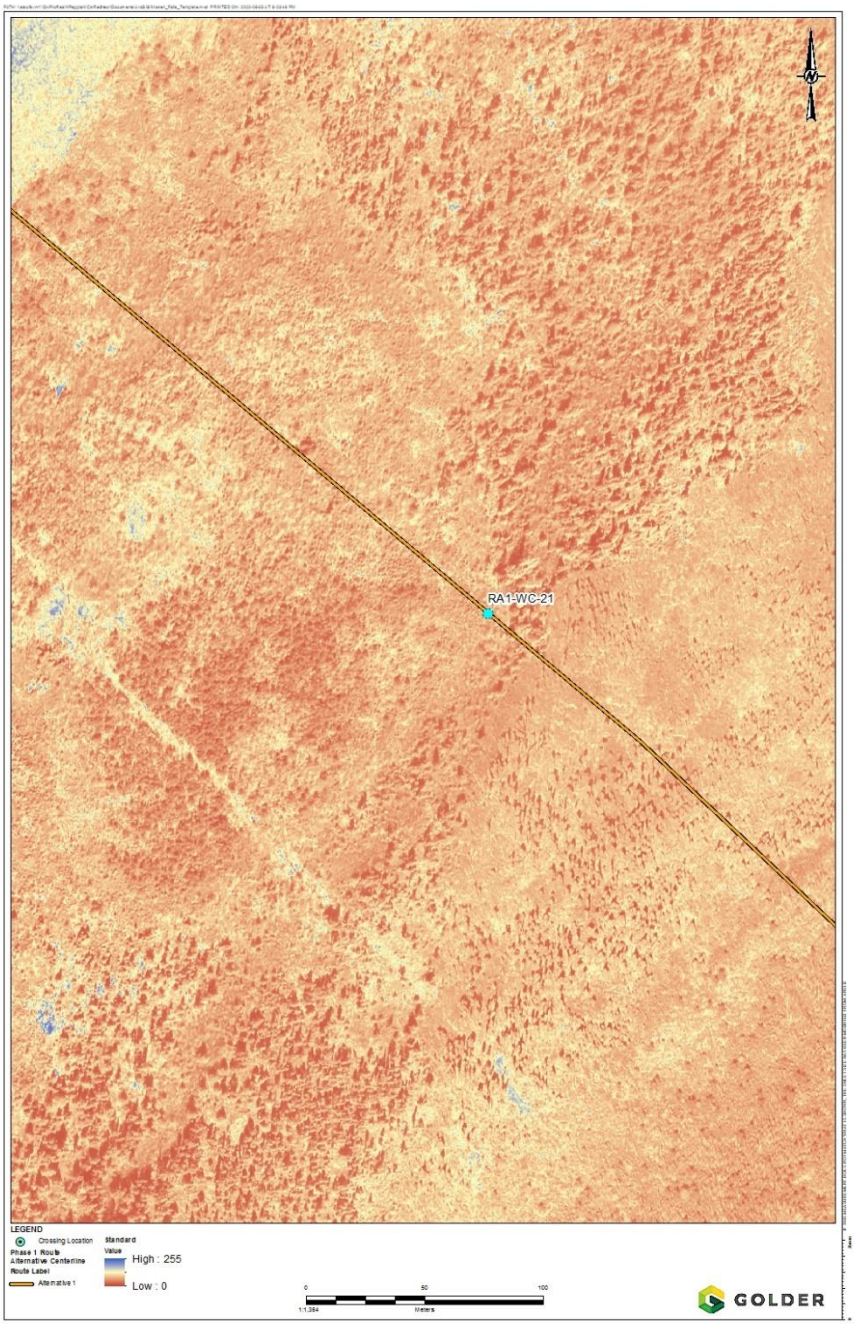



LiDAR imagery at crossing RA1-WC-18; red/blue contrast

| **CROSSING ID: RA1-WC-21** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 522006E 5663171N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-21 | Aerial photograph of crossing RA1-WC-21 |

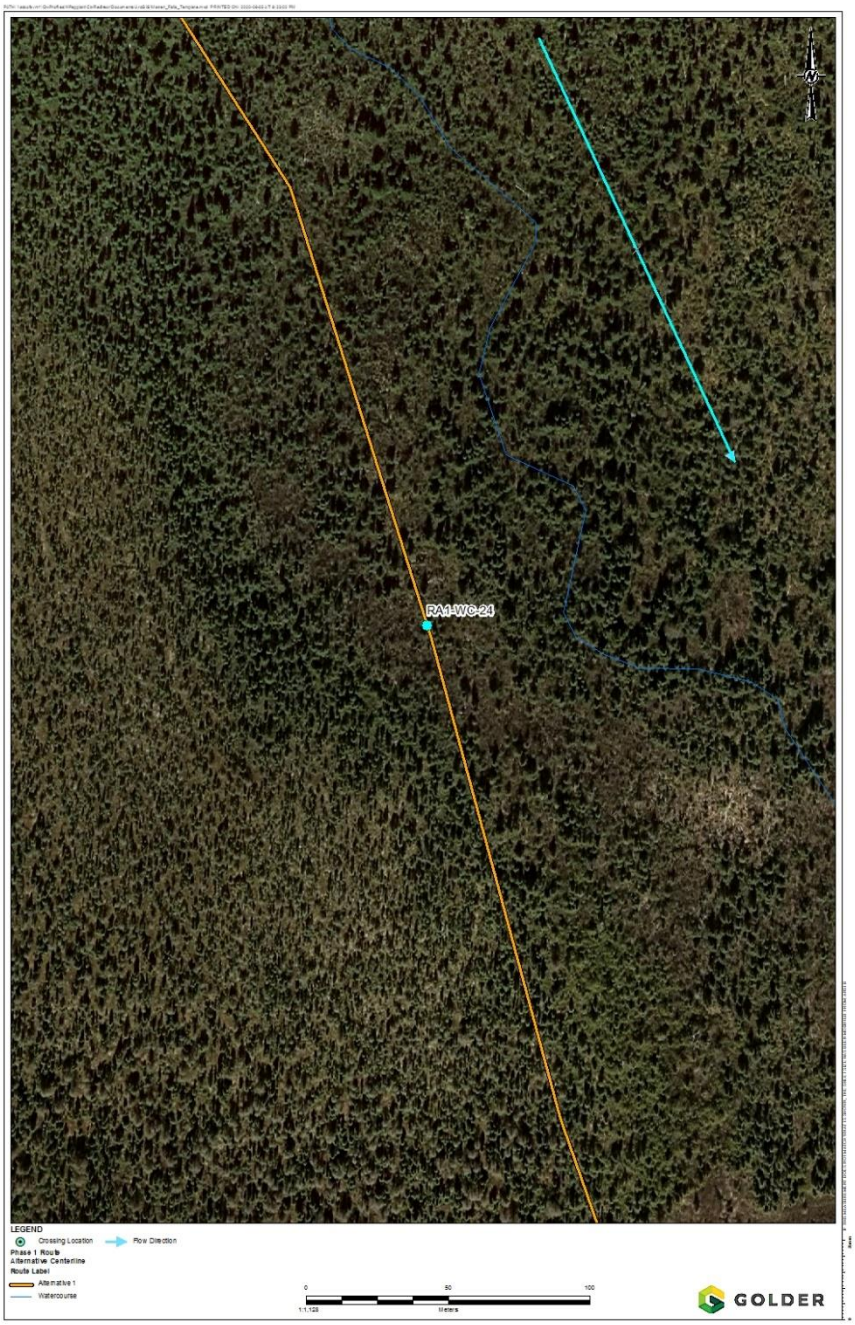
| **CROSSING ID: RA1-WC-21** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 522006E 5663171N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-21

| **CROSSING ID: RA1-WC-21** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 522006E 5663171N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-21; red/blue contrast |

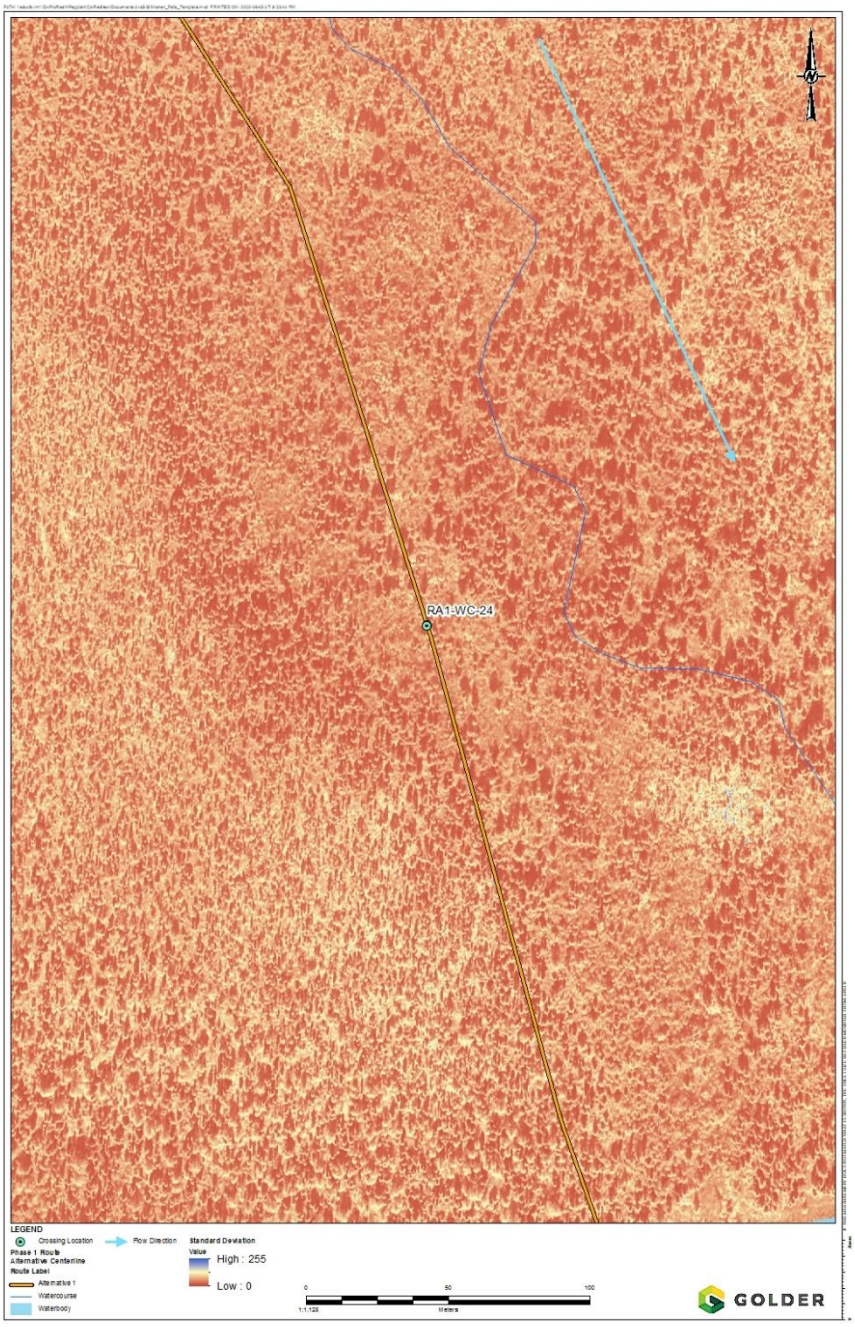
| **CROSSING ID: RA1-WC-24** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 521657E 5691768N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-24; red bracket showing general location of RA1 WC 24 | LiDAR imagery at crossing RA1-WC-24 |

| **CROSSING ID: RA1-WC-24** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 521657E 5691768N |
| **DATA SOURCE:** LiDAR Imagery |



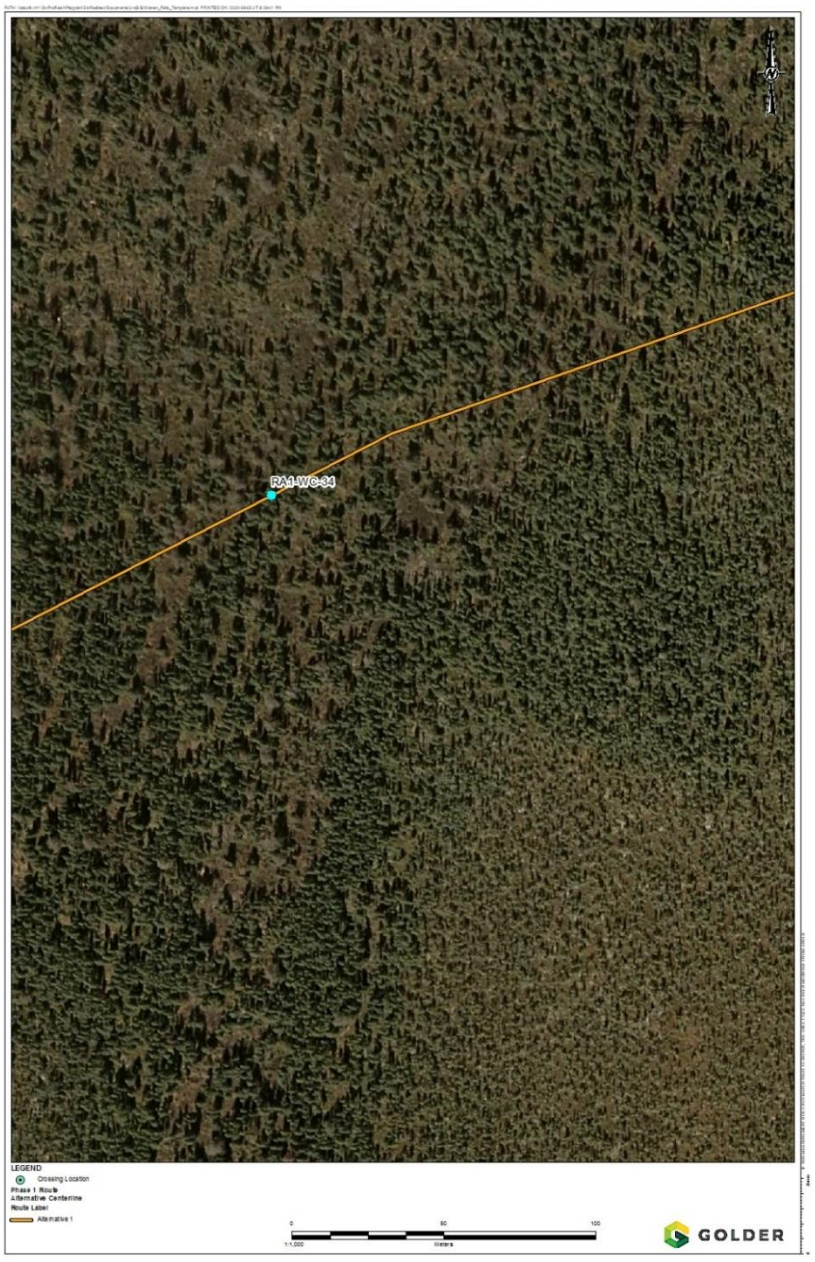

LiDAR imagery at crossing RA1-WC-24

| **CROSSING ID: RA1-WC-24** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 521657E 5691768N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-24; red/blue contrast

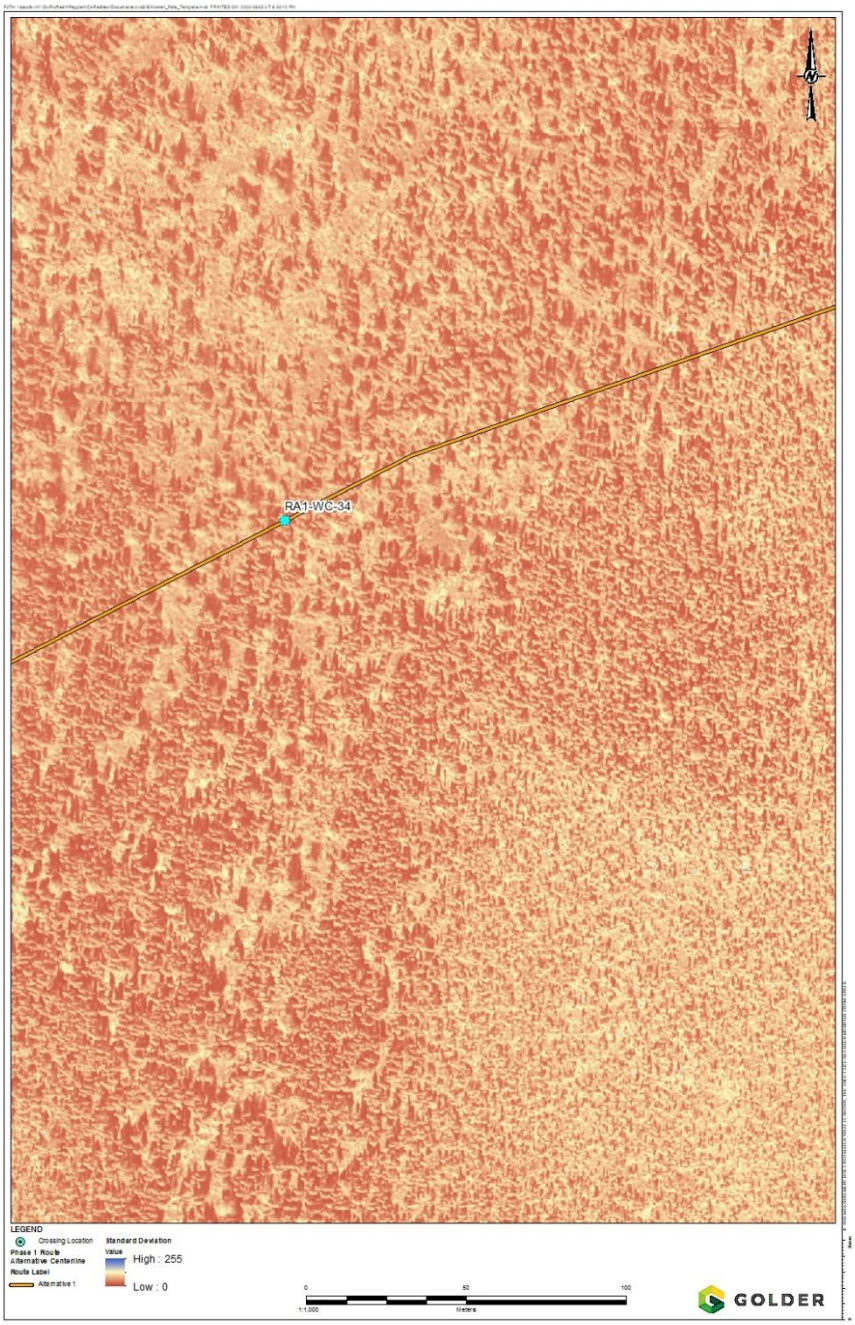
| **CROSSING ID: RA1-WC-34** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523410E 5712188N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) – No photos, see LiDAR[1] |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-34

1- Aerial reconnaissance photos at the crossing location were unavailable.

| **CROSSING ID: RA1-WC-34** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523410E 5712188N |
| **DATA SOURCE:** LiDAR Imagery |



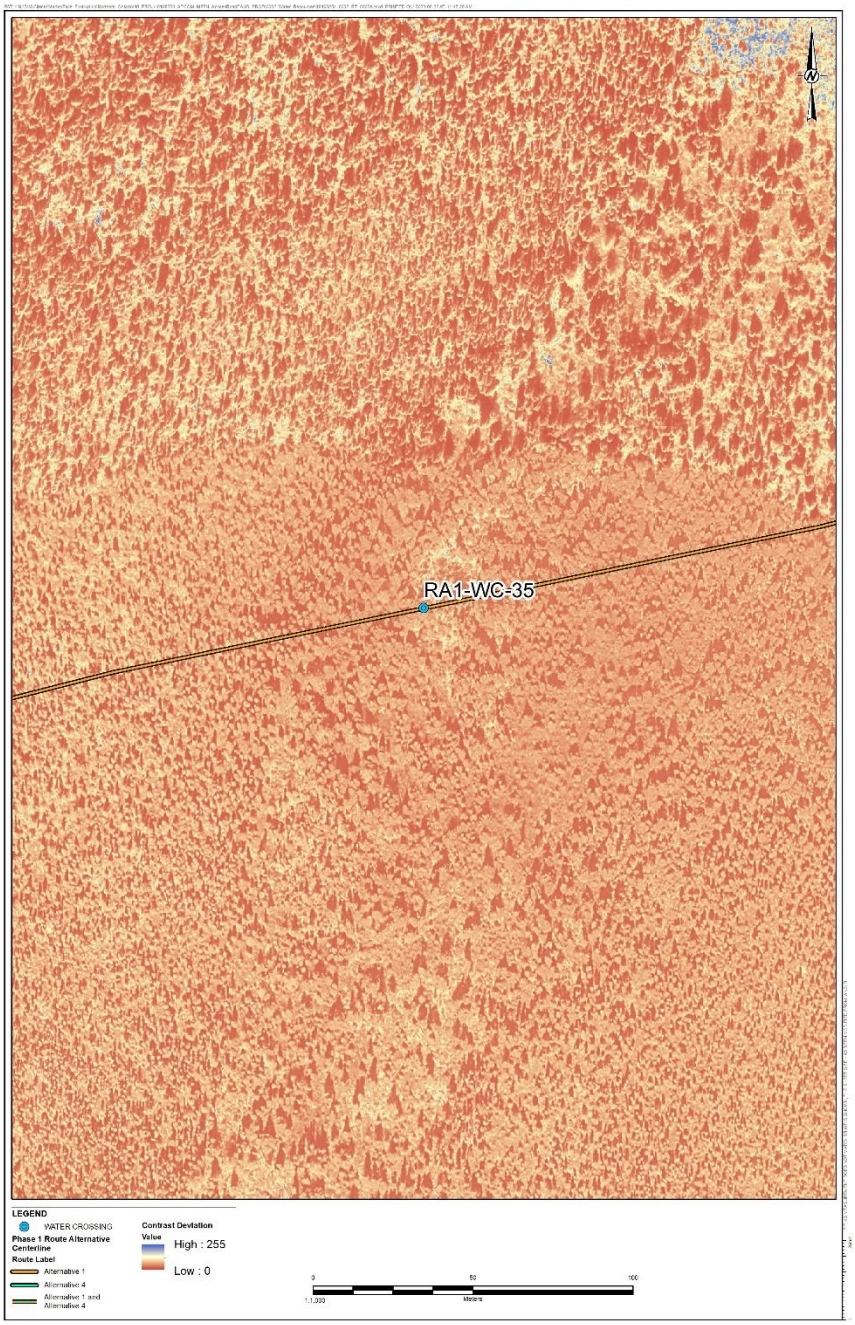

LiDAR imagery at crossing RA1-WC-34; red/blue contrast

| **CROSSING ID: RA1-WC-35** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532937E 5712348N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-WC-35 |

| **CROSSING ID: RA1-WC-35** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532937E 5712348N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-35

| **CROSSING ID: RA1-WC-35** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 532937E 5712348N |
| **DATA SOURCE:** LiDAR Imagery |

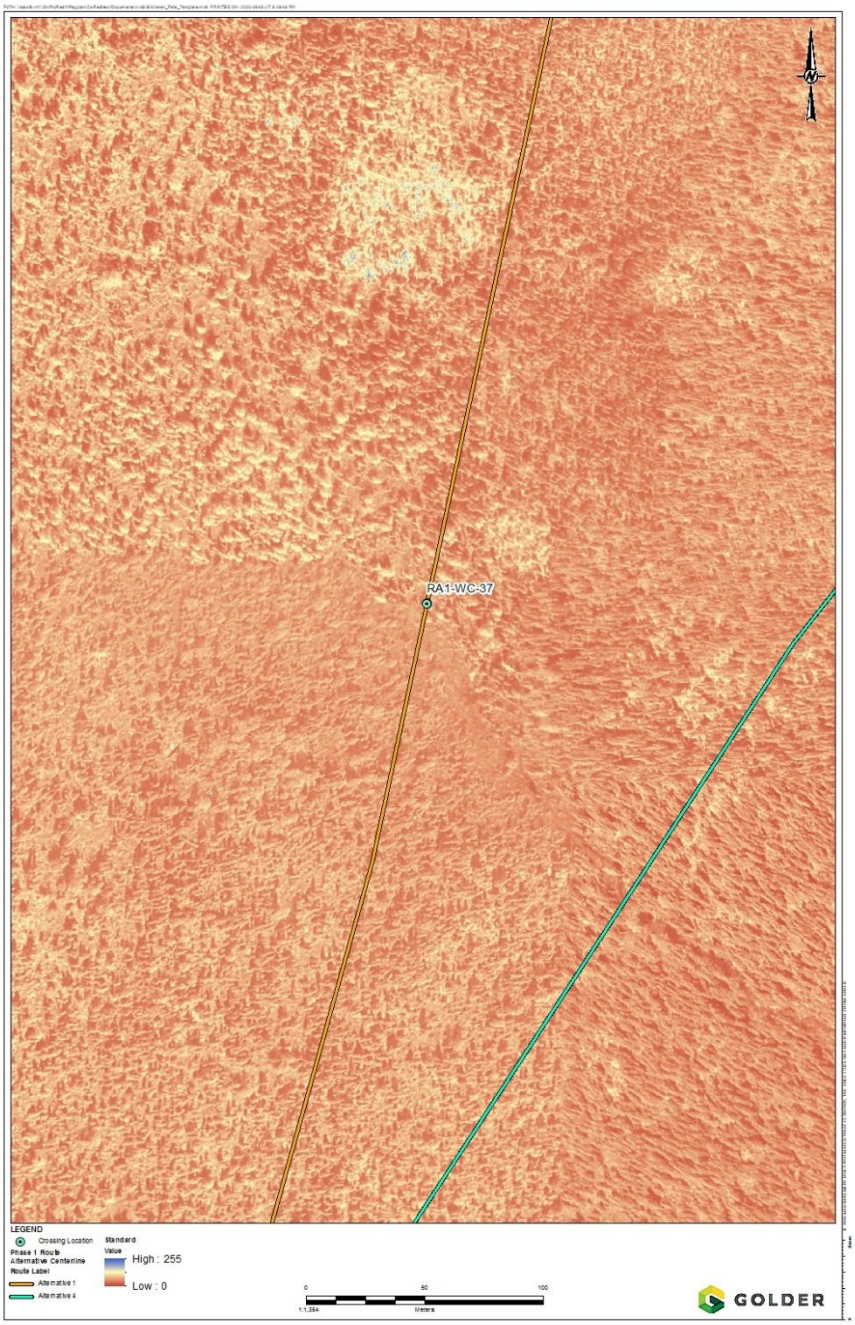



LiDAR imagery at crossing RA1-WC-35; red/blue contrast

| **CROSSING ID: RA1-WC-37** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 525524E 5714913N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-37 | Aerial photograph of crossing RA1-WC-37 |

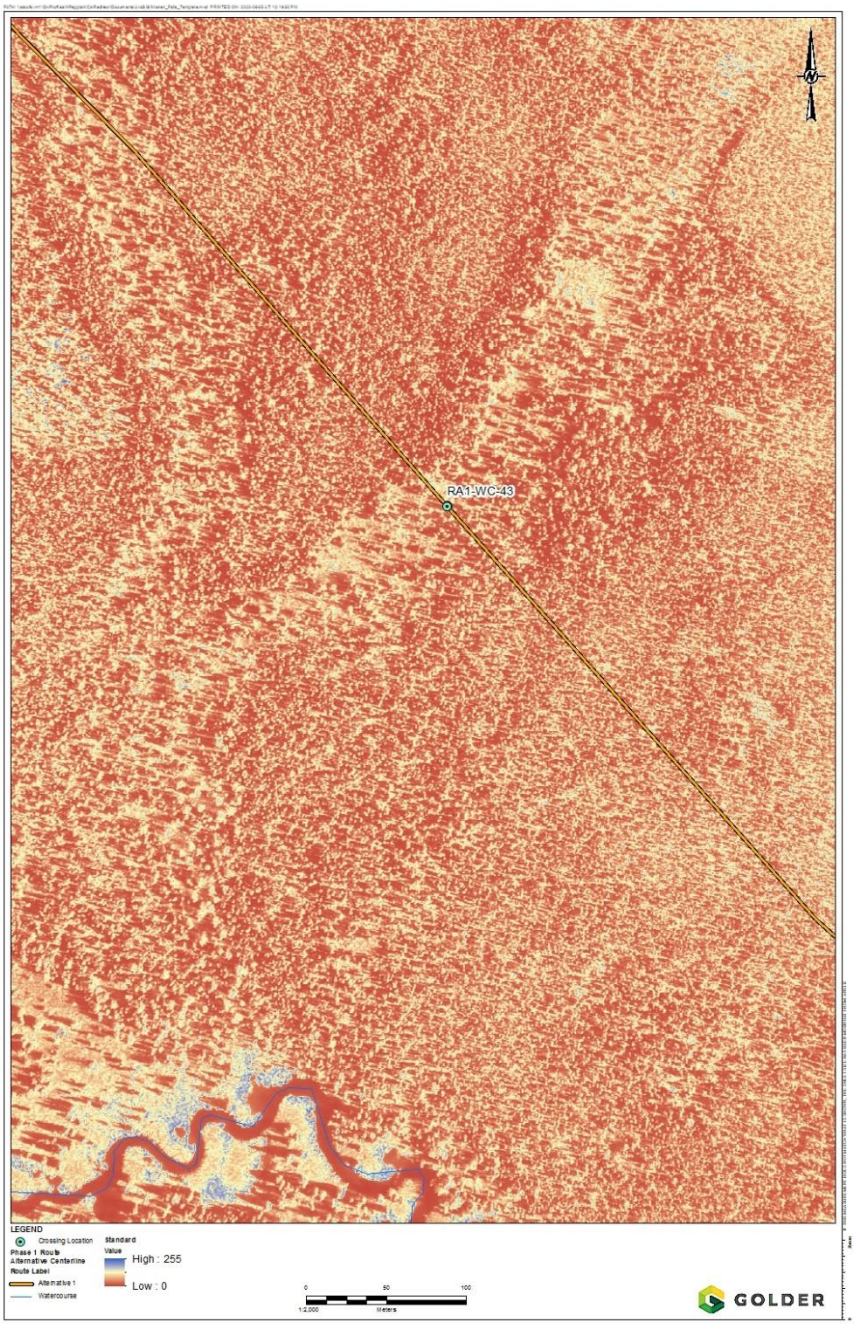
| **CROSSING ID: RA1-WC-37** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 525524E 5714913N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-37

| **CROSSING ID: RA1-WC-37** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 525524E 5714913N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-37; red/blue contrast |

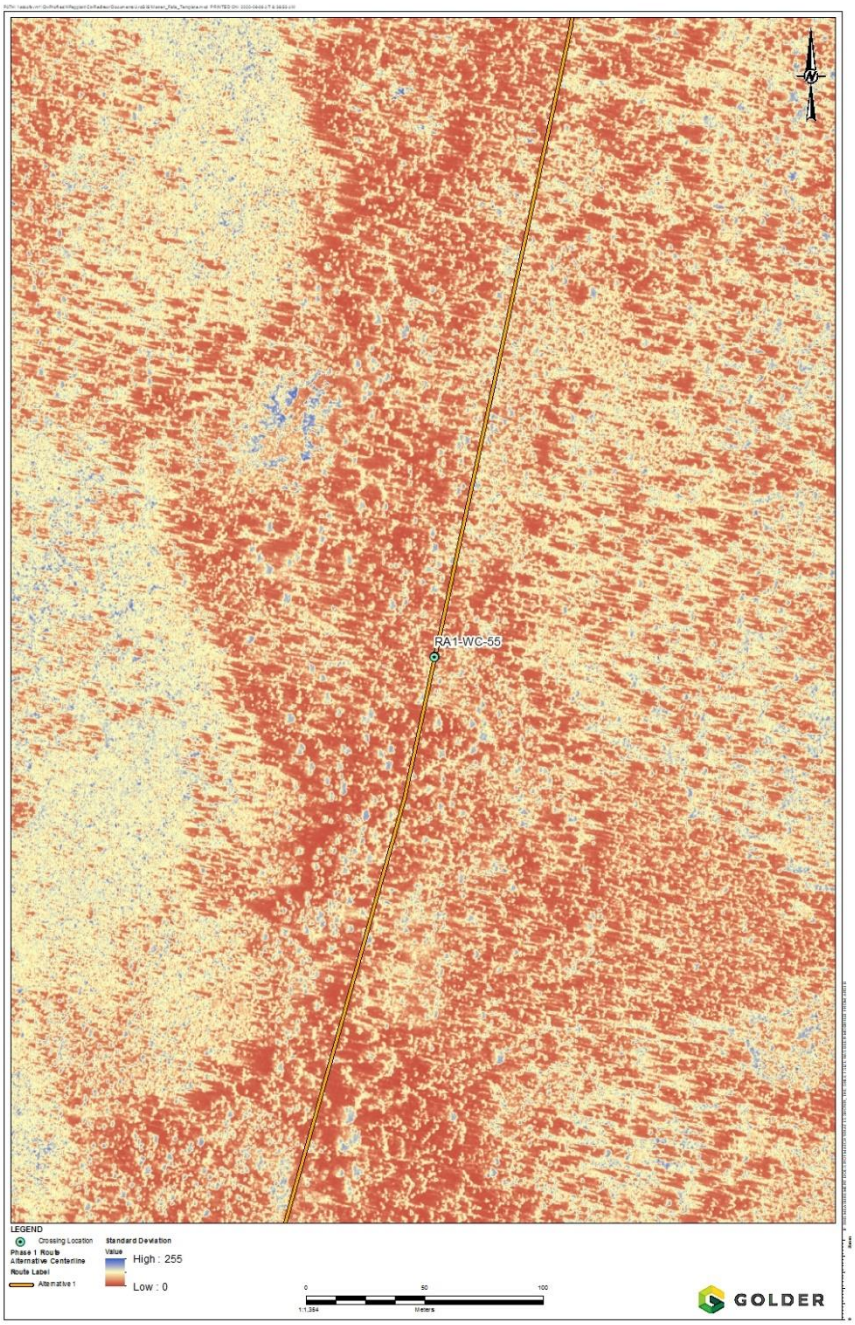
| **CROSSING ID: RA1-WC-43** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 518281E 5722675N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) – No photos, see LiDAR |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-43

| **CROSSING ID: RA1-WC-43** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 518281E 5722675N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-43; red/blue contrast |

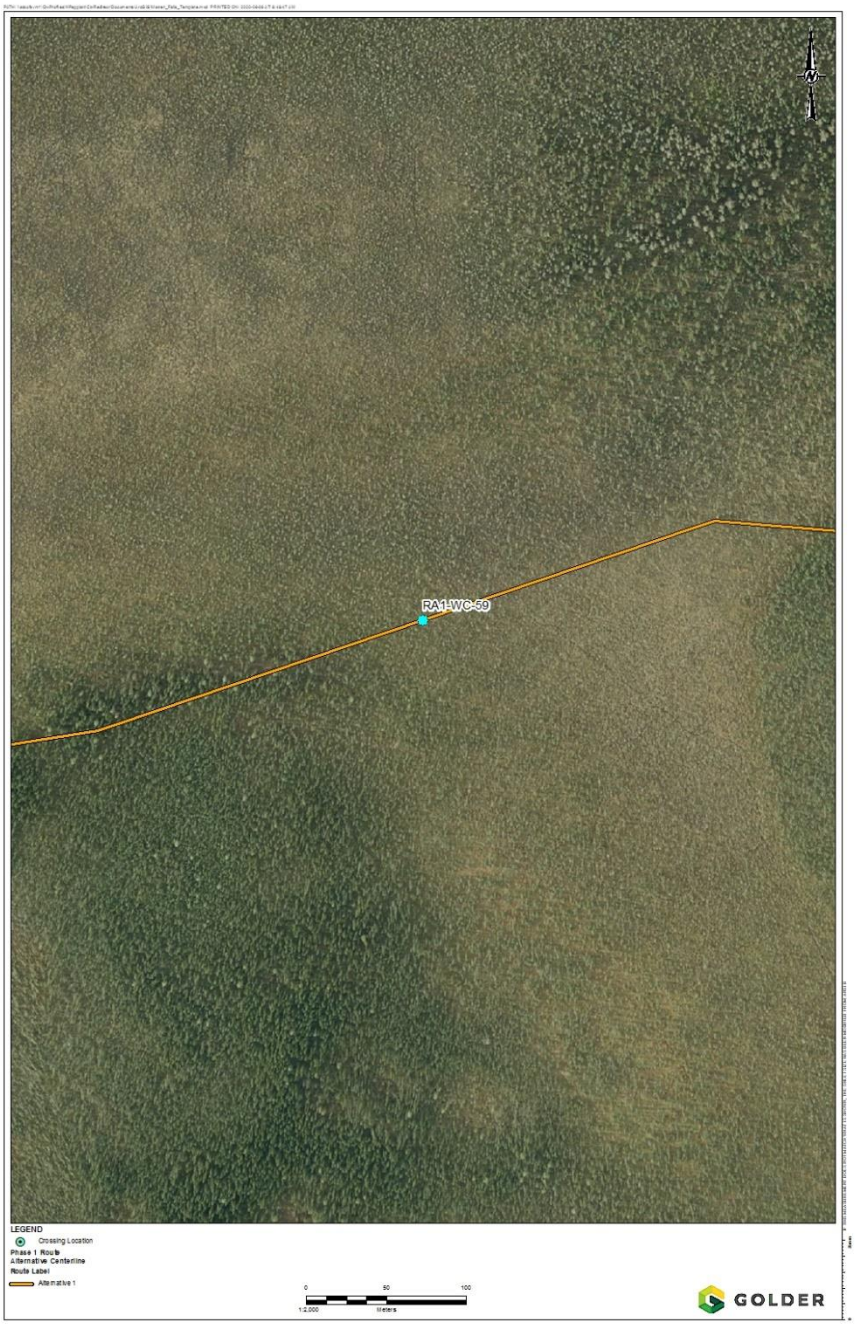
| **CROSSING ID: RA1 WC 55** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 511484E 5734824N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) – No photos, see LiDAR |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-55

| **CROSSING ID: RA1 WC 55** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 511484E 5734824N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-55; red/blue contrast |

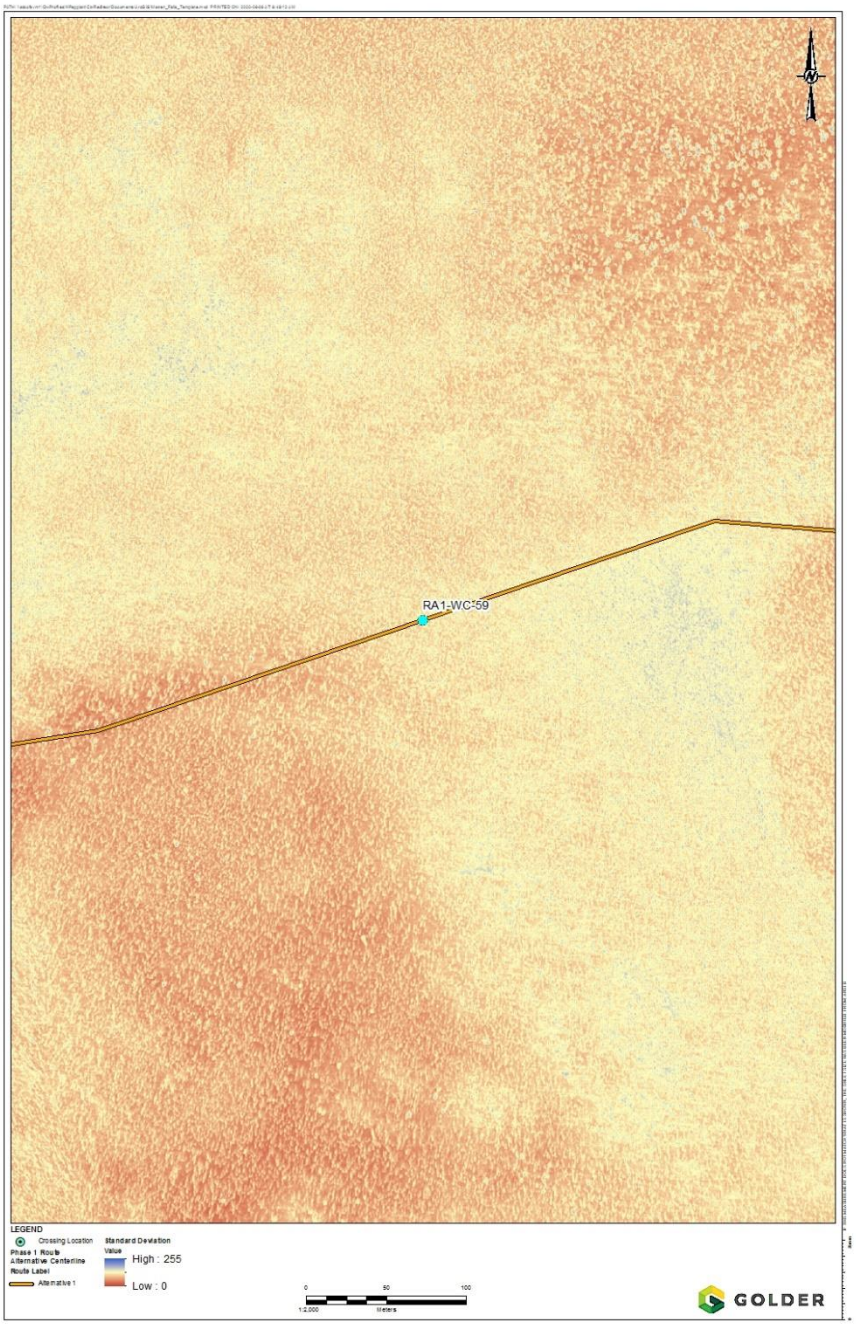
| **CROSSING ID: RA1-WC-59** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 521927E 5742953N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-WC-59 |

| **CROSSING ID: RA1-WC-59** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 521927E 5742953N |
| **DATA SOURCE:** LiDAR Imagery |

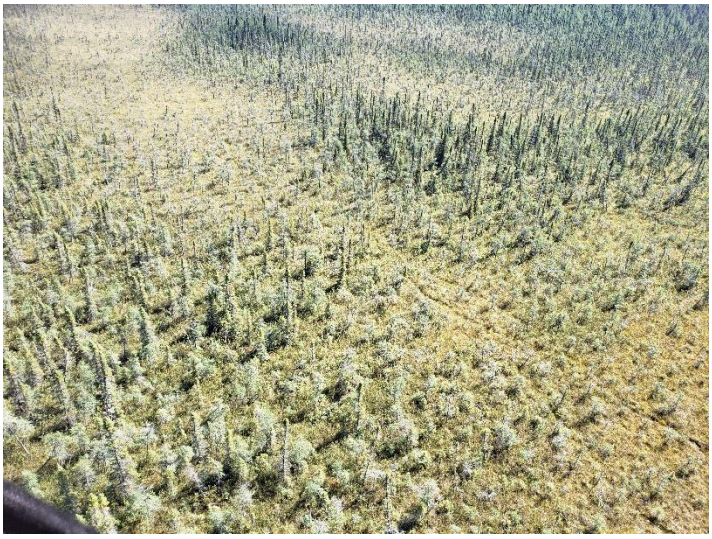



LiDAR imagery at crossing RA1-WC-59

| **CROSSING ID: RA1-WC-59** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 521927E 5742953N |
| **DATA SOURCE:** LiDAR Imagery |

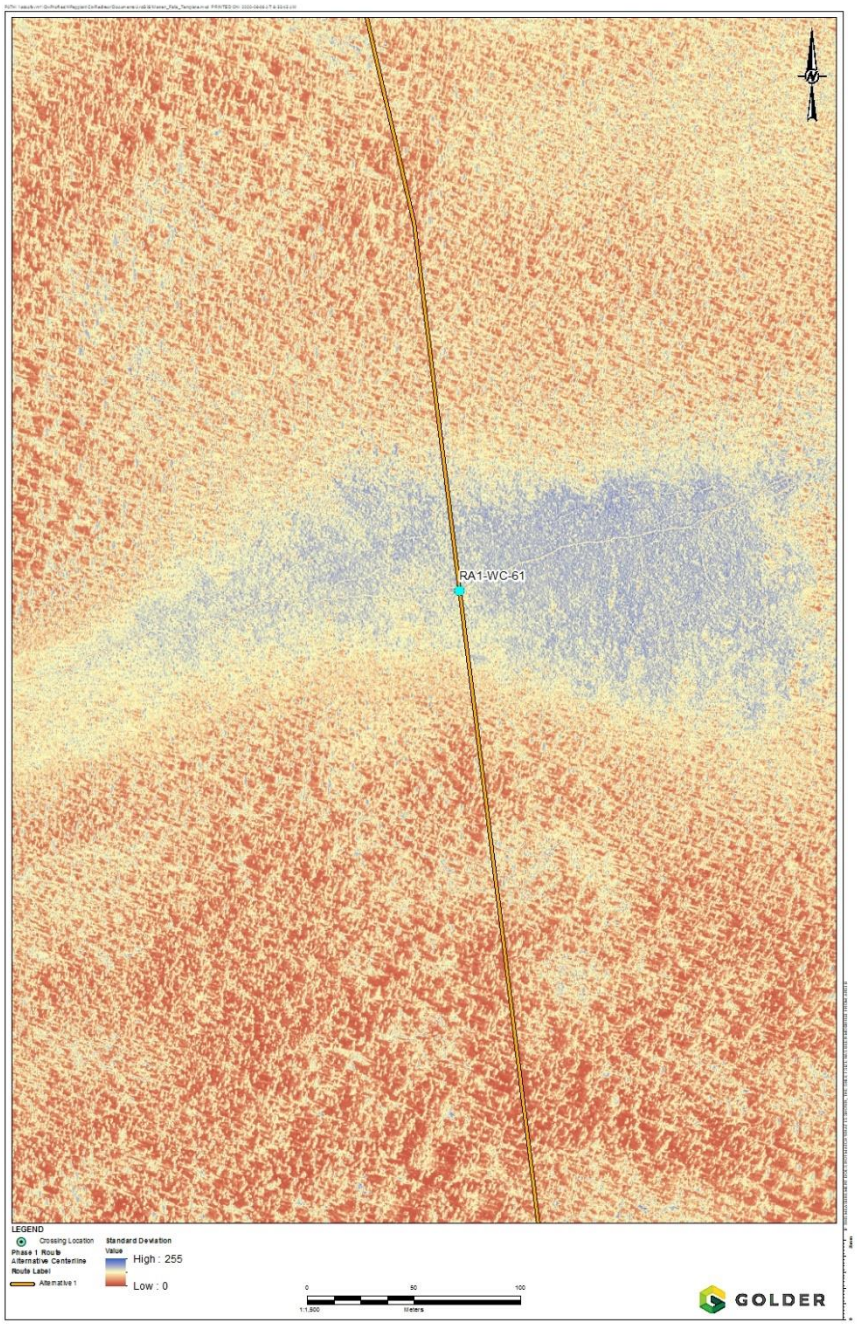



LiDAR imagery at crossing RA1-WC-59; red/blue contrast

| **CROSSING ID: RA1-WC-61** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523202E 5742193N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
|  |
| Aerial photograph of crossing RA1-WC-61 |

| **CROSSING ID: RA1-WC-61** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523202E 5742193N |
| **DATA SOURCE:** LiDAR Imagery |
| |
| LiDAR imagery at crossing RA1-WC-61 |

| **CROSSING ID: RA1-WC-61** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523202E 5742193N |
| **DATA SOURCE:** LiDAR Imagery |

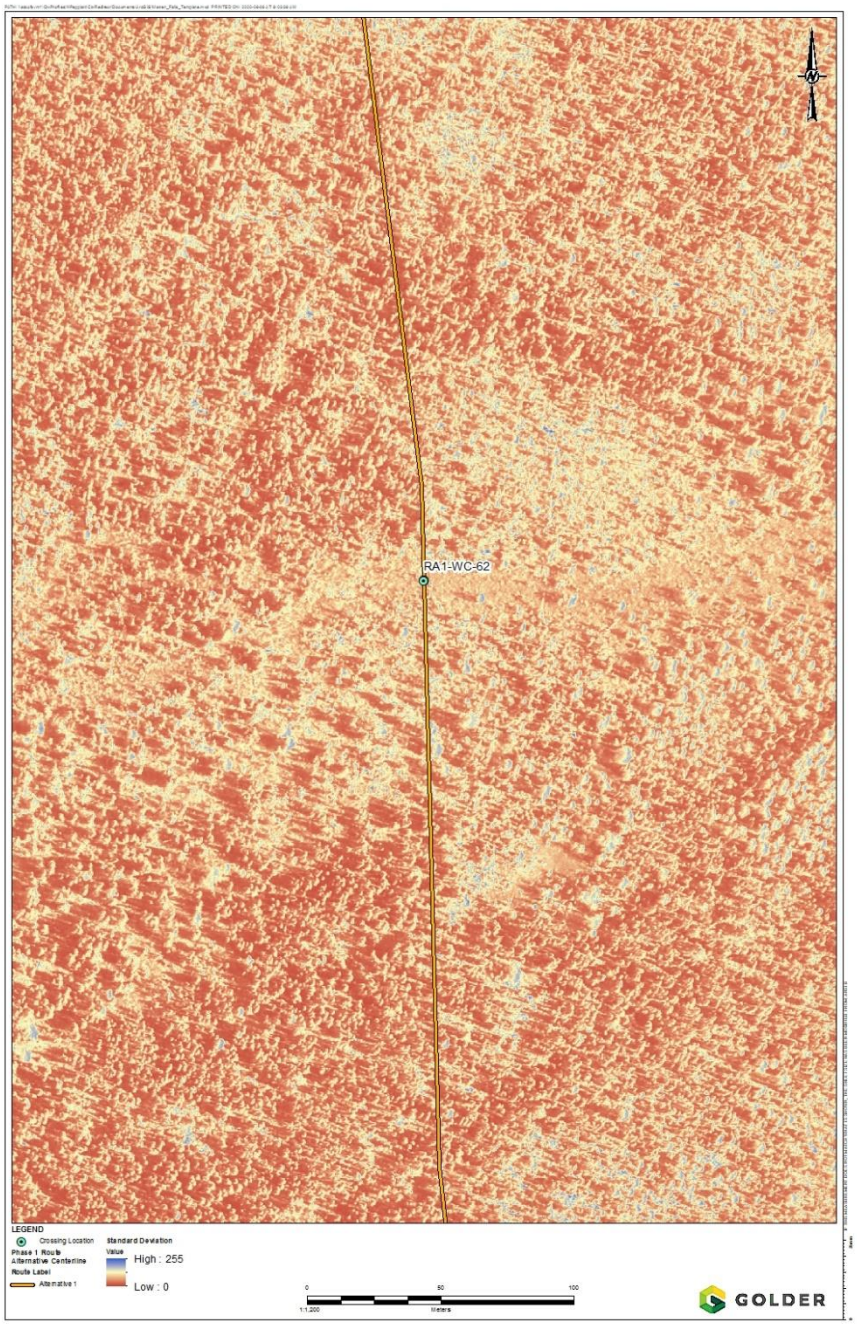



LiDAR imagery at crossing RA1-WC-61; red/blue contrast

| **CROSSING ID: RA1-WC-62** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 523242E 5741847N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA1-WC-62 | Aerial photograph of crossing RA1-WC-62 |

| **CROSSING ID: RA1-WC-62** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523242E 5741847N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-62

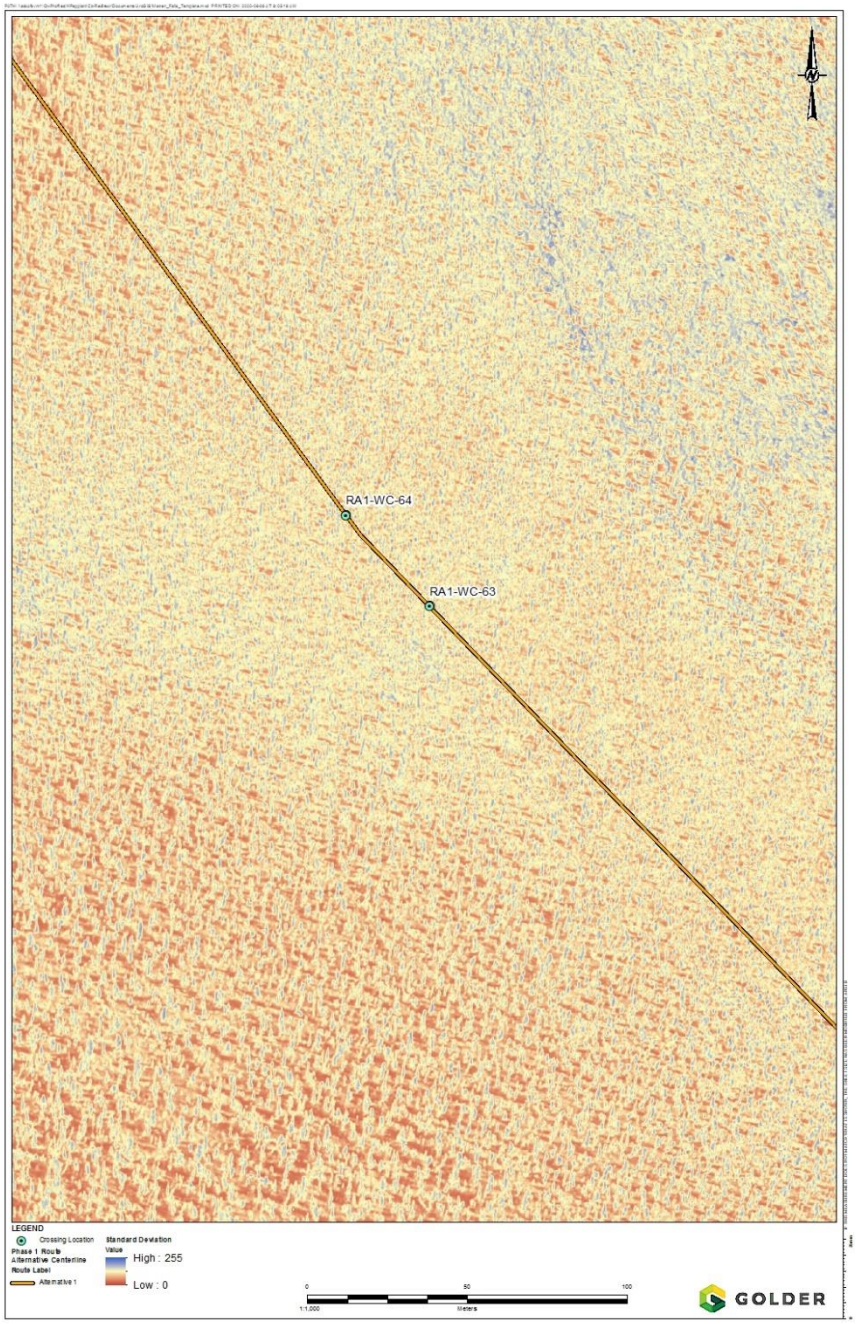
| **CROSSING ID: RA1-WC-62** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523242E 5741847N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-62; red/blue contrast |

| **CROSSING ID: RA1-WC-63, RA1-WC-64** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523650E 5740383N, 523623E 5740411N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA1-WC-63 |
| |
| Aerial photograph of crossing RA1-WC-64 |

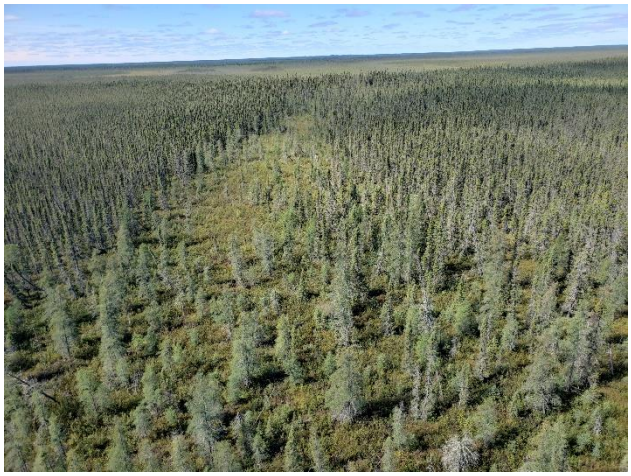
| **CROSSING ID: RA1-WC-63, RA1-WC-64** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523650E 5740383N, 523623E 5740411N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery of crossings RA1-WC-63, RA1-WC-64

| **CROSSING ID: RA1-WC-63, RA1-WC-64** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 523650E 5740383N, 523623E 5740411N |

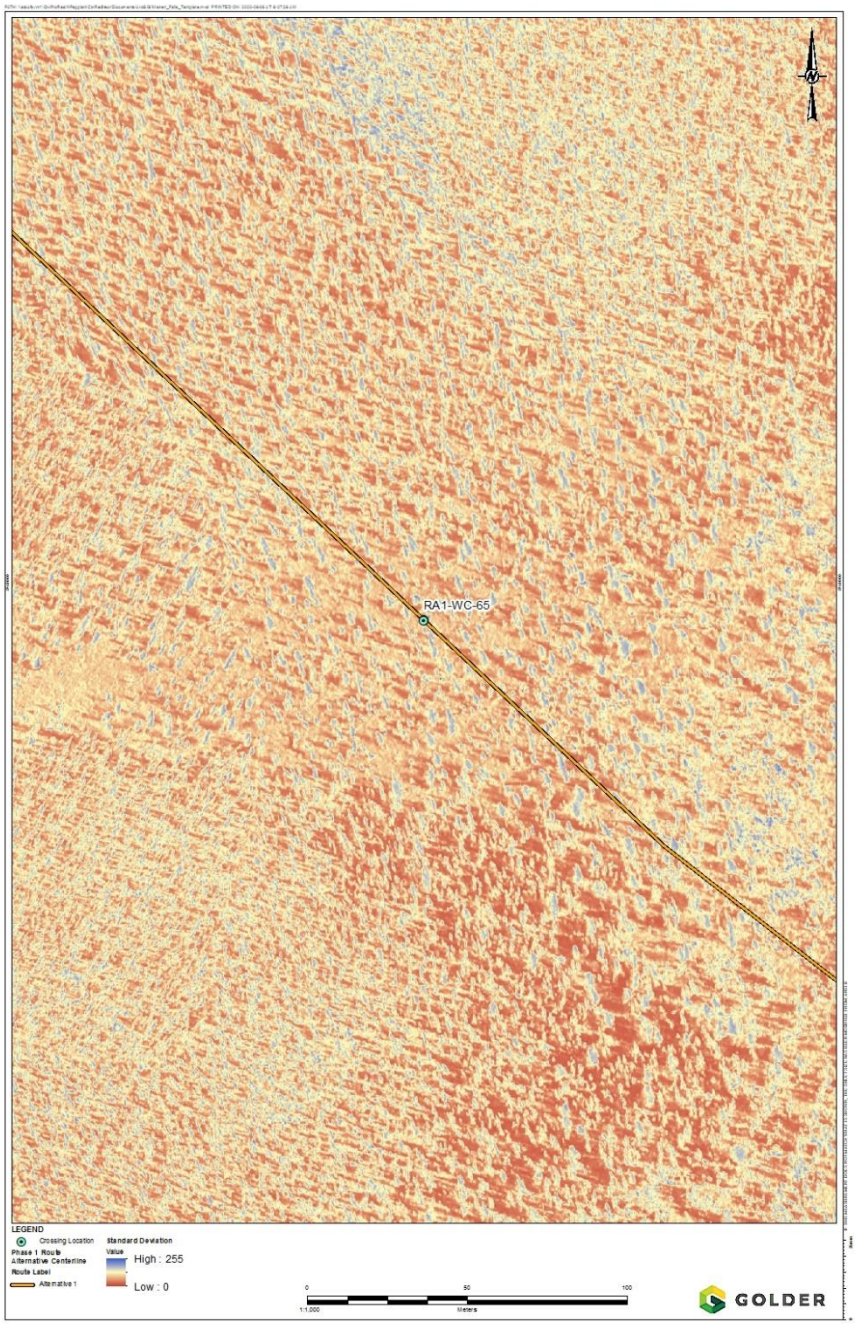


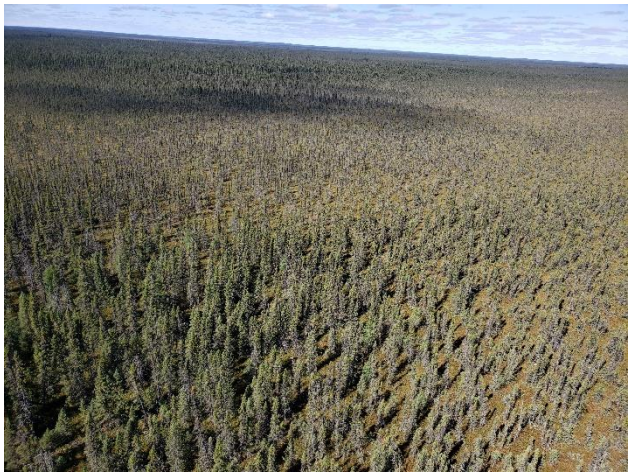

LiDAR imagery of crossings RA1-WC-63, RA1-WC-64; red/blue contrast

| **CROSSING ID: RA1-WC-65** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 524043E 5739988N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| |  |
| Aerial photograph of crossing RA1-WC-65 | Aerial photograph of crossing RA1-WC-65 |

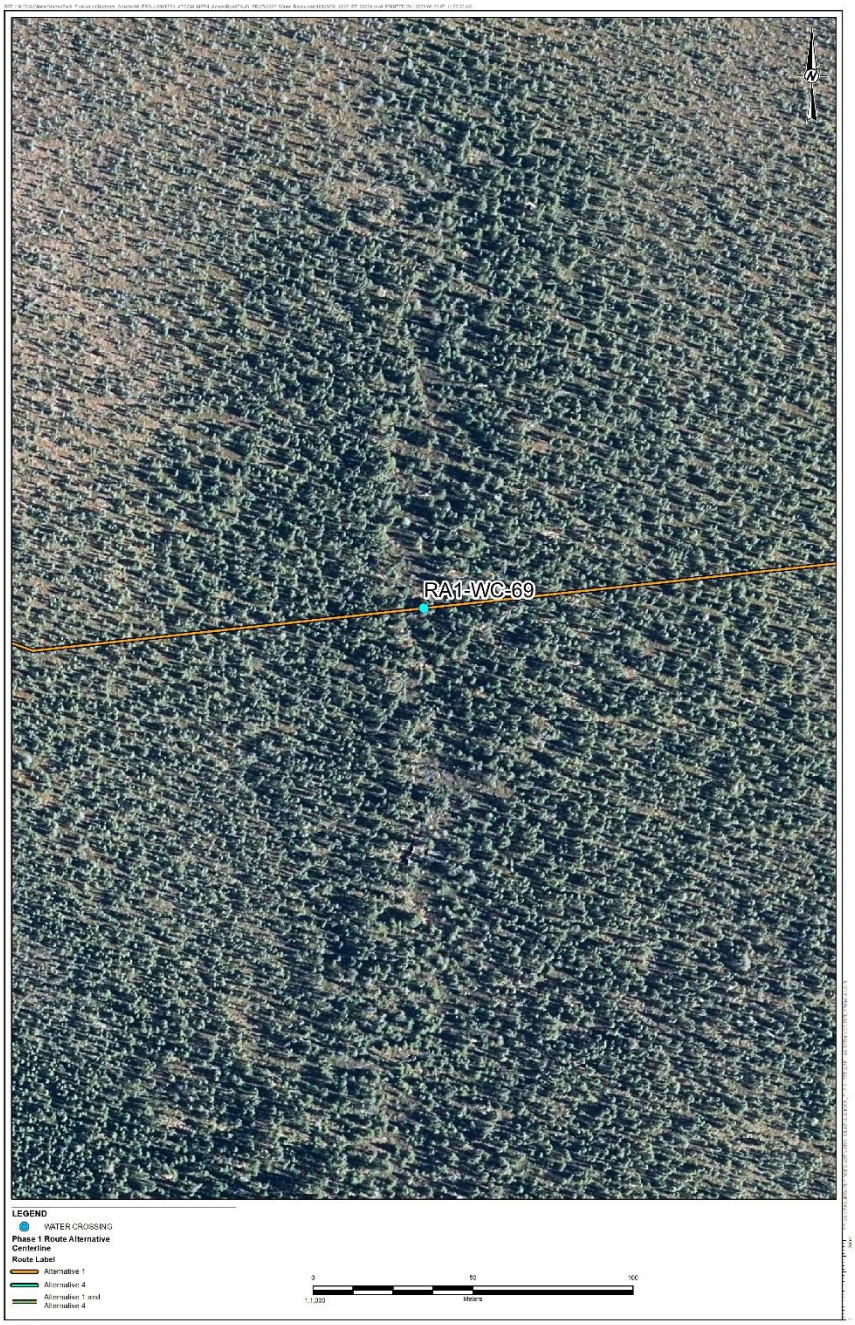
| **CROSSING ID: RA1-WC-65** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 524043E 5739988N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA1-WC-65

| **CROSSING ID: RA1-WC-65** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 524043E 5739988N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA1-WC-65; red/blue contrast |

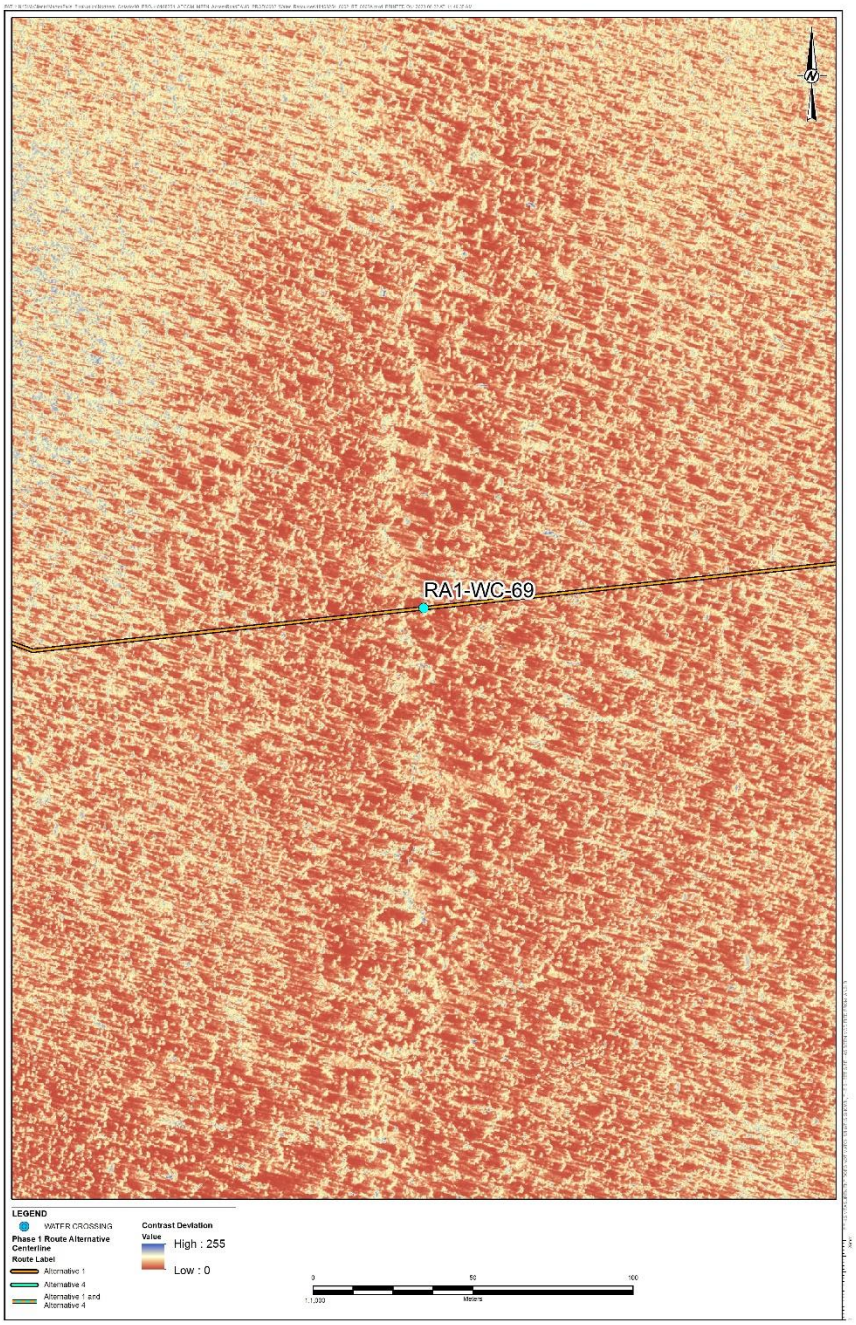
| **CROSSING ID: RA1-WC-69** | |
|---|---|
| **ROUTE:** Alternative 1 | |
| **UTM COORDINATES:** (Zone 16) 534369E 5740229N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| |  |
| Aerial photograph of crossing RA1-WC-69 | Aerial photograph of crossing RA1-WC-69 |

| **CROSSING ID: RA1-WC-69** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 534369E 5740229N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-69

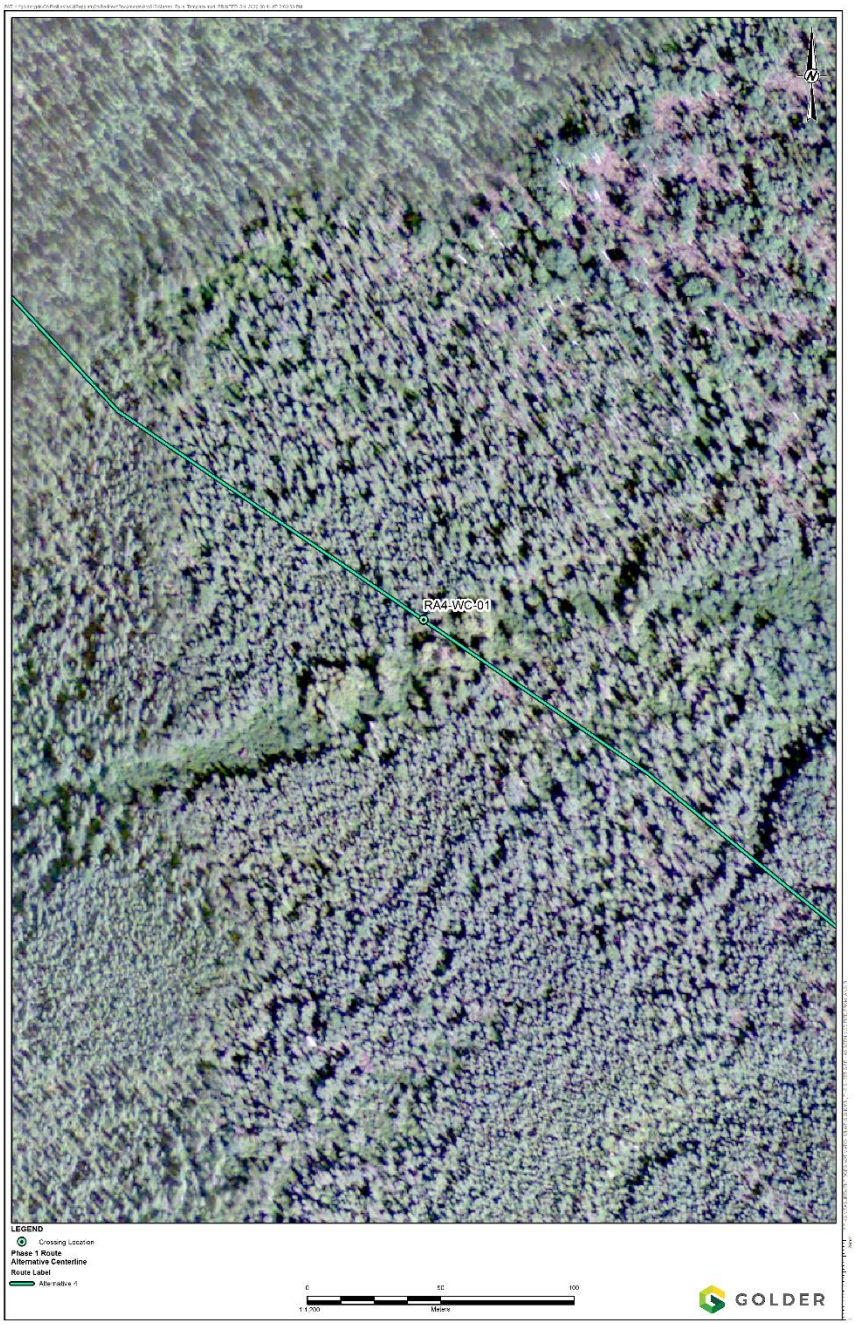
| **CROSSING ID: RA1-WC-69** |
|---|
| **ROUTE:** Alternative 1 |
| **UTM COORDINATES:** (Zone 16) 534369E 5740229N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA1-WC-69; red/blue contrast

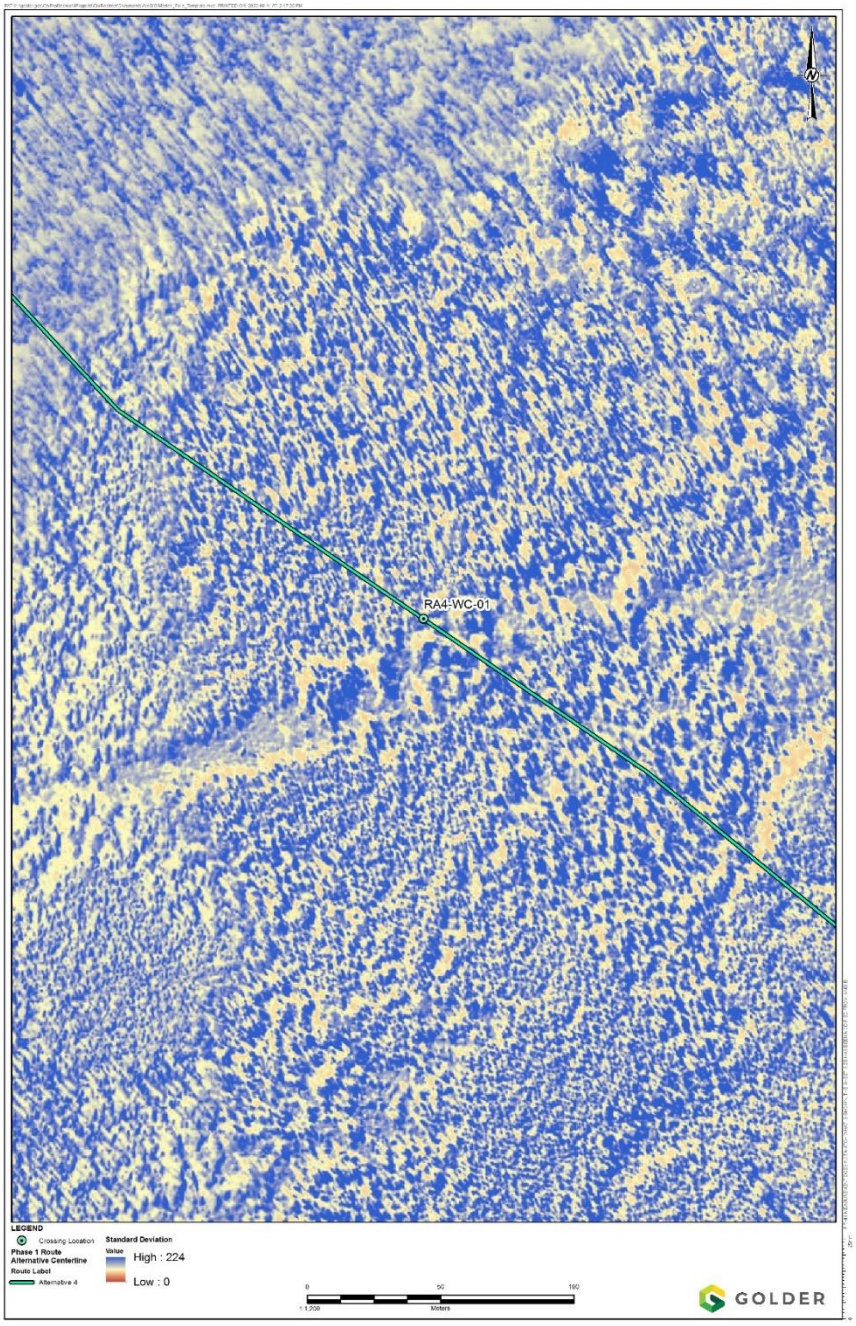
| **CROSSING ID: RA4-WC-01** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 523541E 5621344N | |
| **DATA SOURCE:** Aerial Reconnaissance (6 September 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-01 | Aerial photograph of crossing RA4-WC-01 |

| **CROSSING ID: RA4-WC-01** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 523541E 5621344N |
| **DATA SOURCE:** LiDAR Imagery |

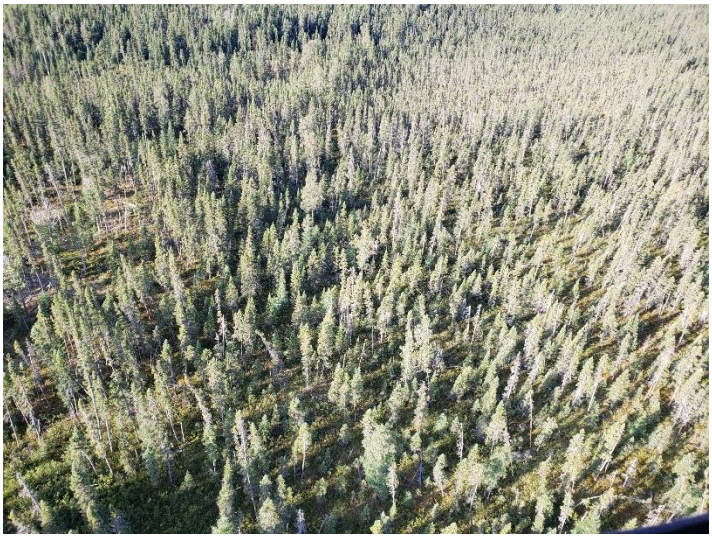



LiDAR imagery at crossing RA4-WC-01

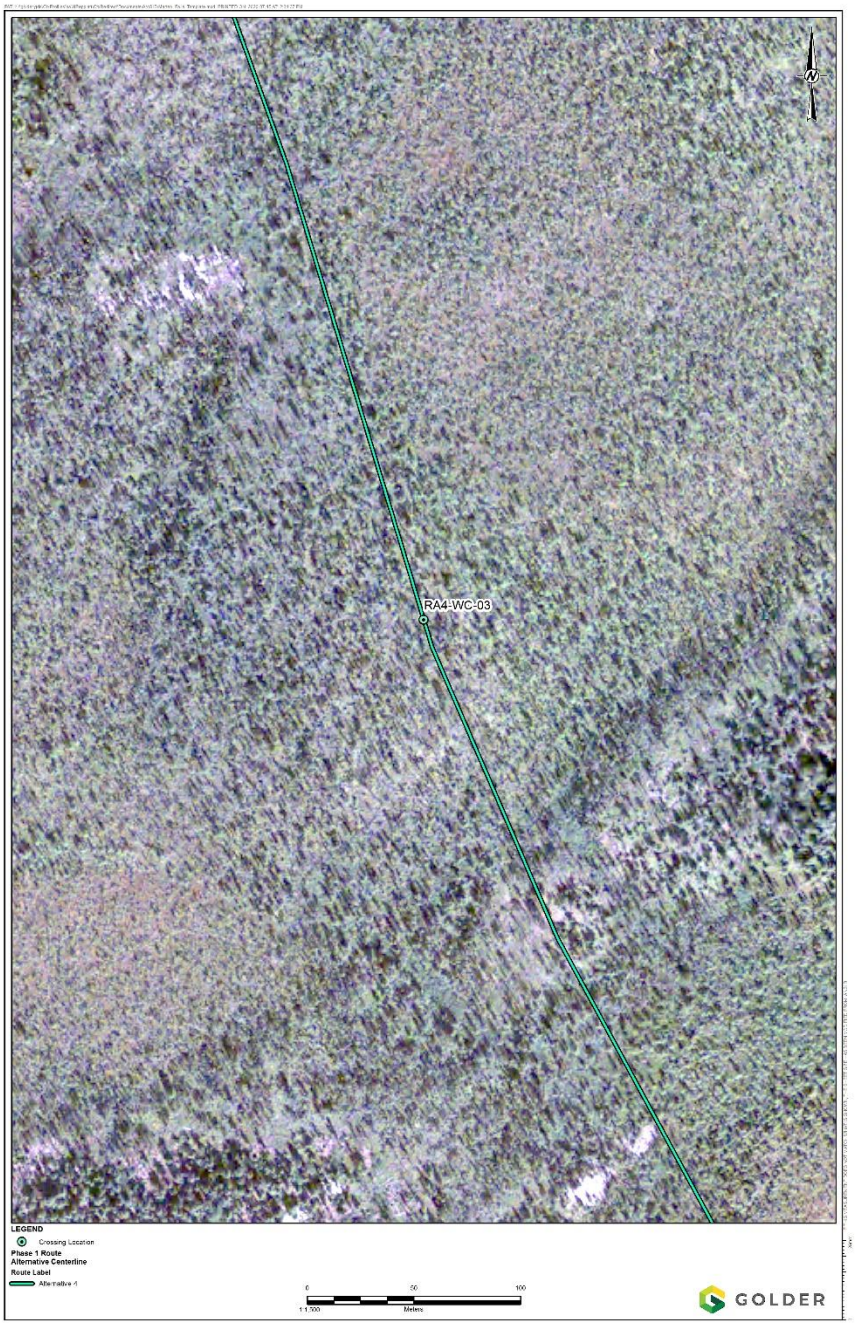
| **CROSSING ID: RA4-WC-01** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 523541E 5621344N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-01; red/blue contrast

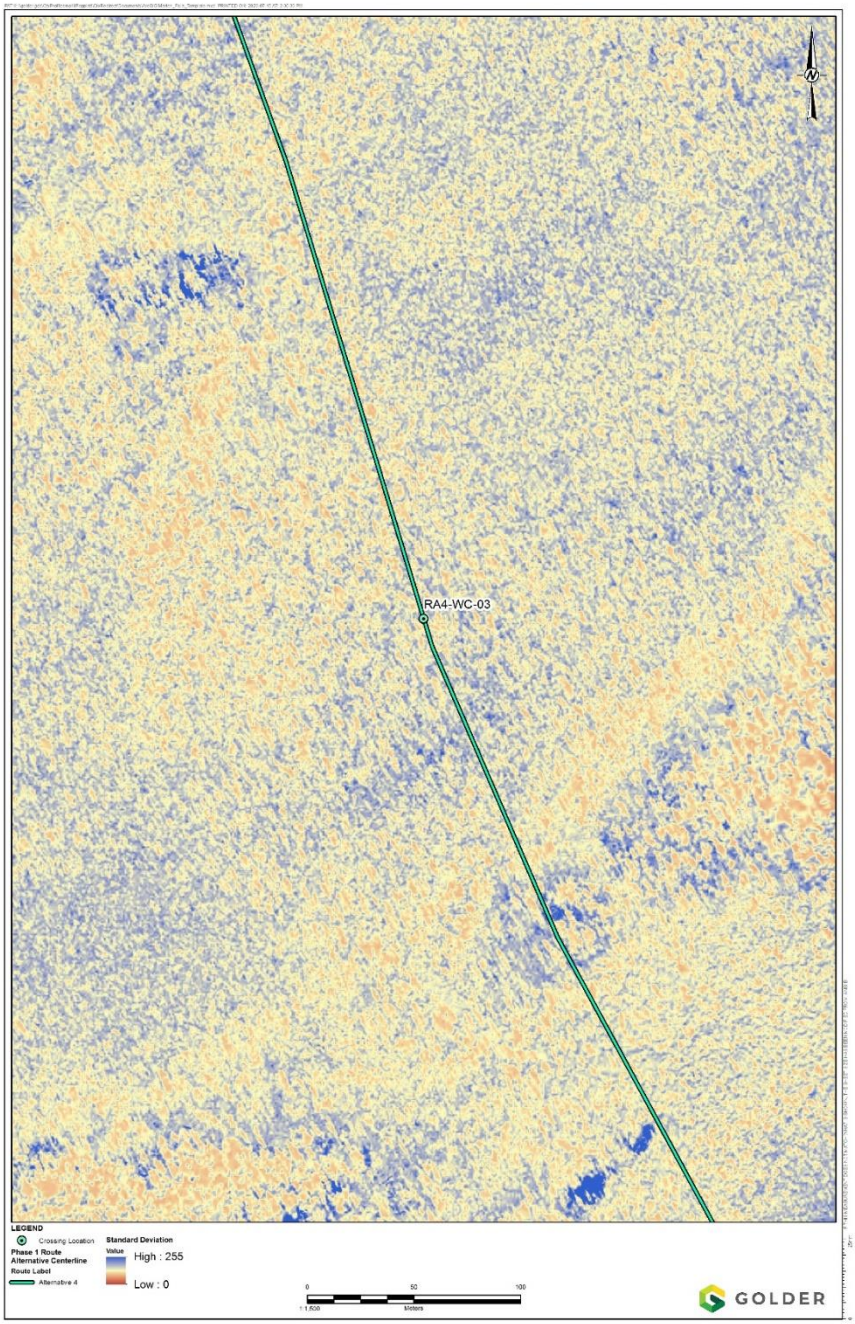
| **CROSSING ID: RA4-WC-03** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 521041E 5625041N |
| **DATA SOURCE:** Aerial Reconnaissance (6 September 2019) |
|  |
| Aerial photograph of crossing RA4-WC-03 |

| **CROSSING ID: RA4-WC-03** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 521041E 5625041N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-03

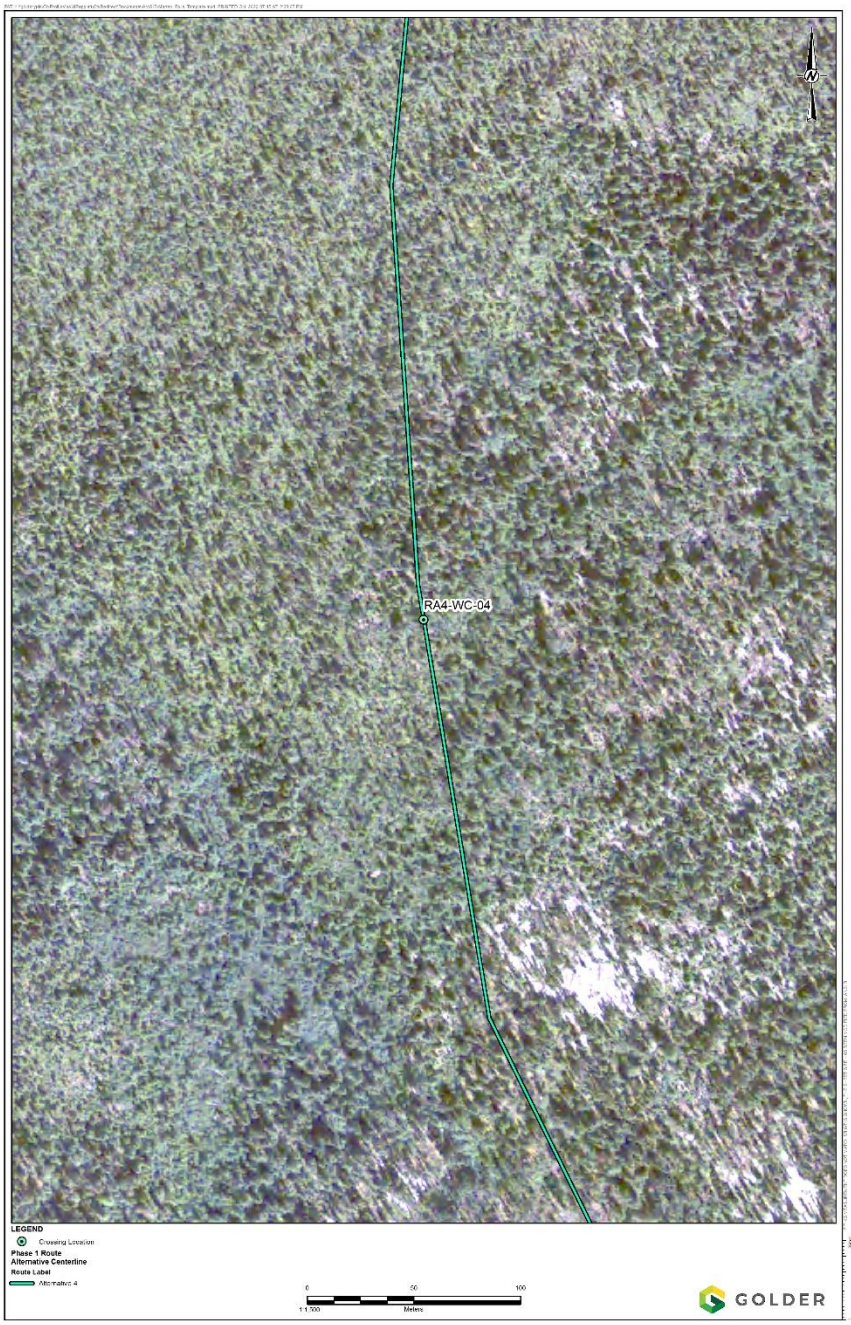
| **CROSSING ID: RA4-WC-03** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 521041E 5625041N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-03; red/blue contrast

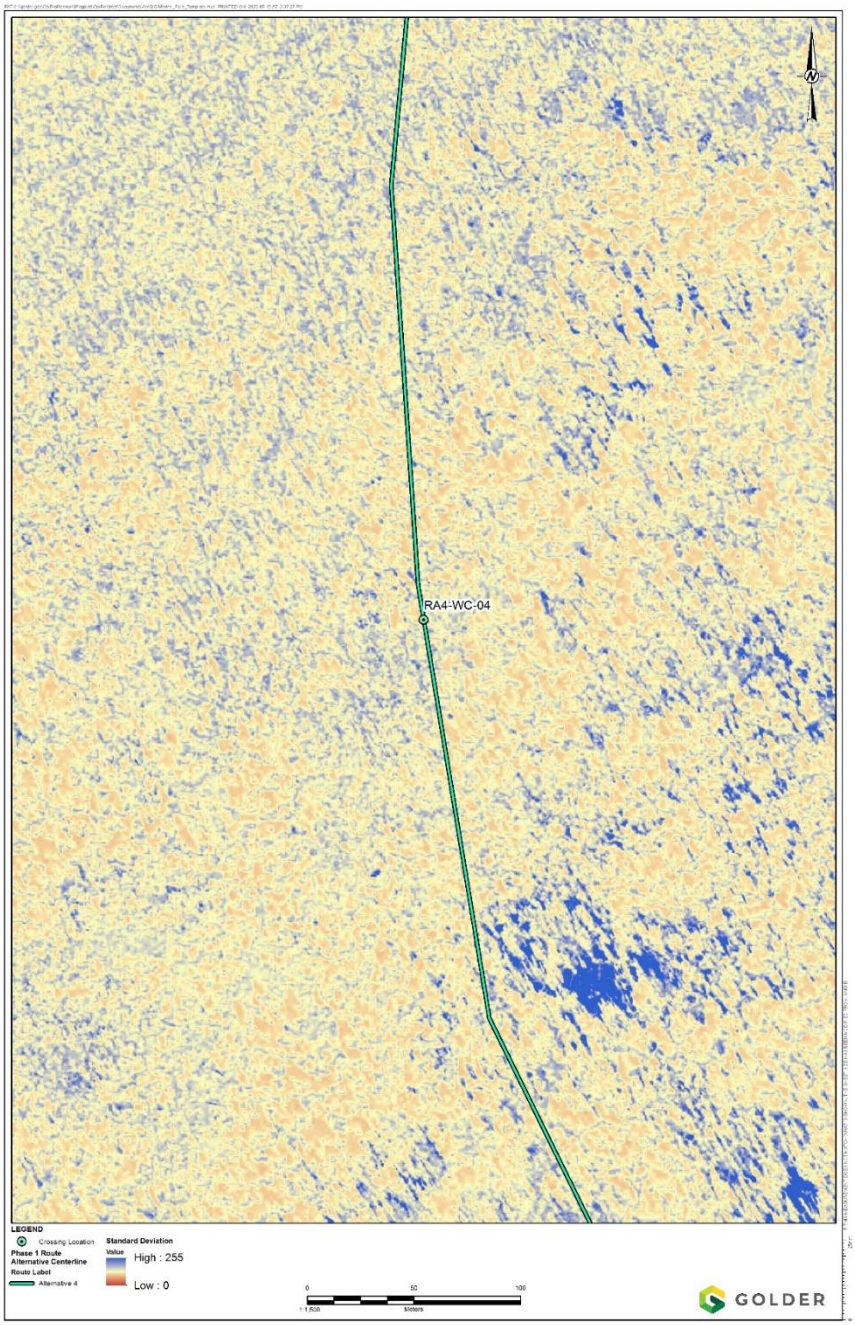
| **CROSSING ID: RA4-WC-04** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 519778E 567216N | |
| **DATA SOURCE:** Aerial Reconnaissance (6 September 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-04 | Aerial photograph of crossing RA4-WC-04 |

| **CROSSING ID: RA4-WC-04** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 519778E 567216N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-04

| **CROSSING ID: RA4-WC-04** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 519778E 567216N |
| **DATA SOURCE:** LiDAR Imagery |

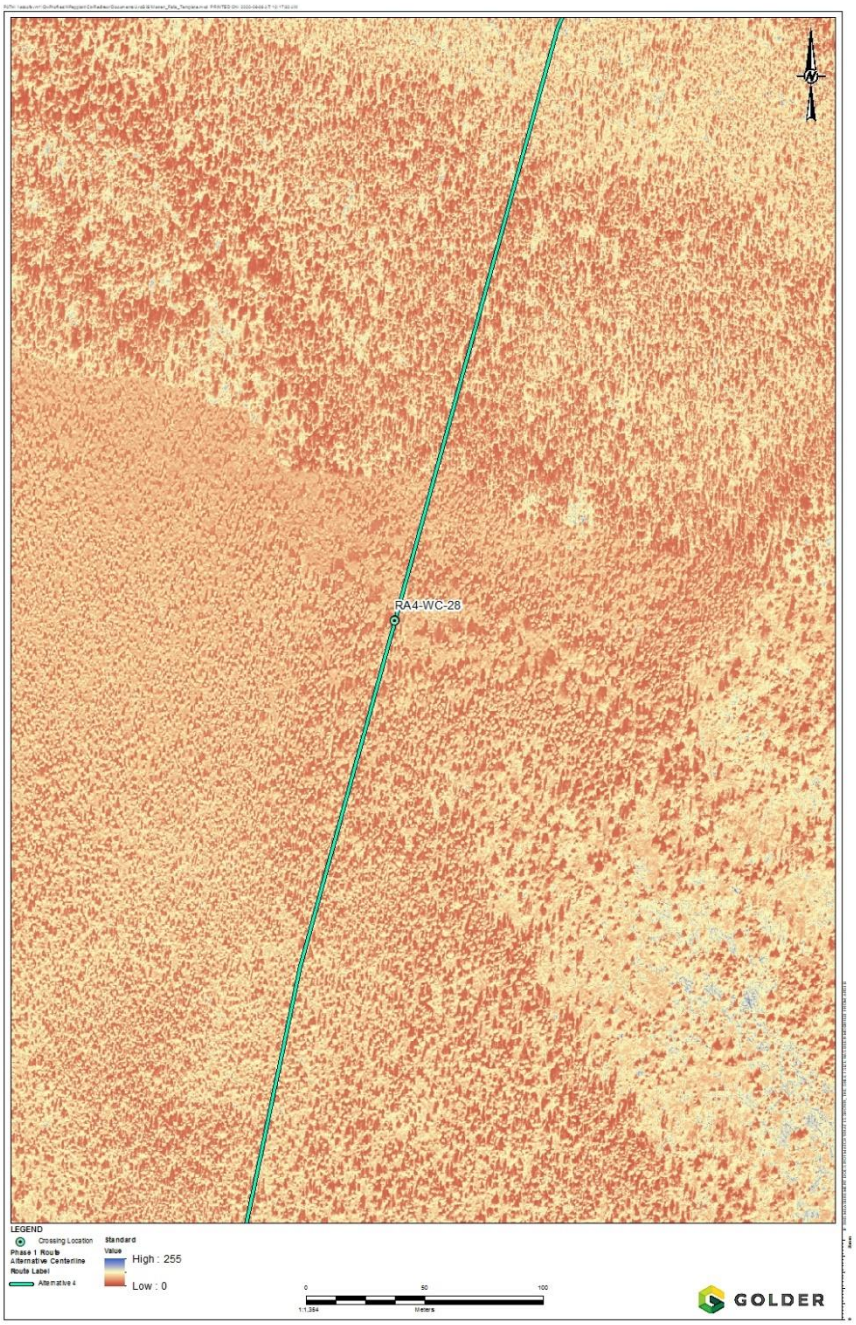



LiDAR imagery at crossing RA4-WC-04; red/blue contrast

| **CROSSING ID: RA4-WC-28** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 522327E 5694071N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-28 | Aerial photograph of crossing RA4-WC-28 |

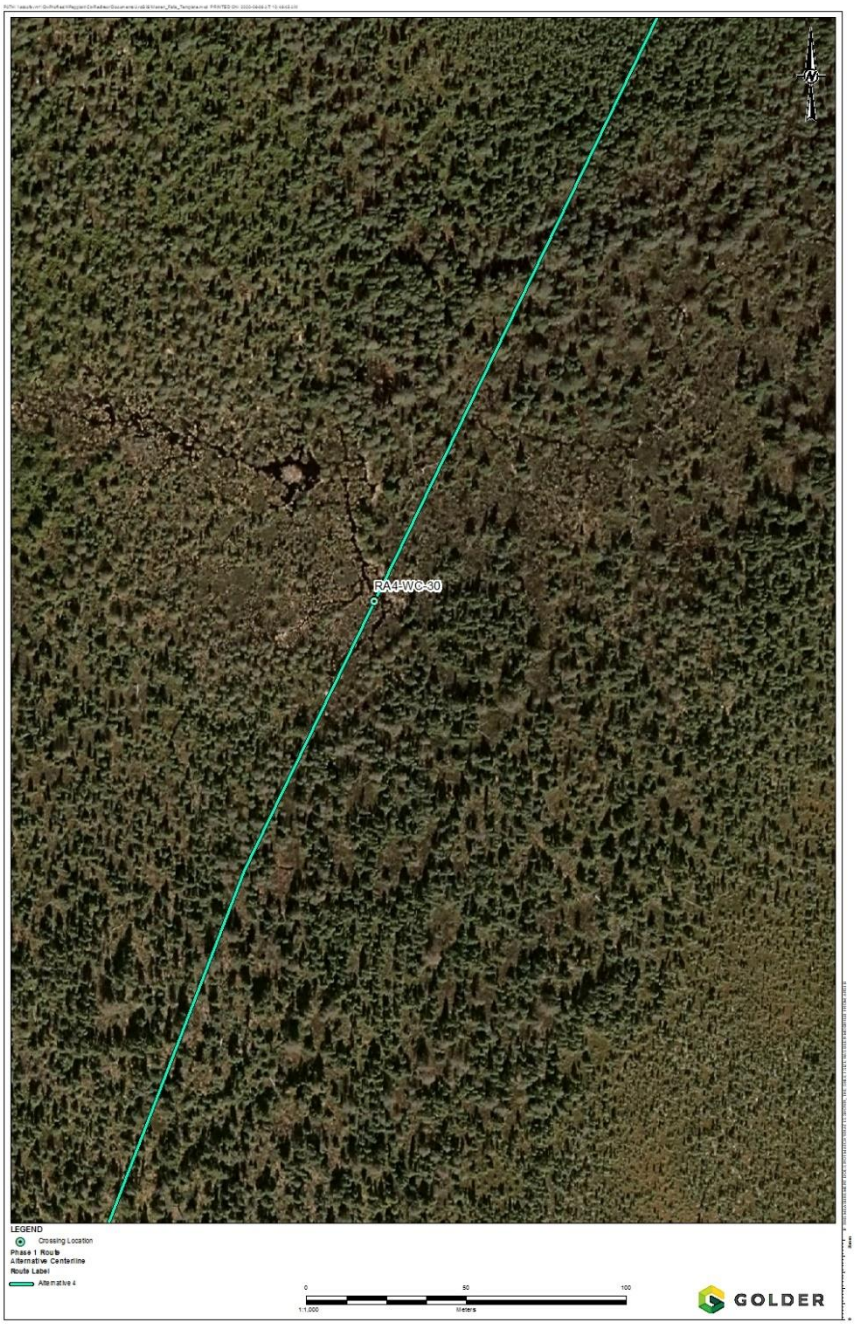
| **CROSSING ID: RA4-WC-28** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 522327E 5694071N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-28

| **CROSSING ID: RA4-WC-28** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 522327E 5694071N |
| **DATA SOURCE:** LiDAR Imagery |
|  |
| LiDAR imagery at crossing RA4-WC-28; red/blue contrast |

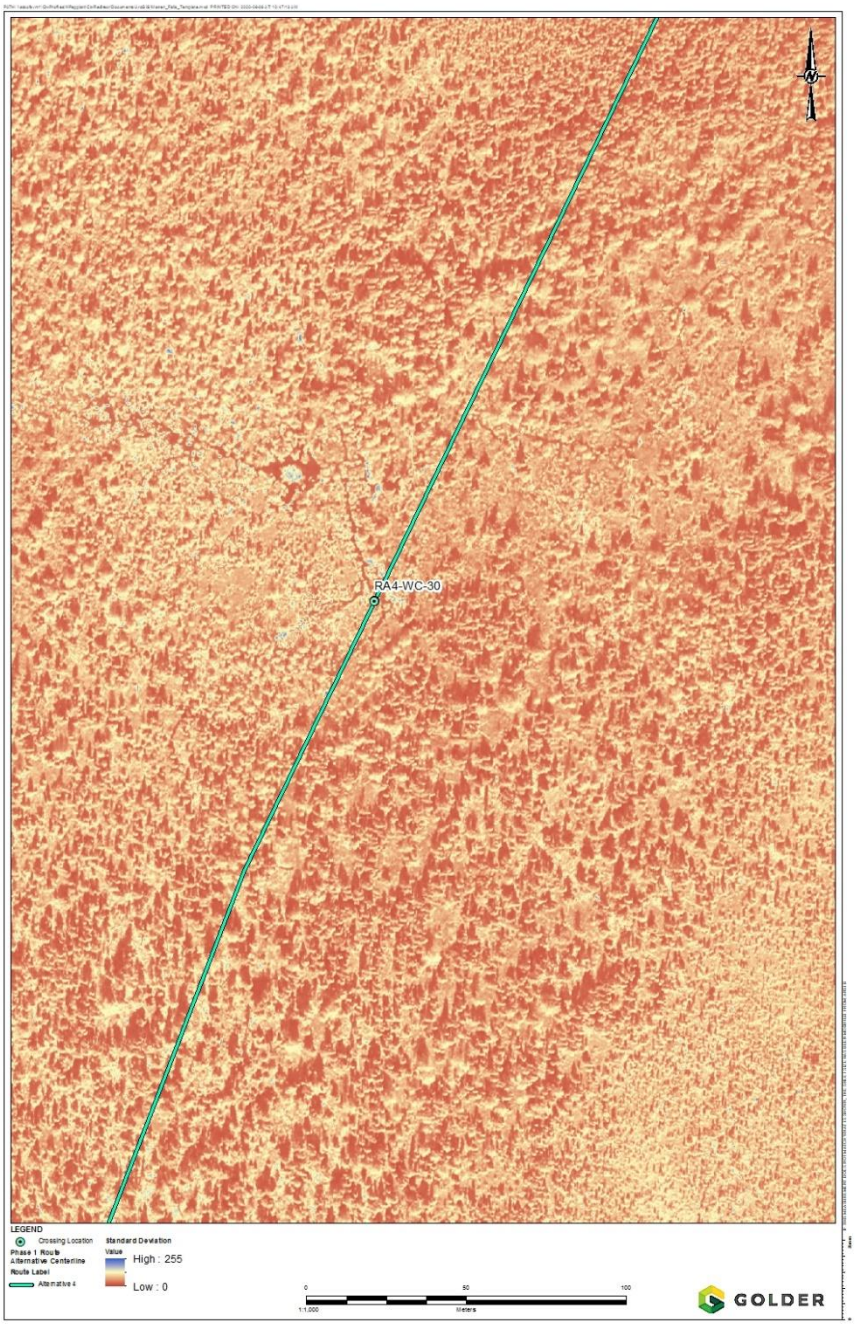
| **CROSSING ID: RA4-WC-30** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 523610E 5697164N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-30 | Aerial photograph of crossing RA4-WC-30 |

| **CROSSING ID: RA4-WC-30** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 523610E 5697164N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-30

| **CROSSING ID: RA4-WC-30** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 523610E 5697164N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-30; red/blue contrast

| **CROSSING ID: RA4-WC-33** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 524442E 5703680N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-33 | Aerial photograph of crossing RA4-WC-33 |

| **CROSSING ID: RA4-WC-33** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 524442E 5703680N |
| **DATA SOURCE:** LiDAR Imagery |

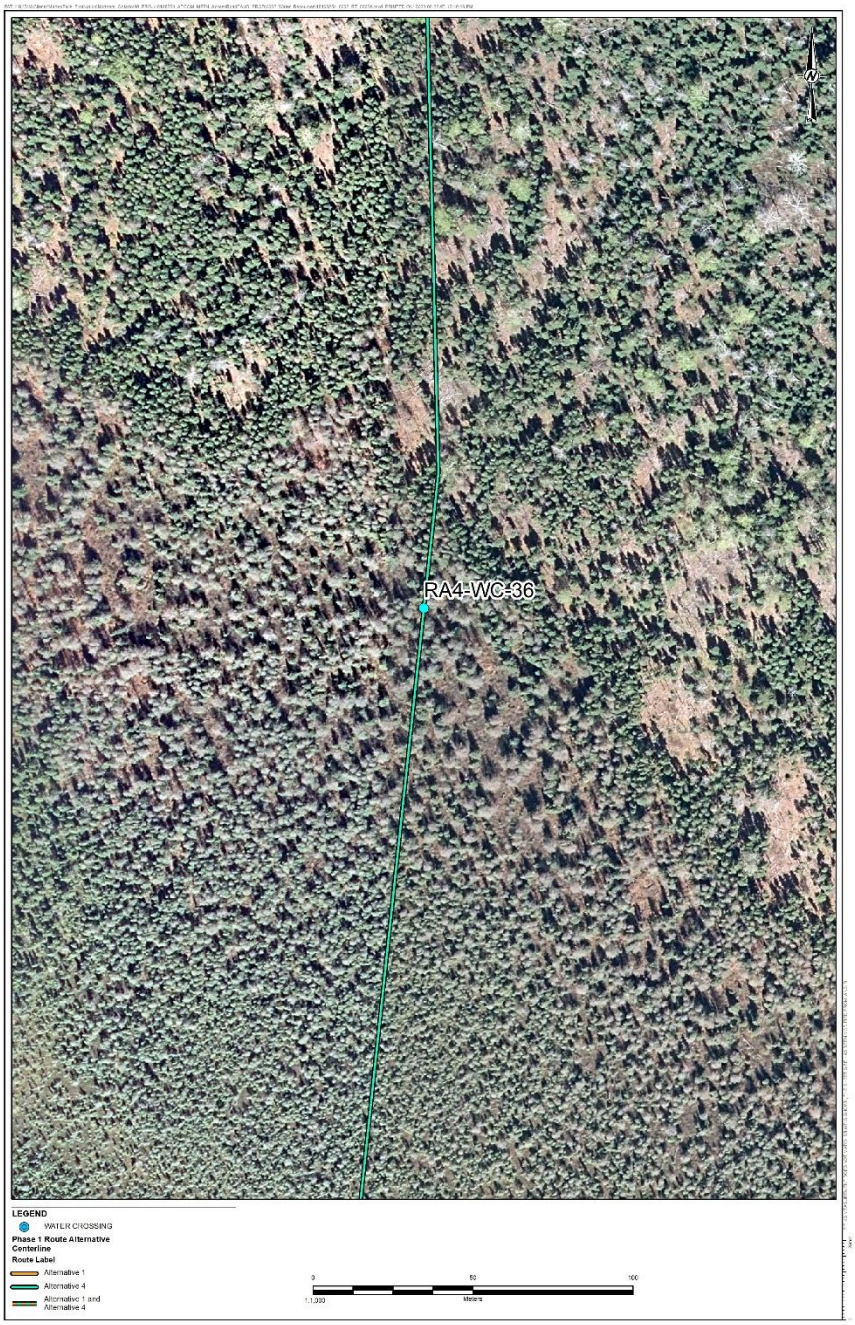
LiDAR imagery at crossing RA4-WC-33

| **CROSSING ID: RA4-WC-33** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 524442E 5703680N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-33; red/blue contrast

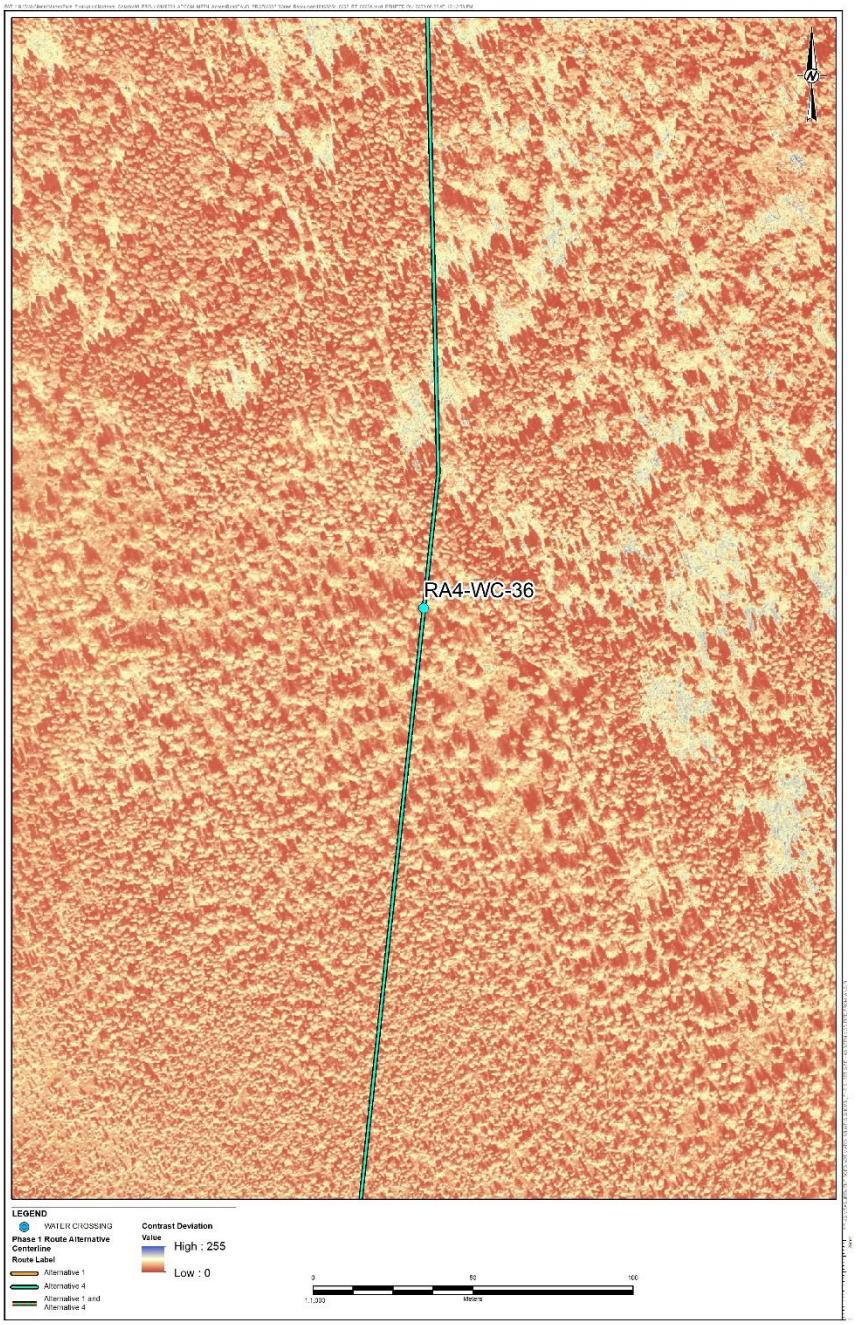
| **CROSSING ID: RA4-WC-36** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 524911E 5706281N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-36 | Aerial photograph of crossing RA4-WC-36 |

| **CROSSING ID: RA4-WC-36** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 524911E 5706281N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-36

| **CROSSING ID: RA4-WC-36** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 524911E 5706281N |
| **DATA SOURCE:** LiDAR Imagery |



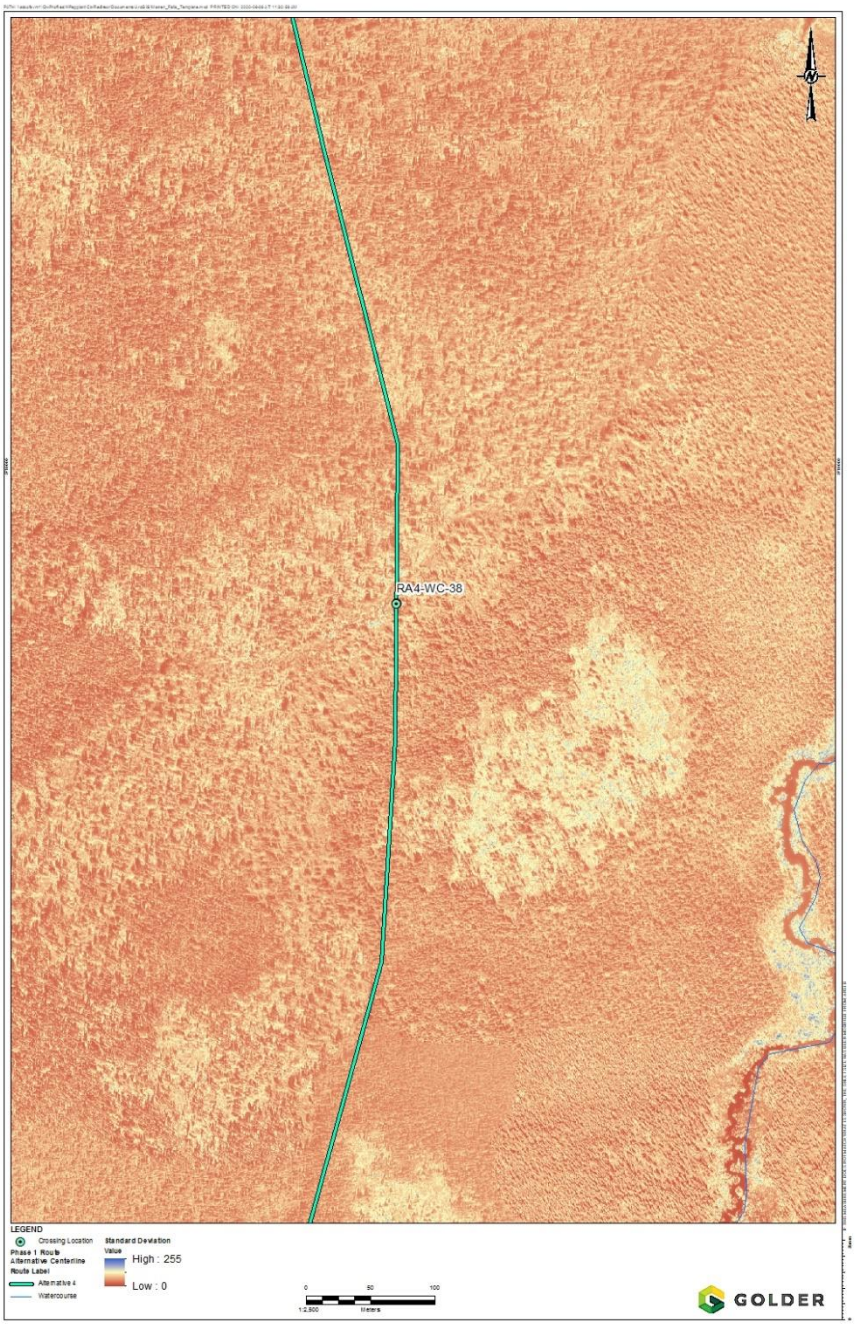

LiDAR imagery at crossing RA4-WC-36; red/blue contrast

| **CROSSING ID: RA4-WC-38** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 524820E 5709893N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-38 | Aerial photograph of crossing RA4-WC-38 |

| **CROSSING ID: RA4-WC-38** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 524820E 5709893N |
| **DATA SOURCE:** LiDAR Imagery |

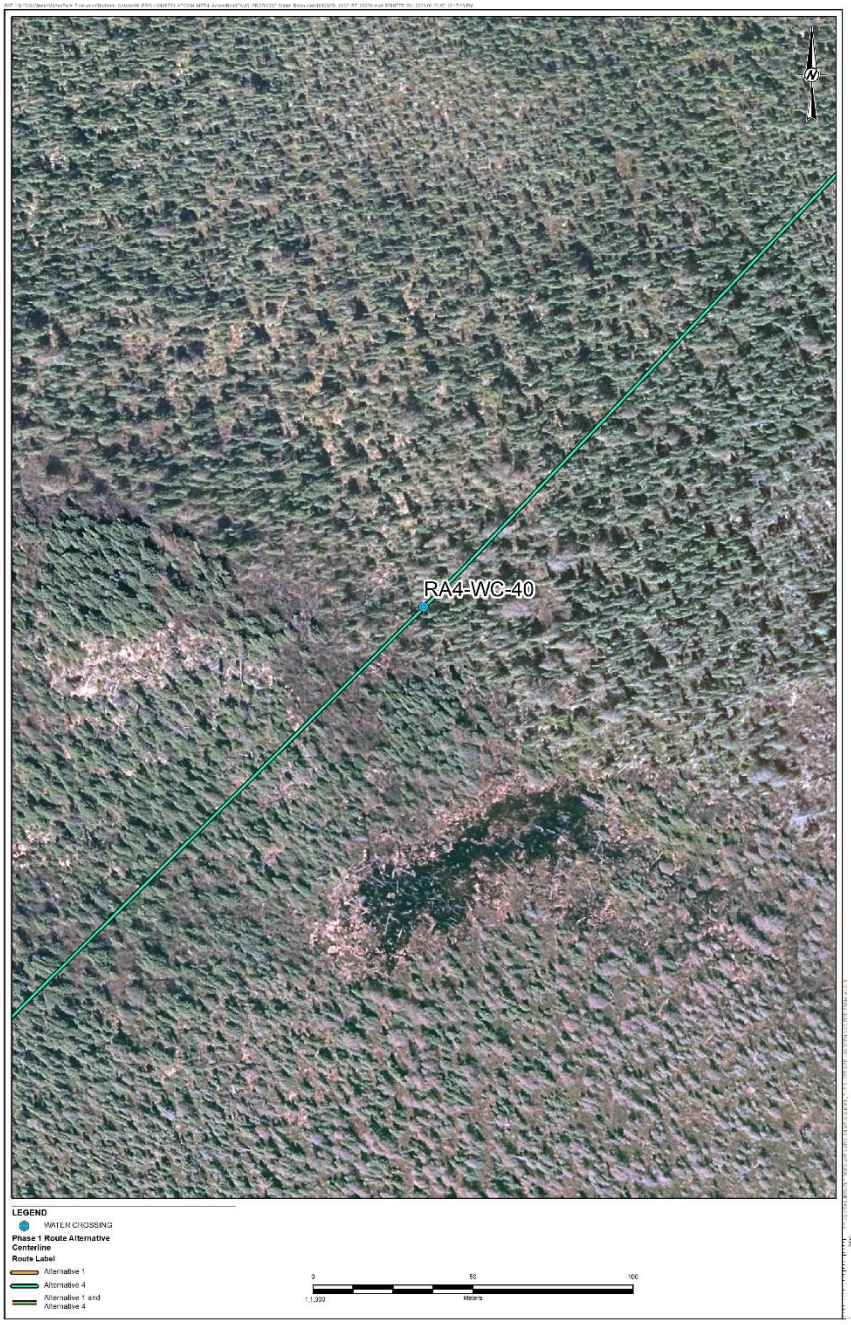
LiDAR imagery at crossing RA4-WC-38

| **CROSSING ID: RA4-WC-38** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 524820E 5709893N |
| **DATA SOURCE:** LiDAR Imagery |



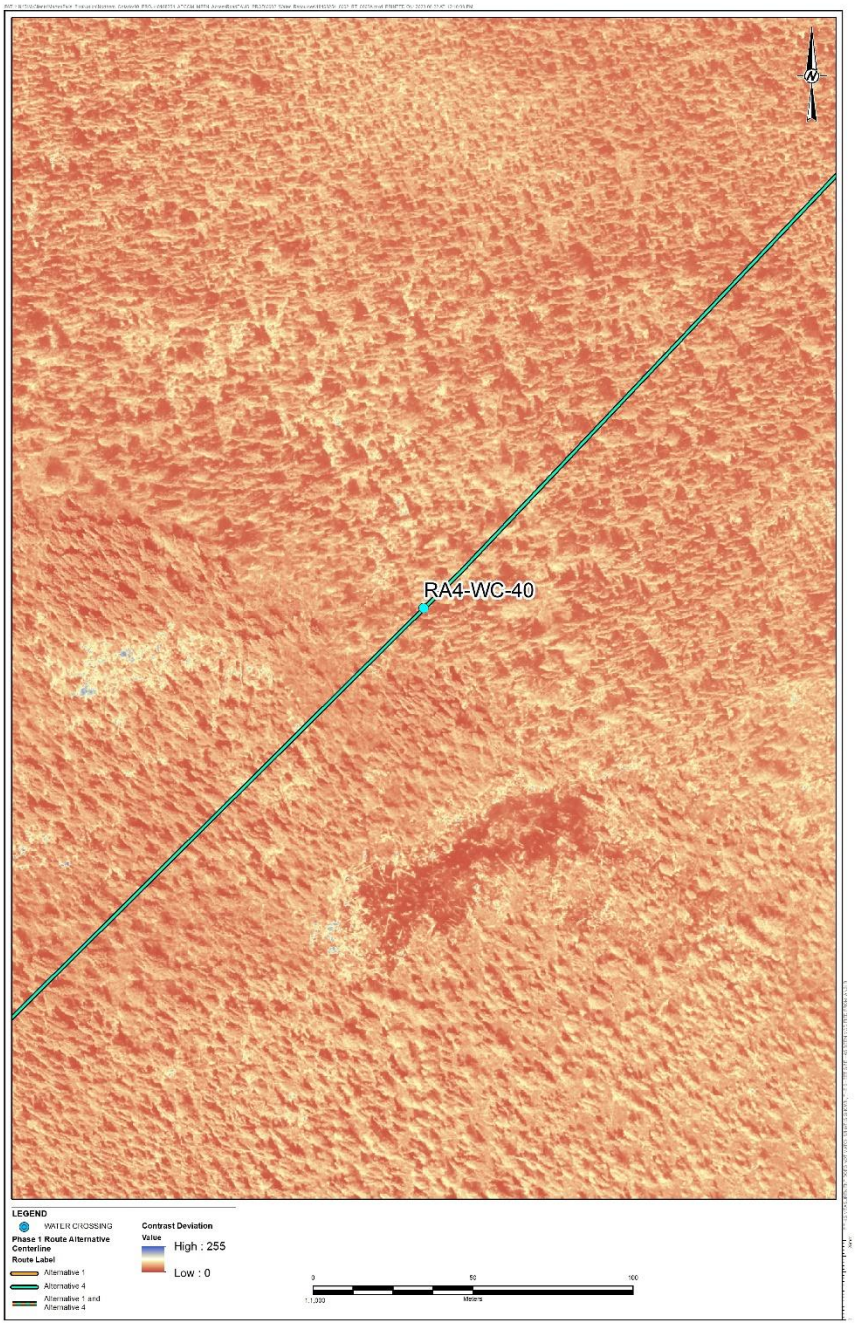

LiDAR imagery at crossing RA4-WC-38; red/blue contrast

| **CROSSING ID: RA4-WC-40** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 526271E 5715544N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) – No photos, see LiDAR |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-40

| **CROSSING ID: RA4-WC-40** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 526271E 5715544N |
| **DATA SOURCE:** LiDAR Imagery |



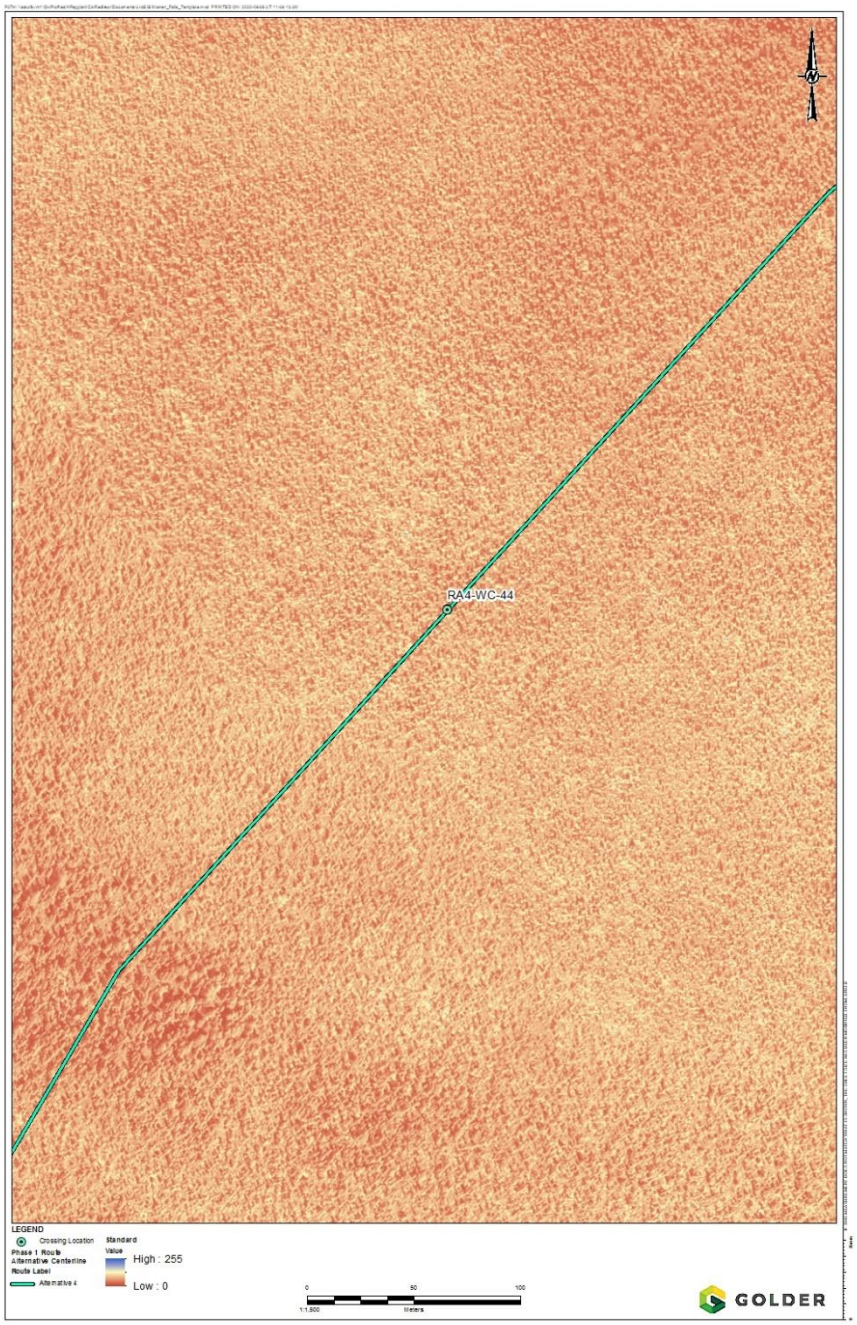

LiDAR imagery at crossing RA4-WC-40; red/blue contrast

| **CROSSING ID: RA4-WC-44** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 529272E 5721878N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-44 |

| **CROSSING ID: RA4-WC-44** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 529272E 5721878N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-44

| **CROSSING ID: RA4-WC-44** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 529272E 5721878N |
| **DATA SOURCE:** LiDAR Imagery |



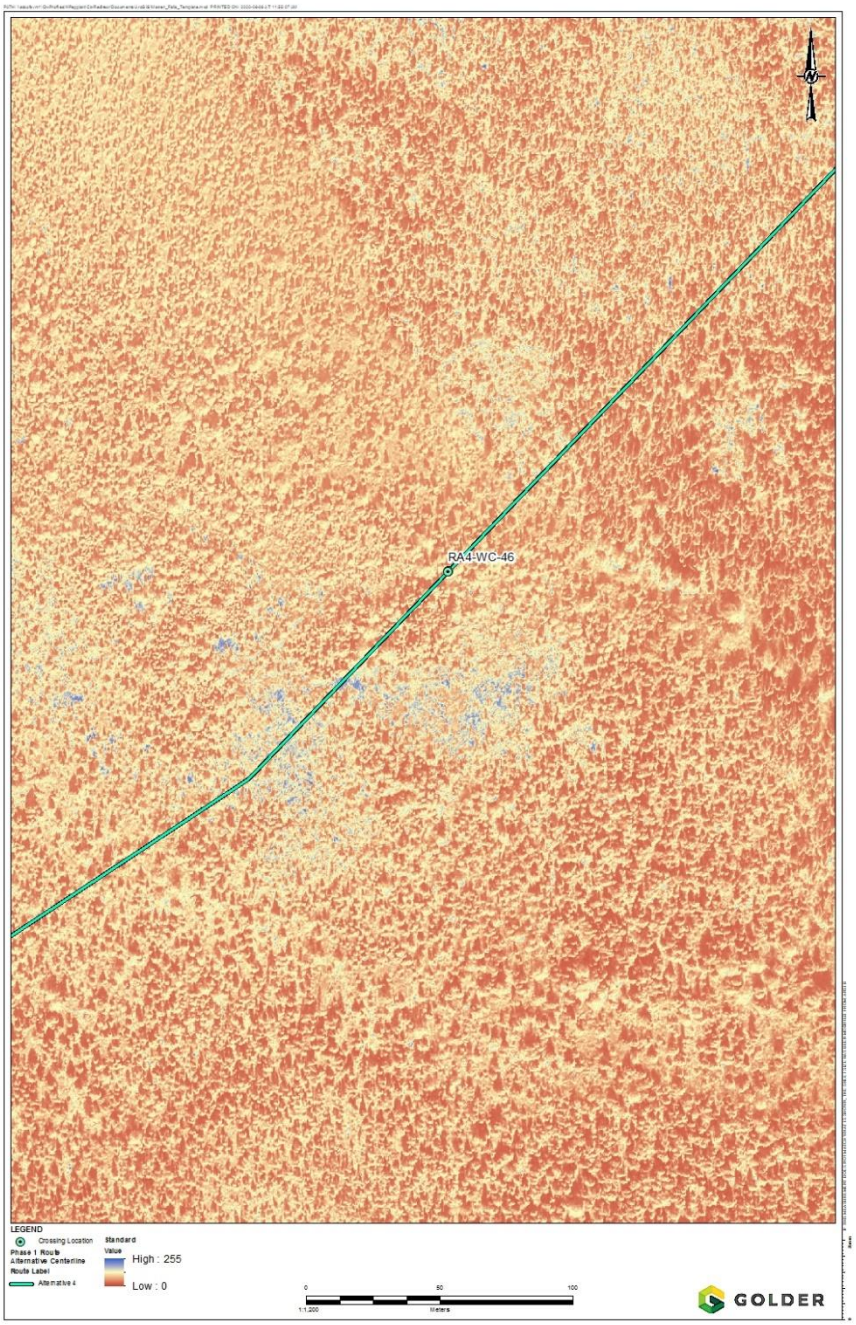

LiDAR imagery at crossing RA4-WC-44; red/blue contrast

| **CROSSING ID: RA4-WC-46** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 531310E 5723310N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-46 |

| **CROSSING ID: RA4-WC-46** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 531310E 5723310N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-46

| **CROSSING ID: RA4-WC-46** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 531310E 5723310N |
| **DATA SOURCE:** LiDAR Imagery |



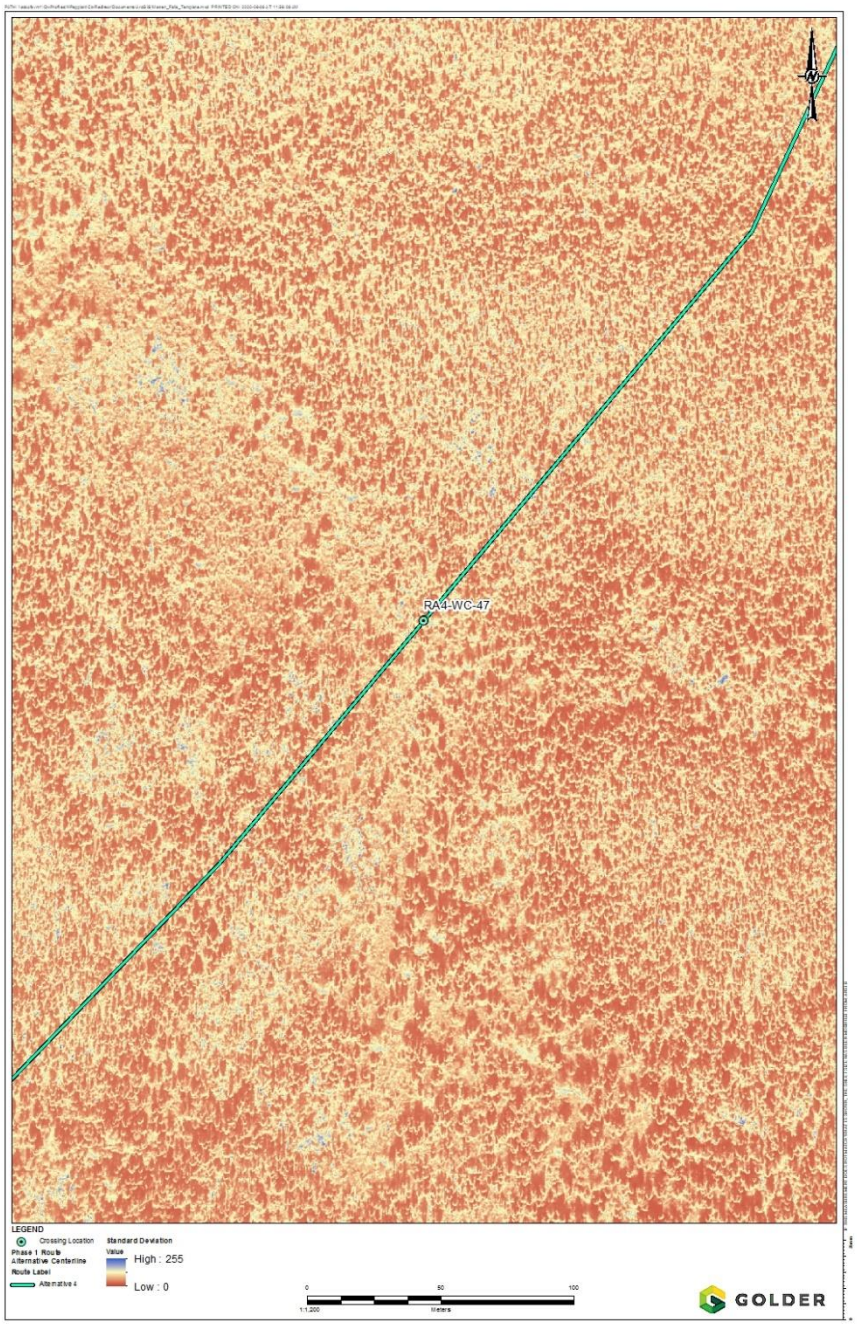

LiDAR imagery at crossing RA4-WC-46; red/blue contrast

| **CROSSING ID: RA4-WC-47** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 531559E 5723581N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-47 |

| **CROSSING ID: RA4-WC-47** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 531559E 5723581N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-47

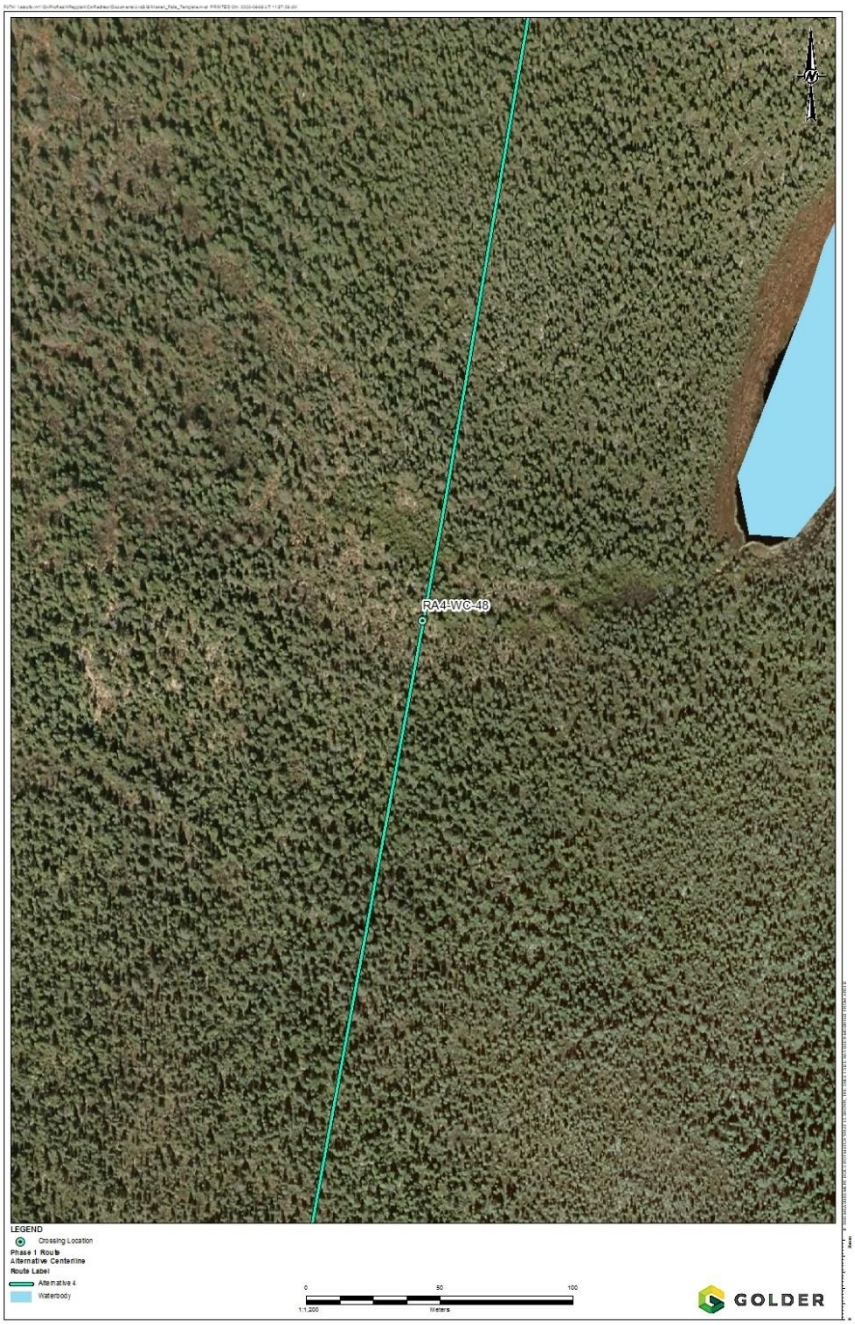
| **CROSSING ID: RA4-WC-47** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 531559E 5723581N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-47; red/blue contrast

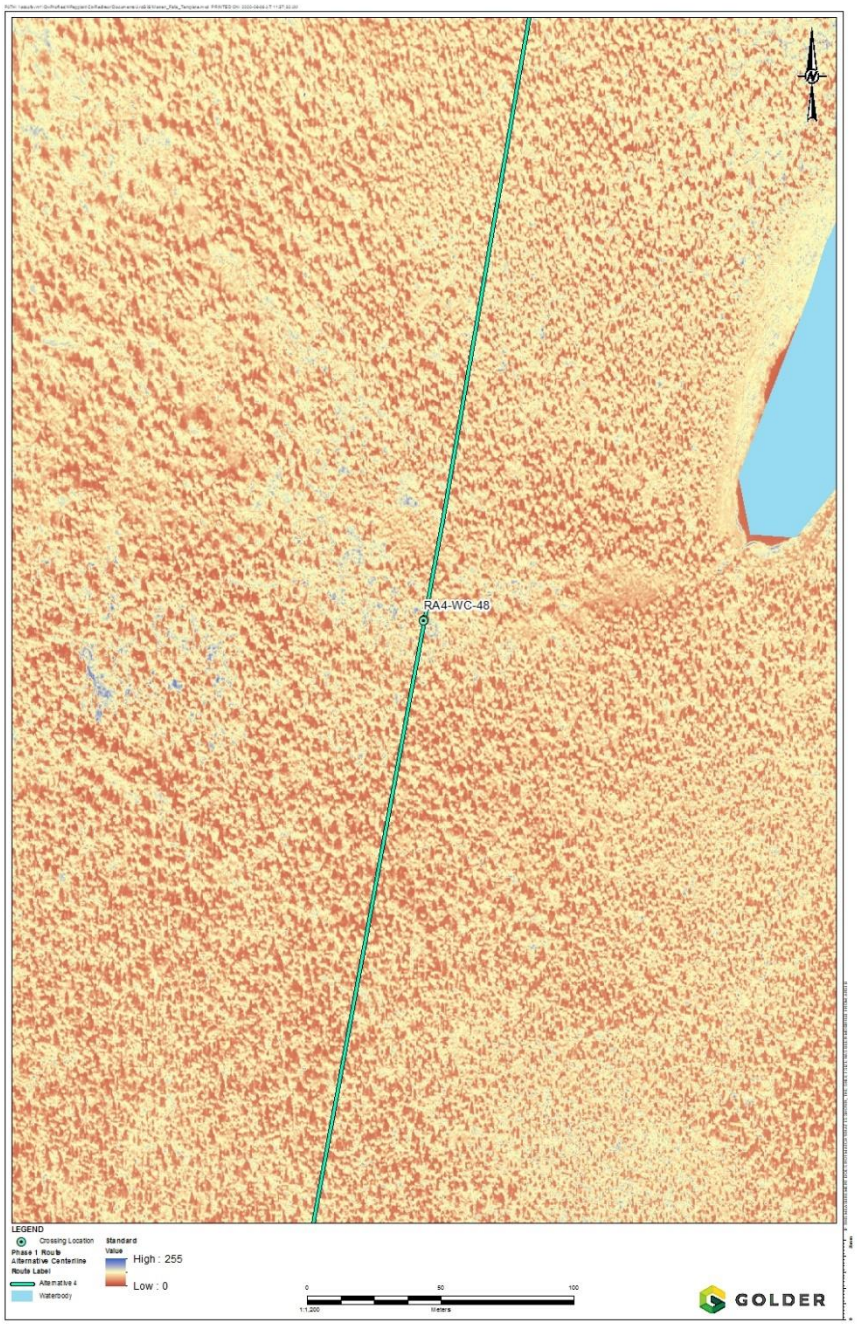
| **CROSSING ID: RA4-WC-48** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 532055E 5724757N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-48 |

| **CROSSING ID: RA4-WC-48** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 532055E 5724757N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-48

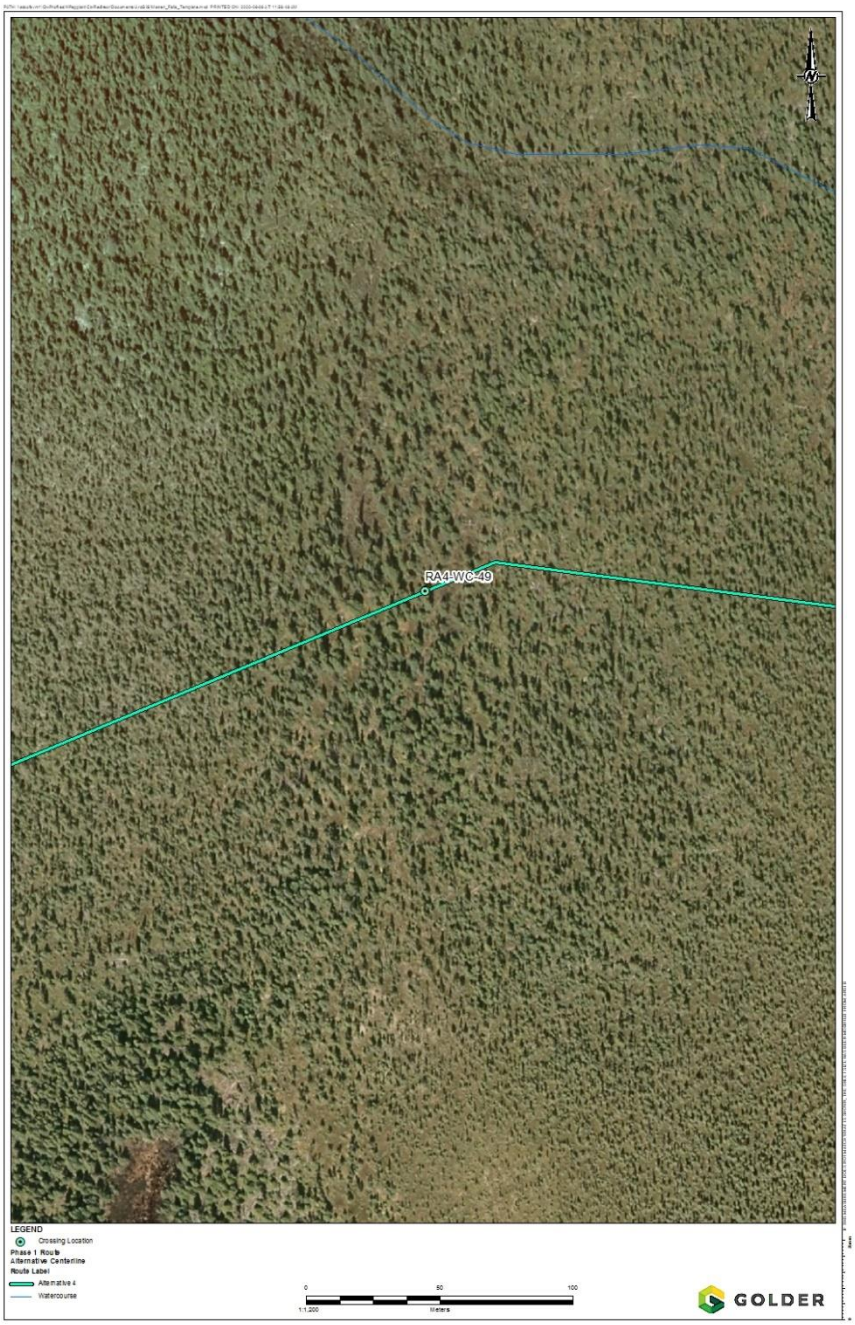
| **CROSSING ID: RA4-WC-48** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 532055E 5724757N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-48; red/blue contrast

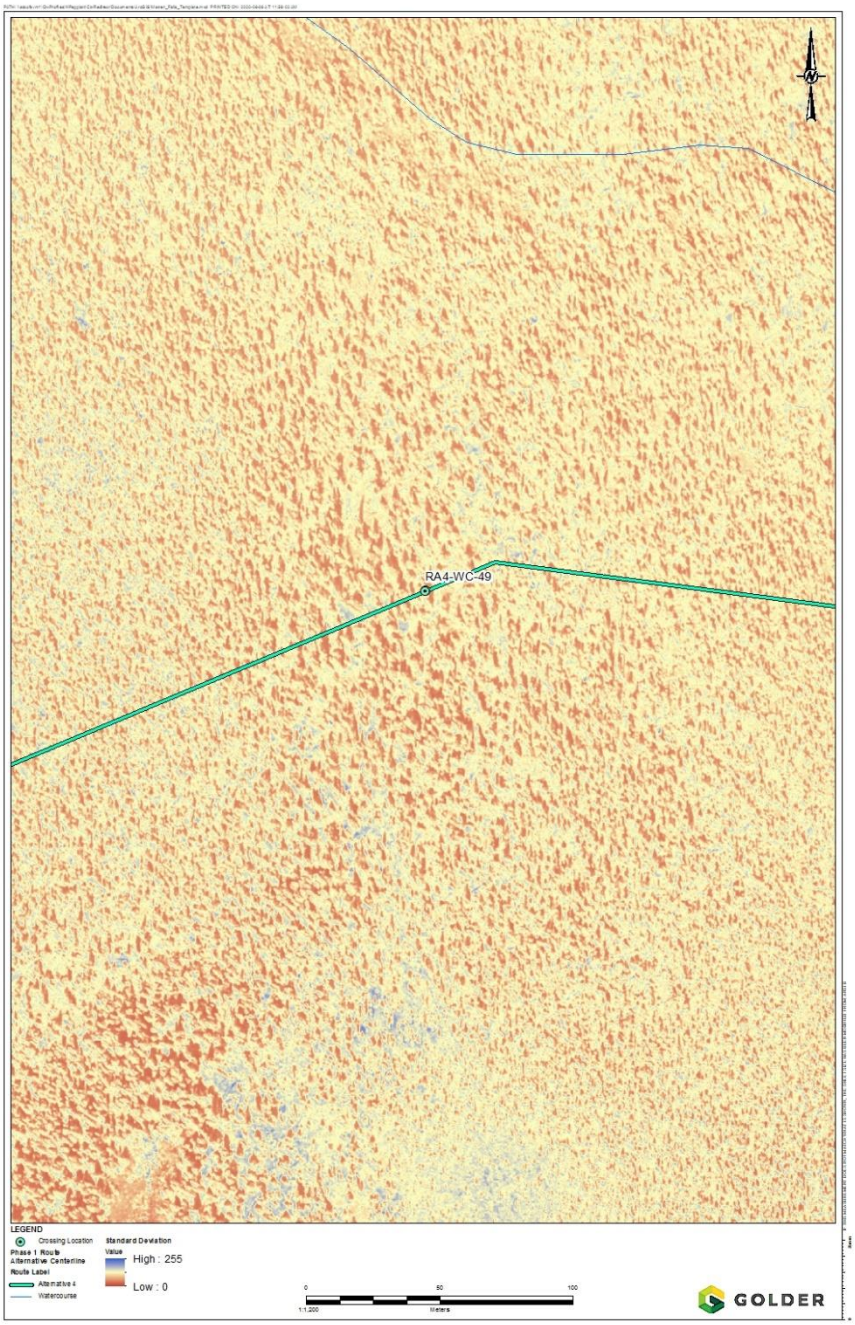
| **CROSSING ID: RA4-WC-49** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 532545E 5725566N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-49 |

| **CROSSING ID: RA4-WC-49** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 532545E 5725566N |
| **DATA SOURCE:** LiDAR Imagery |



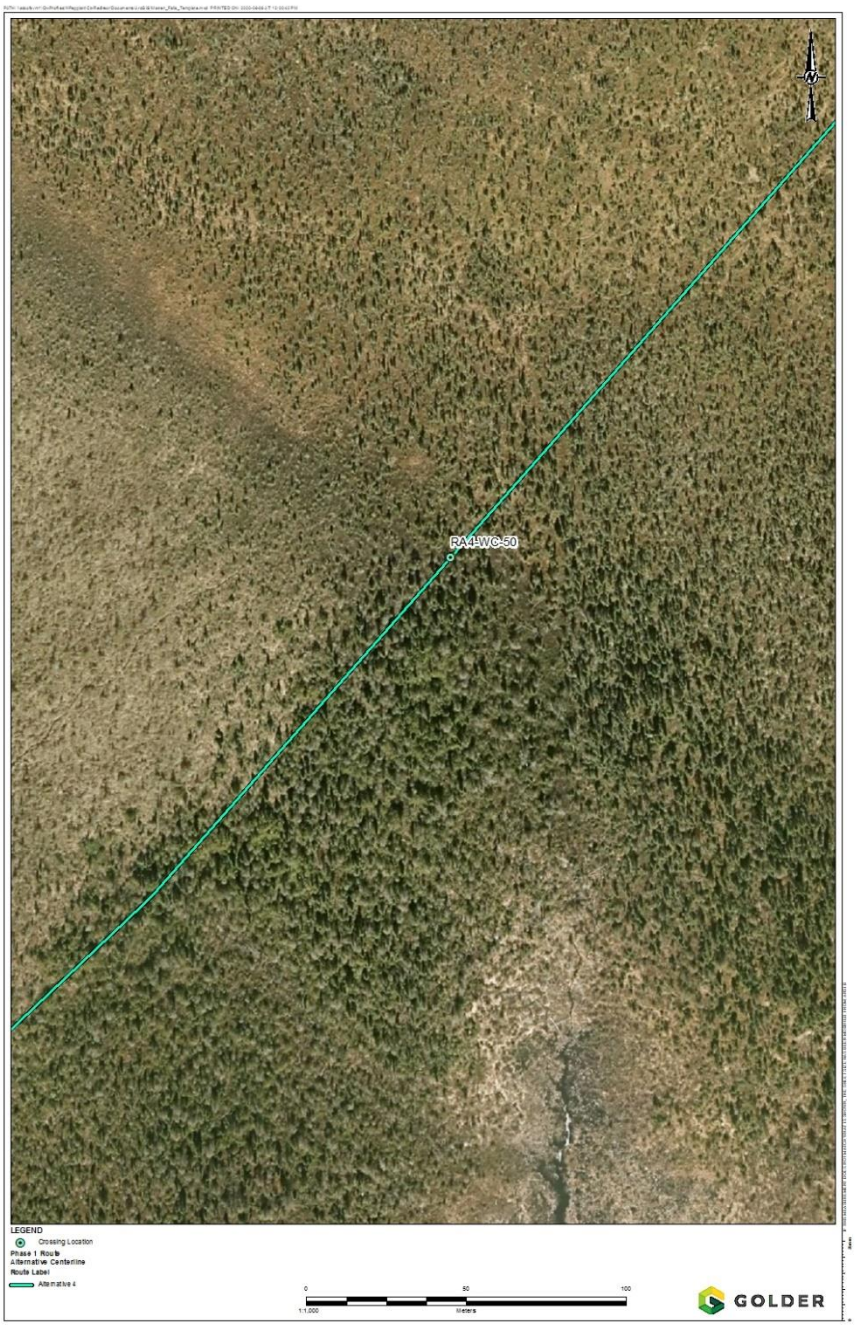

LiDAR imagery at crossing RA4-WC-49

| **CROSSING ID: RA4-WC-49** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 532545E 5725566N |
| **DATA SOURCE:** LiDAR Imagery |



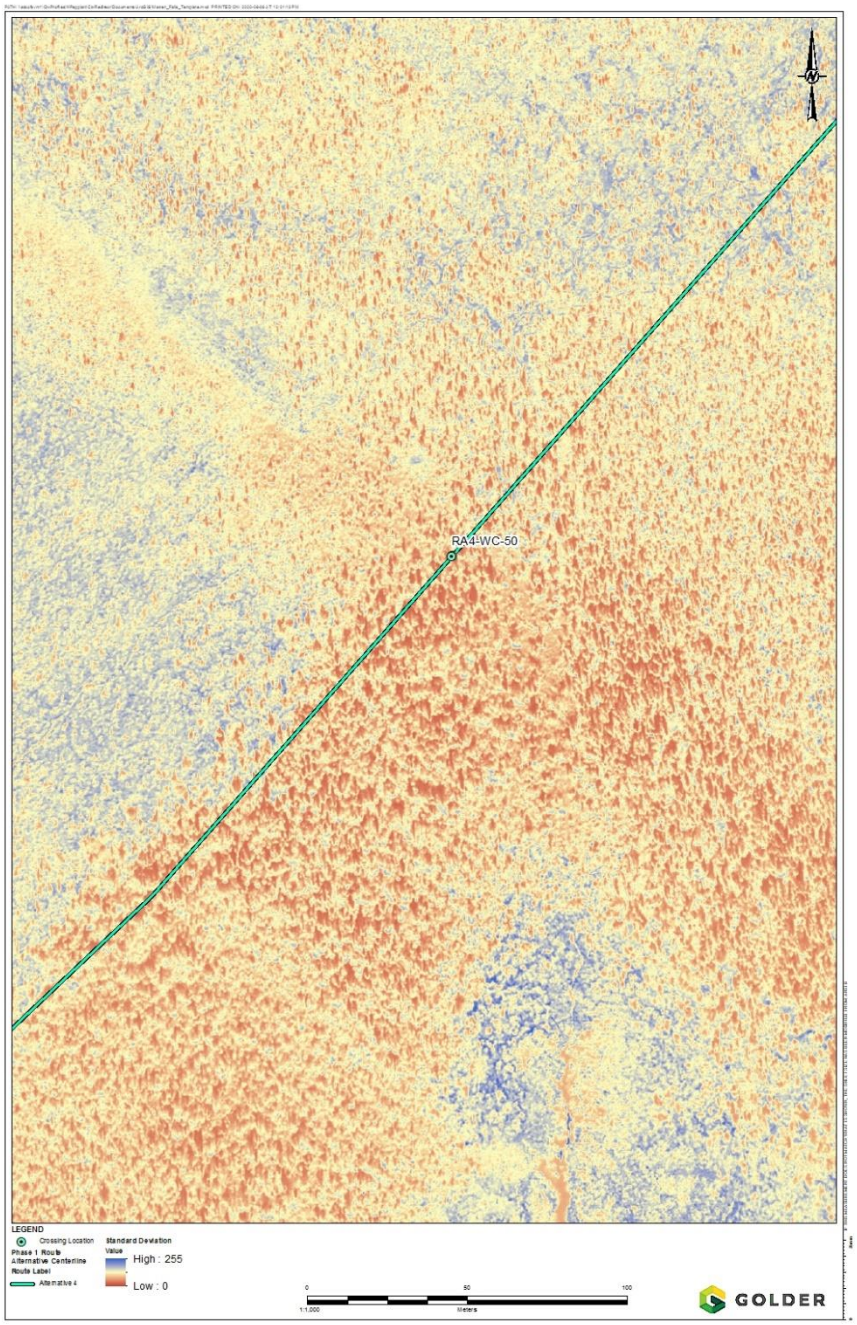

LiDAR imagery at crossing RA4-WC-49; red/blue contrast

| **CROSSING ID: RA4-WC-50** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 534466E 5725709N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) – No photos, see LiDAR |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-50

| **CROSSING ID: RA4-WC-50** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 534466E 5725709N |
| **DATA SOURCE:** LiDAR Imagery |



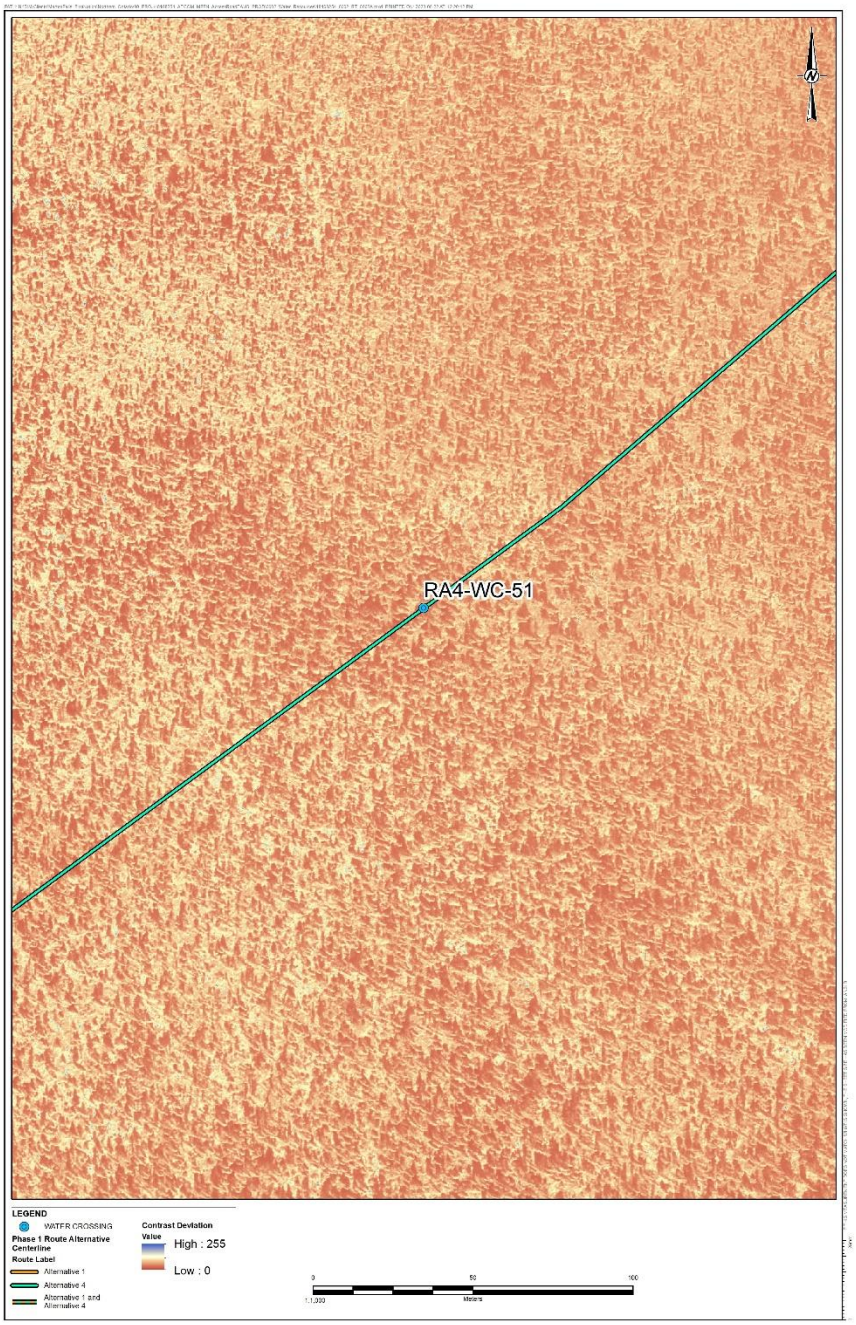

LiDAR imagery at crossing RA4-WC-50; red/blue contrast

| **CROSSING ID: RA4-WC-51** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 536335E 5727159N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-51 | Aerial photograph of crossing RA4-WC-51 |

| **CROSSING ID: RA4-WC-51** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 536335E 5727159N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-51

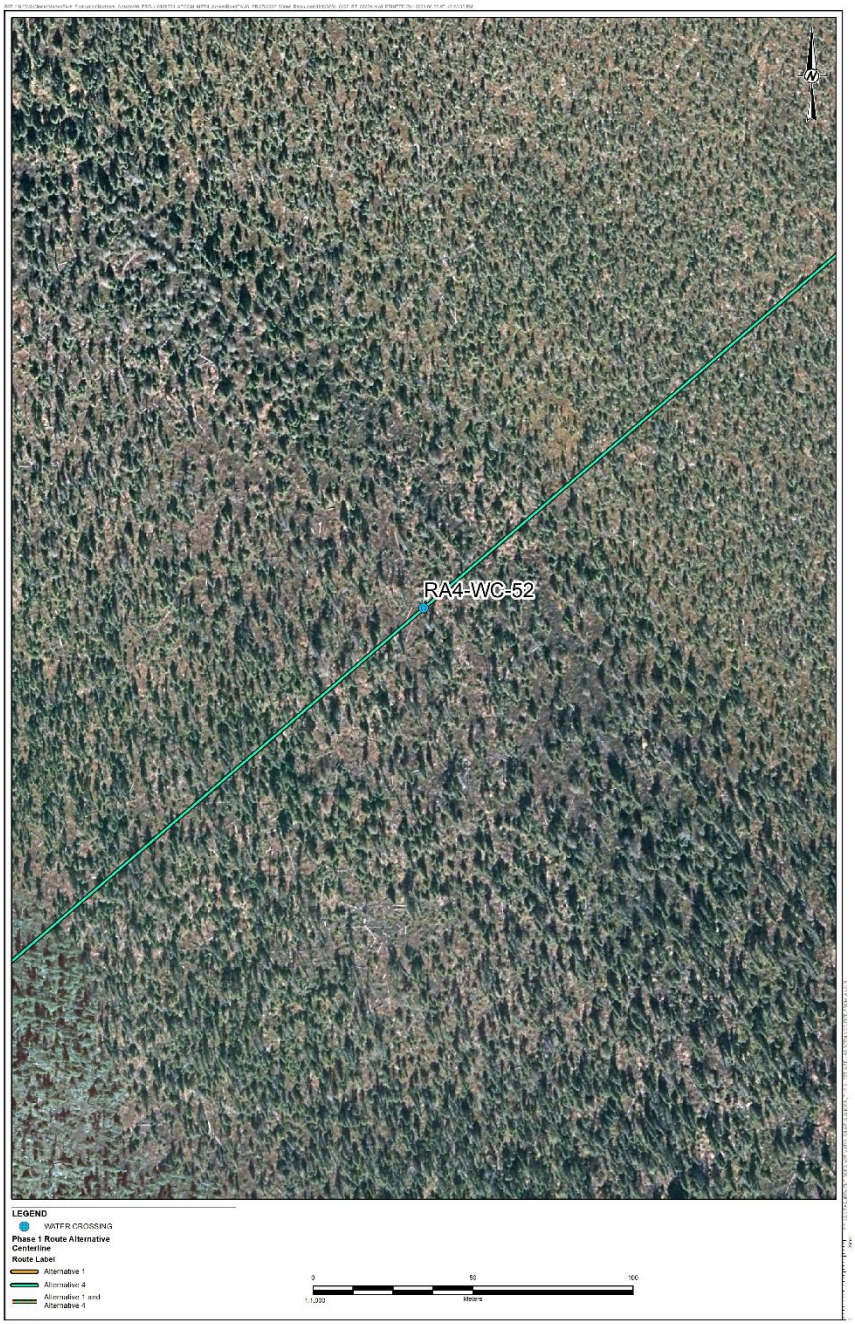
| **CROSSING ID: RA4-WC-51** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 536335E 5727159N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-51; red/blue contrast

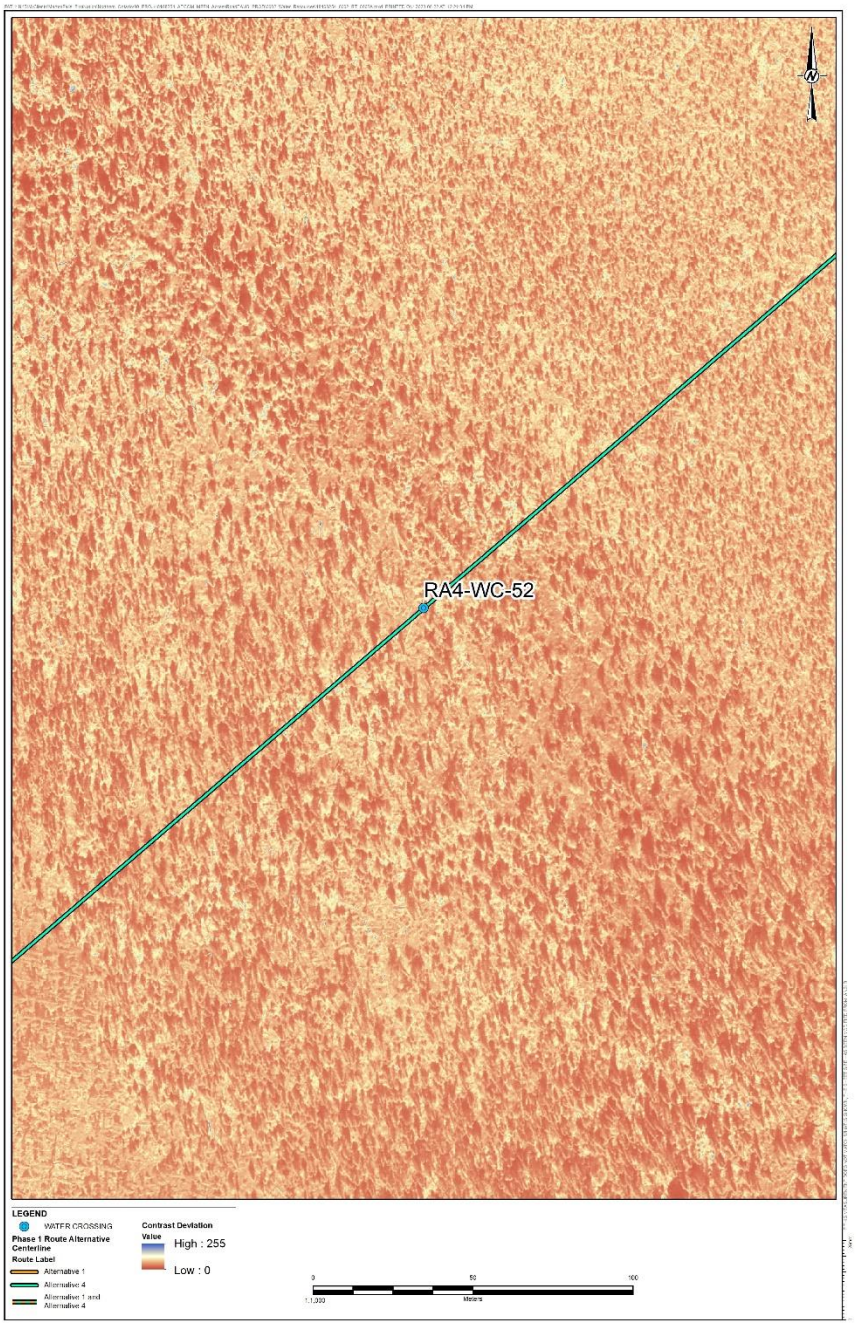
| **CROSSING ID: RA4-WC-52** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 536623E 5727401 |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-52 |

| **CROSSING ID: RA4-WC-52** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 536623E 5727401 |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-52

| **CROSSING ID: RA4-WC-52** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 536623E 5727401 |
| **DATA SOURCE:** LiDAR Imagery |

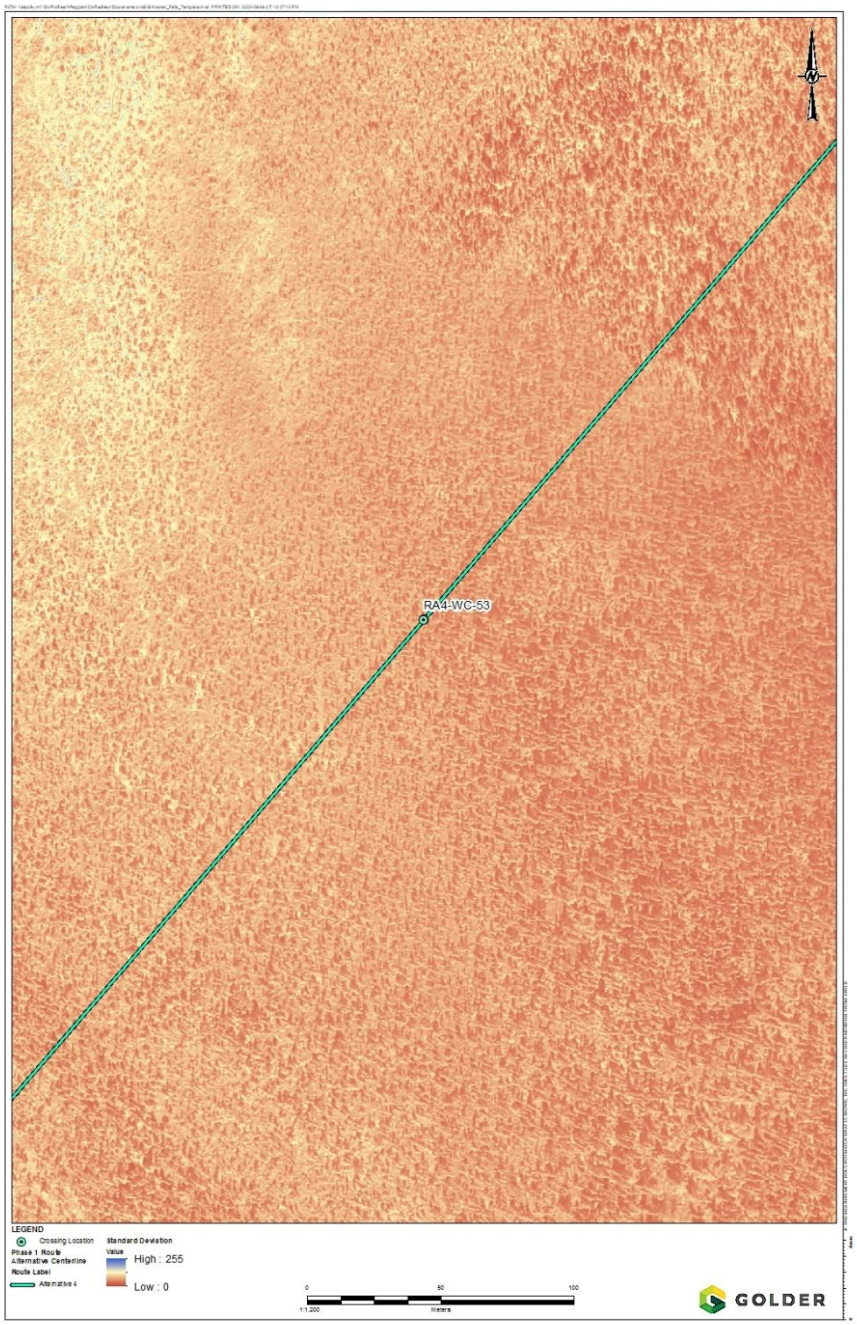



LiDAR imagery at crossing RA4-WC-52; red/blue contrast

| **CROSSING ID: RA4-WC-53** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 537667E 5728714N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-53 |

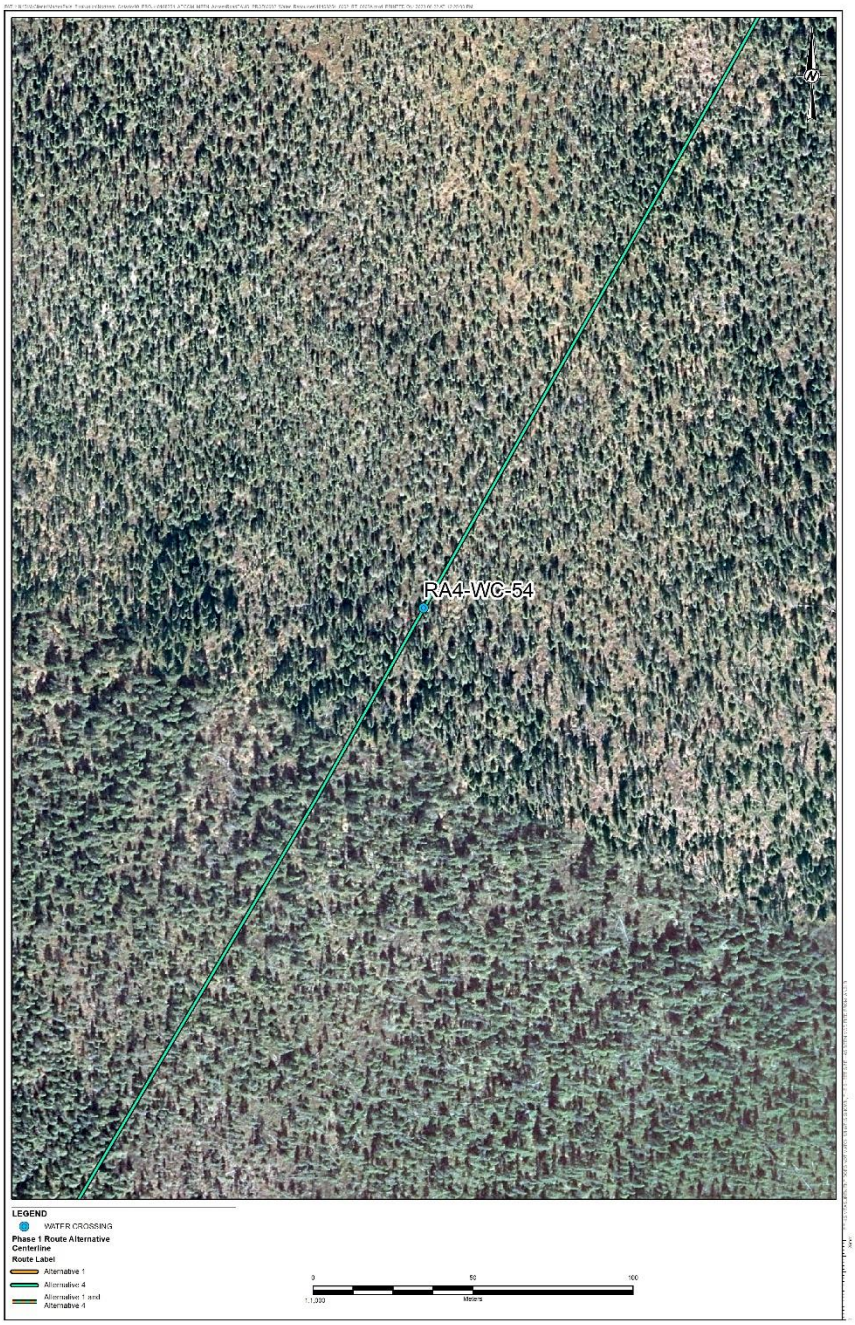
| **CROSSING ID: RA4-WC-53** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 537667E 5728714N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-53

| **CROSSING ID: RA4-WC-53** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 537667E 5728714N |
| **DATA SOURCE:** LiDAR Imagery |
|  <br>LiDAR imagery at crossing RA4-WC-53; red/blue contrast |

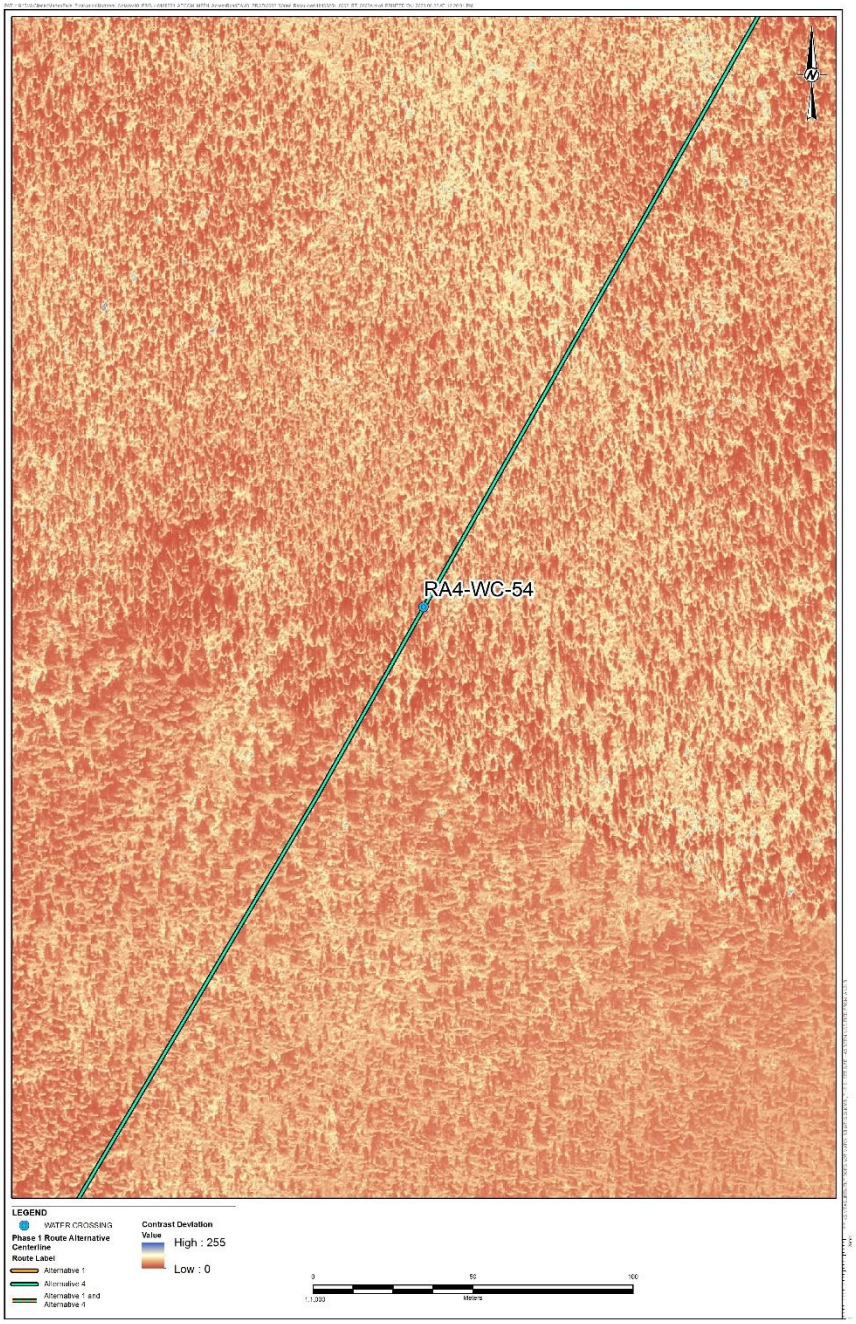
| **CROSSING ID: RA4-WC-54** | |
|---|---|
| **ROUTE:** Alternative 4 | |
| **UTM COORDINATES:** (Zone 16) 537072E 5727839N | |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) | |
| | |
| Aerial photograph of crossing RA4-WC-54 | Aerial photograph of crossing RA4-WC-54 |

| **CROSSING ID: RA4-WC-54** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 537072E 5727839N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-54

| **CROSSING ID: RA4-WC-54** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 537072E 5727839N |
| **DATA SOURCE:** LiDAR Imagery |



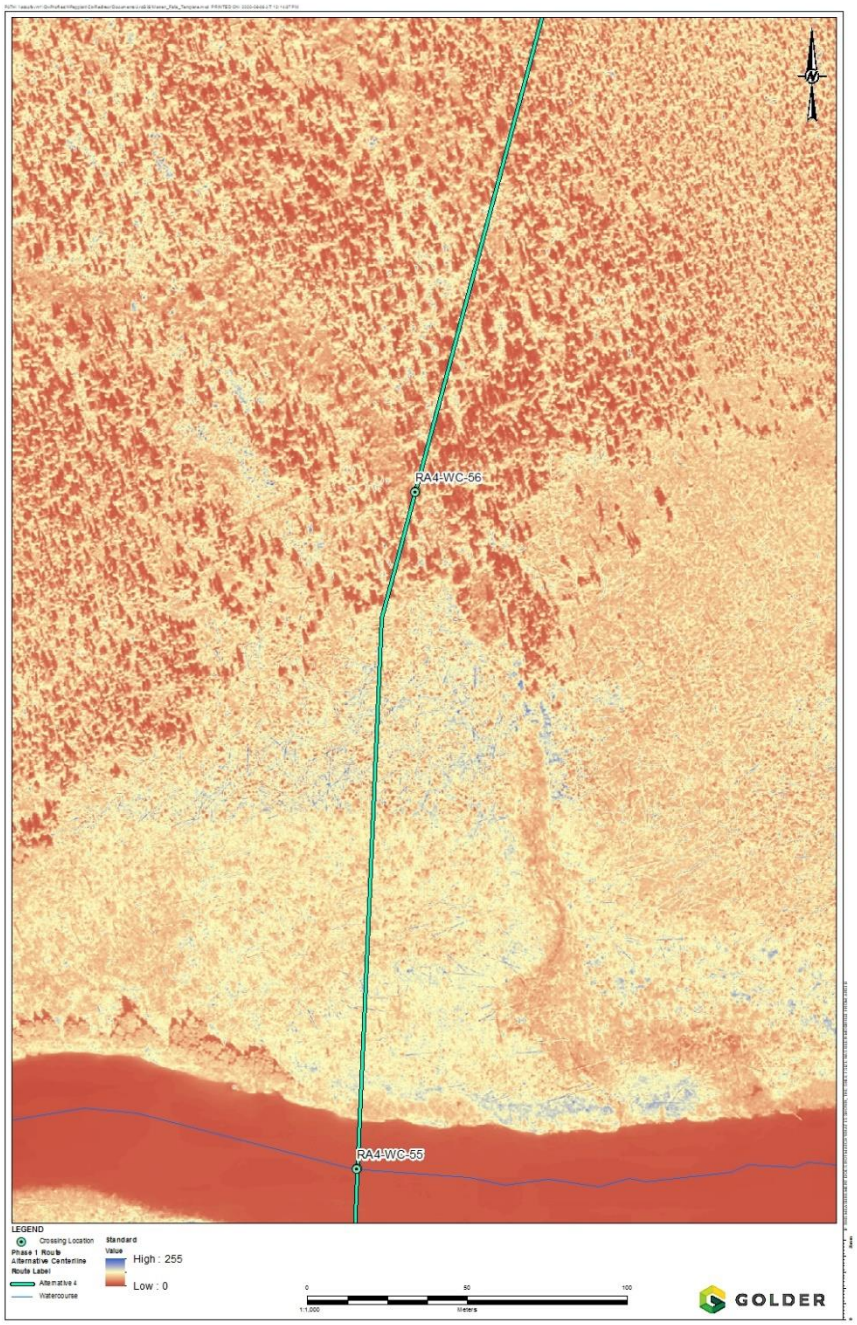

LiDAR imagery at crossing RA4-WC-54; red/blue contrast

| **CROSSING ID: RA4-WC-56** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 539023E 5736140N |
| **DATA SOURCE:** Aerial Reconnaissance (September 5, 2019) |
| |
| Aerial photograph of crossing RA4-WC-56 |

| **CROSSING ID: RA4-WC-56** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 539023E 5736140N |
| **DATA SOURCE:** LiDAR Imagery |

LiDAR imagery at crossing RA4-WC-56

| **CROSSING ID: RA4-WC-56** |
|---|
| **ROUTE:** Alternative 4 |
| **UTM COORDINATES:** (Zone 16) 539023E 5736140N |
| **DATA SOURCE:** LiDAR Imagery |




LiDAR imagery at crossing RA4-WC-56; red/blue contrast

# Attachment E – Waterbody Crossing List

Table 1A: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | UTM Zone 16U | | Proposed Crossing Structure | Park | Tertiary Watershed Name | Mapped or Unmapped | Stream and Fish Habitat Characteristics | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | | | | | Wetted width (m) | Bankfull width (m) | Maximum Depth of surveyed section (m) | Mean Depth of surveyed section (m) | Bed/Banks Description | Habitat Unit | Bed Substrate | Cover Type present in surveyed section | Aquatic Vegetation Present (Y/N/NA) | Barrier Present Within 10 m of Crossing | Type of Barrier | Fish Captured During Survey | Fish Habitat Potential (Y/N) | Data Source[b] | Distance to Cliffs (Golder 2013) | Additional Notes |
| RA1-4-WC-01 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 519622 | 5666913 | Culvert | - | Lower-Ogoki | Mapped | 1.3 | 3 | NA | 0.7 | Well-defined bed and banks | F2 | OR/SI | AV, UC, OV | Y | N | NA | Y | Y | Detailed survey | 12 km from WC18 and WA8, not directly connected | The section is made up of entirely flats and is a tributary to Winslow Lake (approx. 1.8 km upstream from the crossing). |
| RA1-4-WC-02 | Dusey River | Watercourse | Alternative-1-and-Alternative-4 | Y | 520105 | 5676979 | Multi-Span Bridge | - | Lower-Ogoki | Mapped | 34.7 | 44 | 1.3 | 1.3 | Well-defined bed and banks | F1 | CO/BO/GR/SA/SI/BE | Sub, D/T, WD, AV | Y | N | NA | N | Y | Detailed survey | same crossing and WC as WC22; 50 m DS | The crossing location was in a high quality flat. Some riffles are present within the surveyed section. A beaver lodge was observed near the crossing but no dams were present at the time of the survey. |
| RA1-4-WC-07 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 519091 | 5682476 | Multi-Span Bridge | - | Lower-Ogoki | Mapped | 6 | 6 | >1.5 | >1.5 | Moderately-defined bed and banks | F1 | Or | D/T, AV, OV | Y | N | NA | N | Y | Detailed survey | same crossing and WC as WC25 and WA9; 28 m DS | The crossing location was in a flooded wetland with soft and unstable ground and a channelized section within the wetland. |
| RA1-4-WC-09B | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 525332 | 5714194 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 3 | 3 | NA | NA | Poorly-defined bed and banks | F2 | OR/SI/SA | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | 10 km to WC32, on different WC, not connected | Channel observed from the air, all measurements are estimates. |
| RA1-4-WC-10 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 540829 | 5740602 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 6 | 6 | >1.5 | >1.5 | Moderately-defined bed and banks | F2 | OR/SI | - | NA | N | NA | NA | Y | Detailed survey | over 30 km to nearest Cliffs site (WC 38) | The surveyed section was composed of flats with moderately stable defined banks. |
| RA1-4-WC-19 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 546802 | 5742739 | Multi-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 35 | 27 | >1.5 | >1.5 | Moderately-defined bed and banks | F1 | Or | AV, D/T | Y | N | NA | N | Y | Detailed survey | over 30 km to nearest Cliffs site (WC 38) | The entire surveyed section was composed of deep flats with floodplain surrounding the watercourse edge. |
| RA1-4-WC-21 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 551025 | 5740733 | Multi-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 5.5 | 6 | 1.8 | 1.2 | Moderately-defined bed and banks | F1 | Or | D/T, AV, OV, WD | Y | N | NA | N | Y | Detailed survey | over 30 km to nearest Cliffs site (WC 38) | The watercourse is a tributary to Gittins Lake (approx. 2.6 km upstream from the crossing). The watercourse occurs within a bog/wetland area with a defined area running through it. |
| RA1-4-WC-27 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 559549 | 5738052 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 4 | 4 | 1 | 0.75 | Moderately-defined bed and banks | F2/RF | - | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | over 30 km to nearest Cliffs site (WC 38) | Flat habitat throughout surveyed section. Assessed from the air. |
| RA1-4-WC-31 | Buffaloskin River | Watercourse | Alternative-1-and-Alternative-4 | Y | 566883 | 5731970 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 7 | 8 | 0.75 | 0.75 | Well-defined bed and banks | F2 | OR | WD | NA | Y | WD | NA | Y | Aerial rapid survey and LiDAR | over 30 km to nearest Cliffs site (WC 38) | Heterogenous fish habitat in flat habitat. |
| RA1-4-WC-33 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 569502 | 5733028 | Culvert | - | Upper-Albany---Muswabik | Mapped | 2 | 2.5 | 0.65 | 0.65 | Moderately-defined bed and banks | F2 | OR | - | NA | N | NA | N | Y | Detailed survey | over 30 km to nearest Cliffs site (WC 38) | Channel wetted width varied from 2020 and 2022 assessments (5.2 m and 2.0 m respectively) and bank-full widtch varied as well (5.7 m and 2.5 m respectfully). |
| RA1-4-WC-34 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 571650 | 5733977 | Clear-Span Bridge | - | Upper-Albany---Muswabik | Mapped | 20 | 25 | NA | NA | Well-defined bed and banks | F2 | OR | - | NA | Y | BD | NA | Y | Aerial Reconaissance and LiDAR | over 30 km to nearest Cliffs site (WC 38) | Connected to lake |
| RA1-4-WC-35 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 573750 | 5732816 | Clear-Span Bridge | - | Upper-Albany---Muswabik | Mapped | 2.7 | 3.2 | 0.75 | 0.7 | Moderately-defined bed and banks | F2/IP | OR | - | NA | Y | BD | NA | Y | Detailed survey | over 30 km to nearest Cliffs site (WC 38) | The crossing location occurred in a flat habitat. A beaver dam was observed upstream of the crossing and could be a barrier during low-flow periods. A second beaver dam was observed in 2022. |
| RA1-4-WC-36 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 577681 | 5726015 | Clear-Span Bridge | - | Upper-Albany---Muswabik | Mapped | 14.5 | 15.5 | >2 | >2 | Moderately-defined bed and banks | F1 | - | WD, AV, D/T, OV | Y | Y | BD | N | Y | Detailed survey | over 30 km to nearest Cliffs site (WC 38) | A beaver dam was observed upstream of the crossing and could be a barrier during low-flow periods. |
| RA1-WC-01 | - | Watercourse | Alternative-1 | Y | 530918 | 5629153 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 4.75 | 5.5 | 3 | 0.5 | Moderately-defined bed and banks | 2/RF/P2/F | Bo/Co/Si/Or/Sa | D/T, AV, WD, Sub, OV | Y | Y | BD | N | Y | Detailed survey | 10 km to WC2 (on different WC, not connected) | The watercourse is a tributary to Painter Lake. The crossing location occurred within riffle habitat. Two beaver dams were observed downstream of the crossing location. |
| RA1-WC-02 | - | Watercourse | Alternative-1 | Y | 532383 | 5632976 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 8 | 8 | 0.7 | 0.7 | Well-defined bed and banks | F2/RF/P1 | BO/CO/SI | D/T, Sub, WD, OV | N | N | NA | N | Y | Detailed survey | 13 km on same WC as WC3, connected | The crossing location occurred in a flat habitat. |
| RA1-WC-05 | Ogoki River | Watercourse | Alternative-1 | Y | 534175 | 5637960 | Multi-Span Bridge | - | Lower-Ogoki | Mapped | 48.3 | 73.3 | >1.5 | >1.5 | Well-defined bed and banks | R1/RF | BO/CO/GR/SA | Sub, D/T, WD, AV | Y | N | NA | Y | Y | Detailed survey | 22 km from WC9, same WC (Ogoki River/Patience Lake) | Potential spawning for **Lake Sturgeon** |
| RA1-WC-09 | - | Watercourse | Alternative-1 | Y | 532606 | 5644605 | Culvert | - | Lower-Ogoki | Mapped | 2.1 | 2.4 | 0.8 | 0.3 | Poorly-defined bed and banks | F3/IP3 | OR | UC,WD,OV | N | Y | D (3), DP ( | Y | Y | Detailed survey | over 25 km from WC9, different WC, not connected | Beaver dam was observed in 2019 assessment and was not observed in 2022 assessment. Large amount of woody debris found instream in the 2022 assessment. |
| RA1-WC-11 | Ogoki River | Watercourse | Alternative-1 | Y | 534983 | 5649288 | Multi-Span Bridge | - | Lower-Ogoki | Mapped | 100 | 110 | >2 | >2 | Well-defined bed and banks | F1 | CO/OR/SI | Sub, D/T, AV | Y | N | NA | Y | Y | Detailed survey | 22 km from WC9, same WC (Ogoki River/Patience Lake) | High spawning, rearing, and overwintering potential for all fish |
| RA1-WC-13 | - | Watercourse | Alternative-1 | Y | 530495 | 5654590 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 9 | 9 | NA | NA | Well-defined bed and banks | F1/RF | BO/CO/SI/OR | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | 15 km from WC11, connected | Ontop of riffle sequence. Riffle sequences continue upstream of the crossing |
| RA1-WC-14 | - | Watercourse | Alternative-1 | Y | 529515 | 5656013 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 3 | 3.5 | 1.2 | 1.2 | Well-defined bed and banks | F1 | OR/SI | D/T, WD, UC | NA | N | NA | N | Y | Detailed survey | 8 km from WC15, not connected | Beaver dam observed about 70 m downstream of crossing location, not expected to be a barrier to fish passage. |
| RA1-WC-15 | - | Watercourse | Alternative-1 | Y | 528799 | 5657136 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 22 | 4 | NA | NA | moderately-defined bed and banks | F1 | OR/SI | AV | Y | N | NA | NA | Y | Aerial rapid survey and LiDAR | 8 km from WC15, not connected | Watercourse flows into Brundrit Lake approx 1.5 km downstream. |
| RA1-WC-16 | - | Watercourse | Alternative-1 | Y | 526864 | 5658007 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 70 | 7 | 1.7 | 1.7 | poorly-defined bed and banks | F1 | OR/SI | D/T, AV | Y | N | NA | N | Y | Detailed survey | 6 km from WC15, not connected | Crossing location occurred in a poorly defined deep flat within a wetland area. |
| RA1-WC-17 | - | Watercourse | Alternative-1 | Y | 525296 | 5659102 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 9 | 10 | 0.9 | 0.9 | Moderately-defined bed and banks | F1 | GR/BO/OR/SI/CO/SA | D/T, Sub, AV, WD, UC, OV | Y | N | NA | Y | Y | Detailed survey | same WC as WC15; 5km DS from WC15; connected | Moderate overwintering potential for small-bodied fish. |

Table 1A: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | UTM Zone 16U | | Proposed Crossing Structure | Park | Tertiary Watershed Name | Mapped or Unmapped | Stream and Fish Habitat Characteristics | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | | | | | Wetted width (m) | Bankfull width (m) | Maximum Depth of surveyed section (m) | Mean Depth of surveyed section (m) | Bed/Banks Description | Habitat Unit | Bed Substrate | Cover Type present in surveyed section | Aquatic Vegetation Present (Y/N/NA) | Barrier Present Within 10 m of Crossing | Type of Barrier | Fish Captured During Survey | Fish Habitat Potential (Y/N) | Data Source[b] | Distance to Cliffs (Golder 2013) | Additional Notes |
| RA1-WC-19 | - | Watercourse | Alternative-1 | Y | 522734 | 5662540 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 20 | 2 | NA | NA | Poorly-defined bed and banks | F2 | OR/SI | - | NA | Y | BD | NA | Y | Aerial rapid survey and LiDAR | 2.5 km from WC18, not connected, different WC | Area flooded at time of survey. Some old beaver damns were present but are not likely to cause fish passage barriers. |
| RA1-WC-20 | - | Watercourse | Alternative-1 | Y | 522442 | 5662774 | Culvert | - | Lower-Ogoki | Unmapped | 2 | 2 | <1 | <1 | Poorly-defined bed and banks | F3/IP | OR/SI | - | NA | Y | BD | NA | Y | Aerial rapid survey and LiDAR | 2 km from WC18, not connected, different WC | Low-lying region. Watercourse becomes disconnected or disappears within 40 m US and DS of crossing. Beaver dams are old and not likely to cause barrier to fish passage. |
| RA1-WC-22 | - | Watercourse | Alternative-1 | Y | 521713 | 5663417 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 50 | 17 | 1 | 1 | Moderately-defined bed and banks | F1/IP2 | OR/SI | D/T, AV, WD | N | N | NA | Y | Y | Detailed survey | same WC as WA8 (2.2 m DS) and connected to WC18 (3.8 km DS) | Crossing location occureed in a moderately deep flat within a wetland area. A historical beaver dam was observed but is not likely a barrier to fish passage. |
| RA1-WC-22A | - | Stream | Alternative-1 | Y | 520800 | 5664189 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 20 | 2 | NA | NA | Poorly-defined bed and banks | F2 | OR/SI | - | NA | NA | NA | NA | y | GIS imagery | | Stream running through flooded, poorly defined area. Downstream of a small lake. |
| RA1-WC-22B | - | Stream | Alternative-1 | Y | 520738 | 5664191 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 20 | 2 | NA | NA | Poorly-defined bed and banks | F2 | OR/SI | - | NA | NA | NA | NA | y | GIS imagery | | Stream running through flooded, poorly defined area. Downstream of a small lake. |
| RA1-WC-22C | - | Stream | Alternative-1 | Y | 520777 | 5664211 | Clear-Span Bridge | - | Lower-Ogoki | Mapped | 20 | 2 | NA | NA | Poorly-defined bed and banks | F2 | OR/SI | - | NA | NA | NA | NA | y | GIS imagery | | Stream running through flooded, poorly defined area. Downstream of a small lake. |
| RA1-WC-23 | - | Lake | Alternative-1 | N | 521732 | 5691515 | - | - | Upper-Albany---Makokibatan | Mapped | 90 | 95 | >2 | >2 | Well-defined bed and banks | R1 | SI/OR | AV, D/T | Y | N | NA | Y-Cliffs | Y | Detailed survey | same crossing and WC as WC27; 40 m DS from WC27 and 5km DS from WA11; connected | High overwintering and rearing potential. |
| RA1-WC-26 | - | Watercourse | Alternative-1 | N | 519376 | 5700621 | - | - | Upper-Albany---Makokibatan | Unmapped | 1.25 | 2 | 0.15 | 0.15 | Moderately-defined bed and banks | F3 | OR/SI | WD, OV, UC | N | N | NA | NA | Y | Detailed survey | Tributary to Albany River (confluence is 500 m DS), WC 29 is 2.5 km from confluence | Channel was braided with two distinct channels within the crossing location. Crossing flooded at the time of survey, but appears likely that one channel may become for dominant during low-flow times. |
| RA1-WC-27 | Albany River | Watercourse | Alternative-1 | N | 519244 | 5702193 | - | Albany River Provincial Park | Upper-Albany---Makokibatan | Mapped | 180 | 200 | >2 | >2 | Defined bed and banks | R1 | BO/CO/BR | D/T, Sub | N | N | NA | Y-Cliffs | Y | Detailed survey | same crossing and same WC as WC29 (Albany River); 0 m | Crossing location was within a deep run. The surveyed section had high overwintering and moderate spawning/rearing potential for most fish. Potential spawning location for Lake Sturgeon. |
| RA1-WC-28 | - | Watercourse | Alternative-1 | N | 520172 | 5703819 | - | - | Upper-Albany---Makokibatan | Mapped | 2 | 2.5 | 0.3 | 0.3 | Well-defined bed and banks | R3 | OR/BO/SA | WD, OV, UC | N | N | NA | N | Y | Detailed survey | Tributary to Albany River (confluence is 500 m DS), WC 29 is 2 km from confluence | The crossing location was within a shallow run habitat. The water depth in 2020 was approx 0.3 m and in 2022 was 0.4 m. |
| RA1-WC-29 | - | Watercourse | Alternative-1 | N | 520833 | 5703964 | - | - | Upper-Albany---Makokibatan | Unmapped | <1 | 5 | NA | NA | Defined bed and banks | F | - | - | NA | - | - | NA | Y | Aerial Reconaissance | Tributary to Albany River (confluence is 500 m DS), WC 29 is 2 km from confluence | No LiDAR. |
| RA1-WC-30 | - | Watercourse | Alternative-1 | N | 520534 | 5709379 | - | - | Upper-Albany---Makokibatan | Mapped | 4 | 3.25 | 0.75 | 0.75 | Defined bed and banks | F2 | SA/OR/BO | D/T, AV, WD. Sub, OV | Y | N | NA | Y | Y | Detailed survey | flows into same pond/lake as WC30; 3.5 km ds WC30, 2km ds fish-bearing lake (Saarimaki Lake) | The watercouse is a tributary to Saarimaki Lake, approx 1.8 km upstream of the crossing location. The channel was flooded at the time of the survey. |
| RA1-WC-32 | - | Watercourse | Alternative-1 | N | 522111 | 5711797 | - | - | Upper-Albany---Makokibatan | Mapped | 6 | 6 | 1.5 | 1.2 | Defined bed and banks | F1 | OR | D/T, AV, WD, OV | Y | N | NA | N | Y | Detailed survey | Tributary (8 km) to WC30 and Saarimaki Lake, connected | Moderate overwintering potential for small-bodied fish. |
| RA1-WC-38 | - | Watercourse | Alternative-1 | N | 525639 | 5715632 | - | - | Upper-Albany---Makokibatan | Mapped | 1.5 | 1.5 | <1 | <1 | Undefined bed and banks | NA | OR | - | NA | NA | NA | NA | Y | Aerial rapid survey | Cliffs ITS WC32 | Pockets of water observed during survey with a poorly defined channel |
| RA1-WC-39 | - | Watercourse | Alternative-1 | N | 525659 | 5718840 | - | - | Upper-Albany---Makokibatan | Mapped | 2 | 2 | <1 | <1 | Poorly defined bed and banks | NA | OR | OV, WD | NA | Y | Intermittent dry spots | NA | Y | Aerial rapid survey | Cliffs ITS WC34 & WA | Areas of standing water, with some channelized sections. Connected to Gourlie Creek. |
| RA1-WC-40 | Gourlie Creek | Watercourse | Alternative-1 | N | 525513 | 5719057 | - | - | Upper-Albany---Makokibatan | Mapped | 14 | 17 | >1 | >1 | Well-defined bed and banks | F1 | Unknown | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | Gourlie Creek, also indirectly connected, but far away from WC32 (15km DS) and WC34/WA17 (12 km DS). | Large permanent watercourse with heterogenous fish habitat. |
| RA1-WC-41 | - | Watercourse | Alternative-1 | N | 521635 | 5720108 | - | - | Upper-Albany---Makokibatan | Mapped | 4 | 4.25 | 1.1 | 1.1 | Moderately-defined bed and banks | F2 | BO/OR/SI | D/T, AV, Sub, OV, UC | Y | N | NA | N | Y | Detailed survey | Tributary connected to WC34/WA17 (9 km DS) and WC32 (17 km DS) | Crossing location within a channelized portion through a wetland area. Moderate overwintering potiential. |
| RA1-WC-42 | - | Watercourse | Alternative-1 | N | 519909 | 5721171 | - | - | Upper-Albany---Makokibatan | Mapped | 2 | 4 | NA | NA | Poorly-defined bed and banks | F1 | Unknown | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary connected to WC34/WA17 (9 km DS) and WC32 (17 km DS) | Branching present along watercourse. Watercourse appears disconnected as area appears to be part wetland. fed by large impoundment |
| RA1-WC-44 | - | Watercourse | Alternative-1 | N | 516855 | 5724132 | - | - | Upper-Albany---Makokibatan | Mapped | <1 | <1 | NA | NA | Poorly-defined bed and banks | F1 | OR/SI | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary connected to WC34/WA17 (13 km DS) and WC32 (22 km DS) | Watercourse not visible on LiDAR. Could be blocked by surrounding forested area. |

Table 1A: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | UTM Zone 16U | | Proposed Crossing Structure | Park | Tertiary Watershed Name | Mapped or Unmapped | Stream and Fish Habitat Characteristics | | | | | | | | | | | | | | | Additional Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | | | | | Wetted width (m) | Bankfull width (m) | Maximum Depth of surveyed section (m) | Mean Depth of surveyed section (m) | Bed/Banks Description | Habitat Unit | Bed Substrate | Cover Type present in surveyed section | Aquatic Vegetation Present (Y/N/NA) | Barrier Present Within 10 m of Crossing | Type of Barrier | Fish Captured During Survey | Fish Habitat Potential (Y/N) | Data Source[b] | Distance to Cliffs (Golder 2013) | |
| RA1-WC-51 | Wabassi River | Watercourse | Alternative-1 | N | 510970 | 5732829 | - | - | Upper-Albany---Makokibatan | Mapped | 60 | 65 | 1.5 | 1.5 | Well-defined bed and banks | F1 | FI/OR | D/T, AV | Y | N | NA | Y-Cliffs | Y | Detailed survey | Same crossing and WC (Wabassi River) as WC38; 300m US from WC38 and 1.9 km US from WA21 | Large-permanent watercourse with heterogenous fish habitat. High overwintering, spawning, and rearing potential. |
| RA1-WC-52 | - | Watercourse | Alternative-1 | N | 510968 | 5733080 | - | - | Upper-Albany---Makokibatan | Mapped | 1 | 40 | 0.12 | 0.12 | Poorly-defined bed and banks | F3 | OR | WD, OV, AV | Y | N | NA | NA | Y | Detailed survey | Cliffs ITS WC38 and WA21 | Crossing location occurred within a poorly-defined channelized portion within a low-lying wetland. A number of poorly defined, diffuse flow channels present. |
| RA1-WC-53 | - | Watercourse | Alternative-1 | N | 511307 | 5734190 | - | - | Upper-Albany---Makokibatan | Mapped | 68 | 8.5 | >1 | 0.75 | Poorly-defined bed and banks | F2 | OR | - | NA | Y | BD | NA | Y | Aerial rapid survey and LiDAR | Tributary to Wabassi River (confluence is 2km DS), WC 38 is another 750m from confluence, WA21 is also 750m from confluence | Bog/wetland area with a channelized flat running through. Some old beaver dams present but not likely to cause barrier to fish passage. |
| RA1-WC-54 | - | Watercourse | Alternative-1 | N | 511339 | 5734297 | - | - | Upper-Albany---Makokibatan | Unmapped | 35 | 20 | <1 | <1 | poorly-defined bed and banks | F2/P | OR | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | Tributary to Wabassi River (confluence is 2km DS), WC 38 is another 750m from confluence, WA21 is also 750m from confluence | Multiple impoundments are found further upstream and downstream and ponding throughout the bog/wetland area. |
| RA1-WC-56 | - | Watercourse | Alternative-1 | N | 513924 | 5740981 | - | - | Upper-Albany---Makokibatan | Unmapped | 50 | 1 | NA | NA | Poorly-defined bed and banks | F3 | OR/SI | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | 8km from WC38, not connected | Channel within low-lying wetted area. Some small chanellization however is a wetland/bog area |
| RA1-WC-57 | - | Watercourse | Alternative-1 | N | 518320 | 5743418 | - | - | Upper-Albany---Makokibatan | Mapped | 13.6 | 31.6 | >1.2 | >1.2 | Well-defined bed and banks | F1 | Si/Or/Sa | D/T, AV, UC, OV | Y | N | NA | N | Y | Detailed survey | Tributary to Wabassi River (confluence is 8 km DS), WA21 is 13km from confluence, WC38 is 15km from confluence | The watercourse drains into Oxtoby Lake and is likely used as a corridor for feeding and spawning. |
| RA1-WC-58 | - | Watercourse | Alternative-1 | N | 519149 | 5743642 | - | - | Upper-Albany---Makokibatan | Unmapped | 1 | 50 | NA | NA | Poorly-defined bed and banks | F2 | OR | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary to Wabassi River (confluence is 8 km DS), WA21 is 13km from confluence, WC38 is 15km from confluence | Appears to be a low-lying depression (i.e., wetted area). Channelized WC present 86 m DS from crossing location - assume that watercourse continues under treed area |
| RA1-WC-60 | - | Watercourse | Alternative-1 | N | 523117 | 5742644 | - | - | Upper-Albany---Makokibatan | Unmapped | <1 | <1 | NA | NA | Poorly-defined bed and banks | R | - | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary with potential connectivity to Wabassi River (confluence is 8km DS), WC 38 is 25 km away | Area of channelized flow present within low-lying depression (i.e., wetted area). |
| RA1-WC-66 | - | Watercourse | Alternative-1 | N | 527414 | 5740047 | - | - | Upper-Albany---Makokibatan | Mapped | 9 | 5 | 1.1 | 1.1 | Moderately-defined bed and banks | F2 | OR/SI | AV, WD, OV | Y | N | NA | Y | Y | Detailed survey | Tributary to Wabassi River (confluence is 1 km DS), WA21 is 26 km from confluence, WC38 is 28 km from confluence | The watercourse is a tributary to the Wabassi River. A beaver dam was observed 90 m upstream of the crossing and could potentially be a barrier to fish passage. |
| RA1-WC-67 | - | Watercourse | Alternative-1 | N | 531917 | 5741009 | - | - | Upper-Albany---Makokibatan | Mapped | 18 | 22 | 1.1 | 1.1 | Well-defined bed and banks | F2 | OR/SI | D/T, AV, WD, OV | Y | N | NA | N | Y | Detailed survey | Tributary to Wabassi River (confluence is 2.5 km DS), WA21 is 33 km from confluence, WC38 is 35 km from confluence | Heterogenous fish habitat, moderately-large permanent watercourse with moderate overwintering potential. |
| RA1-WC-68 | - | Watercourse | Alternative-1 | N | 533421 | 5740556 | - | - | Upper-Albany---Makokibatan | Unmapped | <1 | <1 | NA | NA | Poorly-defined bed and banks | F1 | Unknown | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary to Wabassi River (confluence is 2.5 km DS), WA21 is 33 km from confluence, WC38 is 35 km from confluence | Appears to be a low-lying depression (i.e., potential wetted area). Potential for poorly defined channel. |
| RA4B-WC-01 | Ogoki River | Watercourse | Alternative-4 | N | 512247 | 5636612 | - | Ogoki River Provincial Park | Lower-Ogoki | Mapped | 80 | 110 | >2 | >2 | Well-defined bed and banks | R1 | CO/BO/GR/SA/SI | D/T, AV | Y | N | NA | Y | Y | Detailed survey | same crossing and WC as WC9 (Patience Lake/Ogoki River); 97 m DS | High overwintering, spawning, and rearing potential for all fish. |
| RA4B-WC-02 | - | Watercourse | Alternative-4 | N | 517166 | 5631036 | - | Ogoki River Provincial Park | Lower-Ogoki | Mapped | 2.2 | 2.4 | 0.6 | 0.6 | Well-defined bed and banks | F2/IP2 | OR | D/T, AV, WD, OV, UC | Y | N | BD | N | Y | Detailed survey | - | The crossing location was in flat habitat. A beaver dam was observed downstream of the crossing and was likely not a barrier to fish passage. |

Table 1A: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | UTM Zone 16U | | Proposed Crossing Structure | Park | Tertiary Watershed Name | Mapped or Unmapped | Stream and Fish Habitat Characteristics | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | | | | | Wetted width (m) | Bankfull width (m) | Maximum Depth of surveyed section (m) | Mean Depth of surveyed section (m) | Bed/Banks Description | Habitat Unit | Bed Substrate | Cover Type present in surveyed section | Aquatic Vegetation Present (Y/N/NA) | Barrier Present Within 10 m of Crossing | Type of Barrier | Fish Captured During Survey | Fish Habitat Potential (Y/N) | Data Source[b] | Distance to Cliffs (Golder 2013) | Additional Notes |
| RA4B-WC-03 | - | Watercourse | Alternative-4 | N | 516056 | 5631437 | - | Ogoki River Provincial Park | Lower-Ogoki | Mapped | >5 | >5 | NA | NA | Poorly-defined bed and banks | F3 | NA | - | NA | N | NA | NA | Y | Aerial rapid survey | - | Dense tree cover reducing visibility of the watercourse however some intermitent pockets of water were observed. Low-lying wetted area flowing into McCaw Lake to the northeast |
| RA4B-WC-04 | - | Watercourse | Alternative-4 | N | 511308 | 5638417 | - | Ogoki River Provincial Park | Lower-Ogoki | Mapped | >5 | >5 | NA | NA | Poorly-defined bed and banks | F3 | NA | - | NA | N | NA | NA | Y | Aerial rapid survey | - | Dense tree cover reducing visibility of the watercourse however some intermitent pockets of water were observed. Low-lying wetted area flowing into McCaw Lake to the northeast |
| RA4-WC-00 | - | Watercourse | Alternative-4 | N | 524202 | 5620008 | - | - | Lower-Ogoki | Mapped | 3.5 | 4 | 0.8 | 0.8 | Moderately-defined bed and banks | F2/IP1/P2 | OR/SI/SA/ GR | WD, AV, D/T | Y | N | NA | Y | Y | Detailed survey | - | The watercourse flows in Crony Lake, approx 3.7 km downstream from the crossing. The crossing location was in flat habitat. |
| RA4-WC-02 | Colpitts Creek | Watercourse | Alternative-4 | N | 521688 | 5624119 | - | - | Lower-Ogoki | Mapped | 10 | 11 | >2 | >2 | Moderately-defined bed and banks | F1 | OR/SI/BO | OV, WD, AV, UC, D/T | Y | Y | Chute | Y | Y | Detailed survey | same crossing and WC as WC2, 70 m DS froms WC2 (Colpitts Creek) | Preferred route ROW re-routed after 2021. Habitat between the original site and re-routed site were comparible. |
| RA4-WC-05 | - | Lake | Alternative-4 | N | 519747 | 5628176 | - | - | Lower-Ogoki | Mapped | 10 | 11 | 1.3 | 1.3 | Well-defined bed and banks | F1 | OR/Si | AV, OV, WD, D/T | Y | N | NA | Y-Cliffs | Y | Detailed survey | same crossing and WC as WC3; 12 m US from WC3 | Moderate overwintering and rearing potential for all fish. |
| RA4-WC-12 | - | Watercourse | Alternative-4 | N | 518647 | 5635591 | - | - | Lower-Ogoki | Mapped | 8.4 | 10 | 0.7 | 0.7 | poorly-defined bed and banks | F2 | OR | AV,OV,UC, WD | Y | N | NA | N | Y | Detailed survey | Tributary to Patience Lake/Ogoki River (1.4 km to confluence) and another 2.8 km to WC9 | The crossing location was within a poorly-defined channelized watercourse within a wetland area. |
| RA4-WC-13 | - | Watercourse | Alternative-4 | N | 517166 | 5636864 | - | - | Lower-Ogoki | Unmapped | <1 | <1 | NA | NA | Likely undefined | Unknown | OR | - | NA | Unknown | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary to Patience Lake/Ogoki River (800 m to confluence) and another 1 km to WC9 | Appears to be a wetted area. No channel present on LiDAR imagery, but appears to connect a nearby watercourse (100 m downstream). Could potentially contain fish in high flows. Bank elevation different from Channel elevation in LiDAR. |
| RA4-WC-14 | - | Lake | Alternative-4 | N | 517473 | 5637479 | - | - | Lower-Ogoki | Mapped | 13 | 15 | NA | NA | Poorly-defined bed and banks | F1 | OR | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | Tributary to Patience Lake/Ogoki River (400 m to confluence) and another 200 m to WC9 | Appears to be a wetted area. The entire floodplain area (i.e., 165 m) may need to be cleared if crossing structure is constructed. Ground does not appear to be stable within floodplain as branching is present along watercourse. Beaver dam present approximately 85 m upstream and 105 m downstream of crossing location. |
| RA4-WC-15 | Patience Lake | Lake | Alternative-4 | N | 517655 | 5638092 | - | Ogoki River Provincial Park | Lower-Ogoki | Mapped | 300 | 349 | 4.5 | 3 | Well-defined bed and banks | F1 | GR/FI/BO | AV, D/T, Sub | Y | N | NA | Y-Cliffs | Y | Cliffs WC9 (97 m US of RA4-WC-15) | same crossing and WC as WC9 (Patience Lake/Ogoki River); 97 m DS | Stream characteristics for Cliffs crossing location WC9 (97m US of RA4-WC-15) |
| RA4-WC-16 | - | Watercourse | Alternative-4 | N | 519010 | 5642518 | - | - | Lower-Ogoki | Mapped | <1 | <1 | NA | NA | Poorly-defined bed and banks | Unknown | OR | - | NA | N | NA | NA | Y | Aerial Reconaissance and LiDAR | over 5 km from WC9 and WC11, not connected | Appears to be a wetted area. |
| RA4-WC-17 | - | Watercourse | Alternative-4 | N | 522159 | 5646017 | - | - | Lower-Ogoki | Mapped | 80 | 30 | >1.5 | >1.5 | Moderately-defined bed and banks | F1 | OR/SI | D/T, AV,WD | Y | Y | BD | Y | Y | Detailed survey | over 5 km from WC9 and WC11, not connected | Appears to be a wetted area. Floodplain area (i.e., 165 m) may need to be cleared if crossing structure is constructed. Ground does not appear to be stable within floodplain as branching is present along watercourse. |
| RA4-WC-18 | - | Lake | Alternative-4 | N | 521894 | 5647392 | - | - | Lower-Ogoki | Mapped | 18.2 | 18.2 | 0.5 | 0.5 | Moderately-defined bed and banks | RF | Co, Gr, Bo, SA, Si, Or | AV,OV,WD, Sub, UC,D/T | Y | Y | BD | Observed | Y | Detailed survey | same crossing and WC as WC11, 95 m DS | The proposed crossing was in a riffle habitat. Moderate overwintering potential in the deep portions of the surveyed section with high spawning and rearing habitat potential. |
| RA4-WC-19 | - | Watercourse | Alternative-4 | N | 523071 | 5649798 | - | - | Lower-Ogoki | Mapped | 25 | 2.8 | 1.1 | 1.1 | Moderately-defined bed and banks | F1/R1/IP1 | OR, SA, SI | D/T, AV, WD | Y | Y | WD | N | Y | Detailed survey | Tributary to same watercourse as WC11 (2km to confluence and another 3.5 km to WC11) | The watercourse flows between Byford (1.6 km upstream of crossing) and Glaze Lake (1 km downstream of crossing). The crossing occurred within a channelized portion of a wetland. |
| RA4-WC-20 | - | Watercourse | Alternative-4 | N | 520992 | 5654446 | - | - | Lower-Ogoki | Mapped | 3 | 3 | NA | NA | Poorly-defined bed and banks | F2 | OR | - | NA | Y | BD, WD | NA | Y | Aerial Reconaissance and LiDAR | 3km to WC 15, different WC, not connected | Appears to be a wetted area. The entire floodplain area (i.e., 50 m) may need to be cleared if crossing structure is constructed. Ground does not appear to be stable within floodplain as branching is present along watercourse. |
| RA4-WC-21 | - | Watercourse | Alternative-4 | N | 521131 | 5656047 | - | - | Lower-Ogoki | Mapped | 12.5 | 8 | >1.5 | >1.5 | Moderately-defined bed and banks | F1 | OR/SI | D/T, AV, OV | Y | N | NA | N | Y | Detailed survey | 1.5 km to WC 15, different WC, not connected | Section flooded in 2022 assessments, low-oxygen system making overwintering potential low for large-bodied fish and moderate for small. |
| RA4-WC-22 | - | Watercourse | Alternative-4 | N | 520890 | 5657391 | - | - | Lower-Ogoki | Mapped | 9 | 9.2 | >1.5 | >1.5 | Well-defined bed and banks | RF/R1 | CO/BO/FI/ GR | AV, OV, Sub, WD, D/T | Y | N | NA | Y | Y | Detailed survey | same crossing and WC as WC15; 95m DS | Crossing location occurred in a deep run habitat was boulder/cobble substrates. |

Table 1A: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | UTM Zone 16U | | Proposed Crossing Structure | Park | Tertiary Watershed Name | Mapped or Unmapped | Stream and Fish Habitat Characteristics | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | | | | | Wetted width (m) | Bankfull width (m) | Maximum Depth of surveyed section (m) | Mean Depth of surveyed section (m) | Bed/Banks Description | Habitat Unit | Bed Substrate | Cover Type present in surveyed section | Aquatic Vegetation Present (Y/N/NA) | Barrier Present Within 10 m of Crossing | Type of Barrier | Fish Captured During Survey | Fish Habitat Potential (Y/N) | Data Source[b] | Distance to Cliffs (Golder 2013) | Additional Notes |
| RA4-WC-23 | - | Watercourse | Alternative-4 | N | 519751 | 5658577 | - | - | Lower-Ogoki | Unmapped | 60 | 3.5 | <0.75 | <0.75 | Poorly-defined bed and banks | F2 | OR | - | NA | Y | nittent dry | NA | Y | Aerial rapid survey and LiDAR | 5 km from WC 15, indirectly connected; not on same WC | poorly defined channel with flooded/impounded flow path through a wetland area. Fish passage may be impeded by a lack of connectivity to wetland |
| RA4-WC-24 | - | Watercourse | Alternative-4 | N | 519967 | 5659797 | - | - | Lower-Ogoki | Mapped | 1 | 0.6 | 0.5 | 0.5 | Poorly-defined bed and banks | F2 | OR | AV, UC | Y | N | NA | Y | Y | Detailed survey | 2.2 km to WC 18, different WC, not connected | The watercourse two unnamed lakes/ponds and could be used as a potential corridor between the two. |
| RA4-WC-25 | - | Watercourse | Alternative-4 | N | 519870 | 5662127 | - | - | Lower-Ogoki | Mapped | 6.8 | 7.5 | 0.6 | 0.5 | Well-defined bed and banks | RF/F2 | BO/SA/GR/ CO/SI | WD, Sub, AV,UC,D/T, OV | Y | N | NA | Y | Y | Detailed survey | same crossing and WC as WC18, 200 m US from WC18, Tributary to WA8 | The crossing location occurs within a riffle habitat with boulders, cobbles, sand, and gravel. The surveyed section had moderate overwintering habitat. |
| RA4-WC-26 | - | Watercourse | Alternative-4 | N | 519974 | 5663183 | - | - | Lower-Ogoki | Mapped | 5.5 | 5.5 | 0.8 | 0.8 | Moderately-defined bed and banks | F2/P2/IP2 | SA/BO/CO/ GR/SI/OR | Sub, OV, WD, AV | Y | Y | BD (2) | Y | Y | Detailed survey | same WC as WA8; 600m DS from WA8 and 1.5 km from WC18 | Branching present along watercourse. The crossing location is split into a north and south channel. The north channel was in a pool habitat and the south channel was in a run habitat. |
| RA4-WC-27 | - | Lake | Alternative-4 | Y | 522053 | 5691380 | Multi-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 53 | 178 | >1.5 | >1.5 | Well-defined bed and banks | F1 | Or | D/T, AV, WD | Y | N | NA | N | Y | Detailed survey | same crossing and WC as WC27; 400 m DS from WC27 and 5 km DS from WA11; same WC as MFFN crossing RA1-WC-23 | Large-permanent watercourse with soft boggy banks. |
| RA4-WC-29 | - | Watercourse | Alternative-4 | Y | 523148 | 5695934 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 8 | 8 | <1 | <1 | poorly-defined bed and banks | F3 | Unknown | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | Tributary to WC at WC27 (300 m from confluence, then another 3.2km to WC27) | Poorly defined channel present with sections of ponding and standing water. |
| RA4-WC-31 | - | Watercourse | Alternative-4 | Y | 523972 | 5698738 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 2.5 | 3.5 | 0.4 | 0.4 | Poorly-defined bed and banks | R3/F3 | SA/CO/BO/ GR | WD, OV, Sub | N | N | NA | NA | Y | Detailed survey | Tributary to Albany River - confluence 4 km away, 7.5 km more to WC29, 8 km to WC27 | The crossing location was in shallow run habitate. Although suitable spawning substrates are present, the shallow nature of the system is likely to freeze to bottom and therefore not suitable for overwintering eggs. |
| RA4-WC-32 | - | Watercourse | Alternative-4 | Y | 524169 | 5702612 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 50 | 3 | <1 | <1 | Poorly-defined bed and banks | F2/IP2 | OR | - | NA | N | NA | NA | Y | Aerial rapid survey and LiDAR | Tributary to Albany River - confluence 3km away, 7.5 km more to WC29, 10 km to WC27 | Poorly defined channel wihin a flooded/impounded flow path through a wetland without and defined bed or banks. |
| RA4-WC-34 | Albany River | Watercourse | Alternative-4 | Y | 525100 | 5705282 | Multi-Span Bridge | Albany River Provincial Park | Upper-Albany---Makokibatan | Mapped | 70 | 77 | >2 | >2 | Well-defined bed and banks | R1 | BO/SA/CO/ GR | D/T, Sub | N | N | NA | N | Y | Detailed survey | same WC as WC29 (Albany River); 6km from WC29 | Deep runs, heterogenous fish habitat. **Walleye spawning habitat observed.** |
| RA4-WC-35 | - | Stream | Alternative-4 | Y | 524970 | 5705565 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 1.3 | 1.7 | 0.3 | 0.3 | Well-defined bed and banks | R3 | GR/SI/SA/ OR | WD, UC | N | N | NA | NA | Y | Detailed survey | Cliffs ITS WC29 | Watercourse is a tributary to the Albany River, large amounts of woody debris and overhanging deadfall above channel. |
| RA4-WC-36 | - | Watercourse | Alternative-4 | Y | 524911 | 5706281 | Culvert | Nipigon | Upper-Albany---Makokibatan | Mapped | 1 | - | - | - | - | - | - | - | - | - | - | - | - | Aerial rapid survey and LiDAR | - | - |
| RA4-WC-37 | - | Watercourse | Alternative-4 | Y | 524697 | 5708581 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 9 | 6 | >1.5 | >1.5 | Moderately-defined bed and banks | F1 | OR/SI | D/T, OV, AV | Y | N | NA | N | Y | Detailed survey | Tributary - 8 km to Albany River confluence | Deep hetergenous flat habitat |
| RA4-WC-41 | Gourlie Creek | Watercourse | Alternative-4 | Y | 526665 | 5715963 | Multi-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 31 | 34 | >1.5 | >1.5 | Well-defined bed and banks | R1 | SA/SI | D/T | N | N | NA | Y | Y | Detailed survey | Tributary - 12km to Albany Rver confluence | Moderately-large permanent watercourse with high overwintering potential and moderate spawning/rearing potential. |
| RA4-WC-42 | - | Watercourse | Alternative-4 | Y | 527995 | 5717404 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 4 | 6 | 0.9 | 0.9 | poorly-defined bed and banks | F2 | OR/SI | AV, WD, OV | Y | Y | BD (2) | NA | Y | Detailed survey | over 13 km to nearest Cliffs site (WC 32), not connected | Crossing location occurred within a poorly-defined channelized portion within a wetland. A beaver dam was observed and created a "side channel" diverting water around it. |
| RA4-WC-43 | - | Watercourse | Alternative-4 | Y | 528554 | 5718881 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 25 | 25 | <0.75 | <0.75 | Poorly-defined bed and banks | F2/IP2 | OR | - | NA | Y | BD | NA | Y | Aerial rapid survey | Cliffs ITS WC38 and WA21 | Poorly defined flooded channel. Fish passage may be impeded by wetland ponding and areas drying up in summer months. Low-lying flooded wetland area |
| RA4-WC-45 | - | Watercourse | Alternative-4 | Y | 530801 | 5722972 | Clear-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 7 | 10 | 1.1 | 1.1 | Moderately-defined bed and banks | F2 | OR/SI | WD | N | N | NA | N | Y | Detailed survey | over 15 km to nearest Cliffs site (WC 32), not connected | Crossing location occurred within a poorly-defined channelized portion within a wetland. |
| RA4-WC-50 | - | Watercourse | Alternative-4 | Y | 534466 | 5725709 | Culvert | Nipigon | Upper-Albany---Makokibatan | Unmapped | - | 2 | - | - | Undefined | F2 | OR | - | - | - | - | - | - | Aerial Reconaissance and LiDAR | Cliffs ITS WC29 | No watercourse. Potential wetted area or drainage feature 221 m SE of crossing. |
| RA4-WC-55 | Wabassi River | Watercourse | Alternative-4 | Y | 539004 | 5735928 | Multi-Span Bridge | - | Upper-Albany---Makokibatan | Mapped | 45 | 50 | >1.5 | 1.2 | Well-defined bed and banks | R2/RF | CO/GR/SA/ BO | D/T, AV. Sub, UC | Y | N | NA | N | Y | Detailed survey | same WC as WC38 (Wabassi River), over 45 km DS from WC 38 | Large permanent watercourse with heterogenous fish habitat. |
| RA4-WC-57 | - | Watercourse | Alternative-4 | Y | 539258 | 5736888 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 2 | 2 | 0.5 | 0.5 | Moderately-defined bed and banks | F2 | OR/SI/SA/B O | WD, AV, OV, UC | Y | N | NA | NA | Y | Detailed survey | Tributary - 8 km to Albany River confluence | Shallow flat watercourse through thick alders |

**Table 1A: Stream and Fish Habitat Characteristics**

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | UTM Zone 16U | | Proposed Crossing Structure | Park | Tertiary Watershed Name | Mapped or Unmapped | Stream and Fish Habitat Characteristics | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | | | | | Wetted width (m) | Bankfull width (m) | Maximum Depth of surveyed section (m) | Mean Depth of surveyed section (m) | Bed/Banks Description | Habitat Unit | Bed Substrate | Cover Type present in surveyed section | Aquatic Vegetation Present (Y/N/NA) | Barrier Present Within 10 m of Crossing | Type of Barrier | Fish Captured During Survey | Fish Habitat Potential (Y/N) | Data Source[b] | Distance to Cliffs (Golder 2013) | Additional Notes |
| RA4-WC-58 | - | Watercourse | Alternative-4 | Y | 539324 | 5737051 | Culvert | - | Upper-Albany---Makokibatan | Mapped | 5 | 15 | 0.8 | 0.8 | Moderately-defined bed and banks | F2 | OR | AV, WD, OV | Y | N | NA | NA | Y | Detailed survey | Tributary - 8 km to Albany River confluence | Crossing location occurred within a poorly-defined channelized portion within a wetland. |

(a) Waterbodies with fish habitat potential are listed in this table. Waterbodies with no defined bed or banks and therefore no fish habitat potential are listed in Appendix C. All waterbodies are in the Nipigon MNRF District.

(b) Indicates the source of the data from which the decision on habitat characteristics and fish habitat potential were based.

Table 1B: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | Fish Species[b] | | Proposed Window Based on Fish Habitat Assessment | Species Proposed Restricted Activity Timing Window | Fish Habitat Potential[c,d] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance to Cliffs (Golder 2013) | Fish Species Documented | | | Blacknose Shiner | Bluntnose Minnow | Brook Stickleback | Brook Trout | Burbot | Cisco | Common Shiner | Emerald Shiner | Fathead Minnow | Finescale Dace | Golden Shiner | Iowa Darter | Johnny Darter | Lake Chub | Lake Sturgeon | Lake Trout | Lake Whitefish | Logperch | Longnose Dace | Longnose Sucker | Mimic Shiner | Mottled Sculpin | Ninespine Stickleback | Northern Pearl Dace | Northern Pike | Northern Redbelly Dace | River Darter | Sauger | Shorthead Redhorse | Silver Redhorse | Slimy Sculpin | Spoonhead Sculpin | Spottail Shiner | Trout-perch | Walleye | White Sucker | Yellow Perch |
| RA1-4-WC-01 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 12 km from WC18 and WA8, not directly connected | Pearl Dace, Finescale Dace, Brook Stickleback | April 1 to June 15 | September 1 to June 20 | H | H | S | - | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | - | H | H | H | H | H | H | - | H | H |
| RA1-4-WC-02 | Dusey River | Watercourse | Alternative-1-and-Alternative-4 | Y | same crossing and WC as WC22; 50 m DS | Brook Trout, White Sucker, Lake Whitefish, Northern Pike, Walleye, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Pearl Dace, Yellow Perch | September 1 to June 20 | September 1 to June 20 | S | S | S | S | S | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| RA1-4-WC-07 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | same crossing and WC as WC25 and WA9; 28 m DS | Common Shiner, Finescale Dace, Pearl Dace, White Sucker, Northern Pike | April 1 to June 15 | September 1 to June 20 | H | H | S | H | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | - | H | H | H | H | H | H | - | H | - |
| RA1-4-WC-09B | - | Watercourse | Alternative-1-and-Alternative-4 | Y | 10 km to WC32, on different WC, not connected | - | April 1 to June 15 | September 1 to June 20 | S | S | S | - | - | - | H | H | H | H | H | S | S | H | - | - | - | S | H | - | S | H | H | S | - | H | S | - | - | - | H | H | S | S | - | - | - |
| RA1-4-WC-10 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | September 1 to June 20 | H | H | S | H | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| RA1-4-WC-19 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA1-4-WC-21 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | September 1 to June 20 | H | H | S | H | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA1-4-WC-27 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | S | S | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-4-WC-31 | Buffaloskin River | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | Brook Trout | April 1 to June 15 | September 1 to June 15 | H | H | S | H | - | - | H | H | S | S | S | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| RA1-4-WC-33 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-4-WC-34 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | September 1 to June 20 | H | H | S | H | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| RA1-4-WC-35 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-4-WC-36 | - | Watercourse | Alternative-1-and-Alternative-4 | Y | over 30 km to nearest Cliffs site (WC 38) | - | April 1 to June 15 | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-01 | - | Watercourse | Alternative-1 | Y | 10 km to WC2 (on different WC, not connected) | - | April 1 to June 15 | September 1 to June 20 | S | S | S | - | - | - | H | S | S | S | S | S | S | S | - | - | - | S | S | S | S | H | S | S | S | S | S | - | S | S | H | H | S | S | - | S | S |
| RA1-WC-02 | - | Watercourse | Alternative-1 | Y | 13 km on same WC as WC3, connected | - | April 1 to June 15 | September 1 to June 20 | H | H | S | - | - | - | H | S | S | S | S | H | S | S | - | - | - | H | S | S | H | H | H | H | H | H | - | H | S | H | H | H | S | - | S | S |
| RA1-WC-05 | Ogoki River | Watercourse | Alternative-1 | Y | 22 km from WC9, same WC (Ogoki River/Patience Lake) | Brook Trout, Northern Pike, Lake Sturgeon, Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | September 1 to June 30 | September 1 to June 30 | S | S | S | S | S | H | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| RA1-WC-09 | - | Watercourse | Alternative-1 | Y | over 25 km from WC9, different WC, not connected | Northern Redbelly Dace, Pearl Dace, Brook Stickleback | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | S | S | S | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-11 | Ogoki River | Watercourse | Alternative-1 | Y | 22 km from WC9, same WC (Ogoki River/Patience Lake) | Brook Trout, Northern Pike, Lake Sturgeon,Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | September 1 to June 30 | September 1 to June 30 | H | H | S | S | H | H | H | H | S | S | S | S | S | S | H | H | H | H | H | S | S | H | S | H | S | S | H | S | H | S | S | H | H | S | S | S | S | S | S | S | S |
| RA1-WC-13 | - | Watercourse | Alternative-1 | Y | 15 km from WC11, connected | - | April 1 to June 20 | September 1 to June 20 | H | H | S | H | - | - | H | S | H | H | H | H | S | S | - | - | - | H | S | S | H | H | H | H | H | H | H | S | H | S | H | H | H | S | S | S | H |
| RA1-WC-14 | - | Watercourse | Alternative-1 | Y | 8 km from WC15, not connected | - | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | S | S | S | H | S | H | - | - | - | H | H | H | H | H | H | H | - | H | H | - | H | H | H | H | H | H | - | H | S |

Table 1B: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | Fish Species[b] | | Proposed Window Based on Fish Habitat Assessment | Species Proposed Restricted Activity Timing Window | Fish Habitat Potential[c,d] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance to Cliffs (Golder 2013) | Fish Species Documented | | | Blacknose Shiner | Blunthose Minnow | Brook Stickleback | Brook Trout | Burbot | Cisco | Common Shiner | Emerald Shiner | Fathead Minnow | Finescale Dace | Golden Shiner | Iowa Darter | Johnny Darter | Lake Chub | Lake Sturgeon | Lake Trout | Lake Whitefish | Logperch | Longnose Dace | Longnose Sucker | Mimic Shiner | Mottled Sculpin | Ninespine Stickleback | Northern Pearl Dace | Northern Pike | Northern Redbelly Dace | River Darter | Sauger | Shorthead Redhorse | Silver Redhorse | Slimy Sculpin | Spoonhead Sculpin | Spottail Shiner | Trout-perch | Walleye | White Sucker | Yellow Perch |
| RA1-WC-15 | - | Watercourse | Alternative-1 | Y | 8 km from WC15, not connected | Lake Whitefish, Northern Pike, Walleye | April 1 to June 15 | September 1 to June 20 | H | H | S | - | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | - | H | H | H | H | H | H | - | H | S |
| RA1-WC-16 | - | Watercourse | Alternative-1 | Y | 6 km from WC15, not connected | - | April 1 to June 15 | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-17 | - | Watercourse | Alternative-1 | Y | same WC as WC15; 5km DS from WC15; connected | Northern Pike, Longnose Dace, Johnny Darter | September 1 to June 20 | September 1 to June 20 | S | S | S | S | - | - | S | S | S | S | S | S | S | S | - | - | - | S | H | S | S | S | S | S | S | S | S | S | S | H | S | S | S | S | S | S |
| RA1-WC-19 | - | Watercourse | Alternative-1 | Y | 2.5 km from WC18, not connected, different WC | - | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | H | H | H | H | H | H | - | H | - |
| RA1-WC-20 | - | Watercourse | Alternative-1 | Y | 2 km from WC18, not connected, different WC | - | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-22 | - | Watercourse | Alternative-1 | Y | same WC as WA8 (2.2 m DS) and connected to WC18 (3.8 km DS) | Finescale Dace, Pearl Dace, Brook Stickleback, Common Shiner, White Sucker, Longnose Dace, Northern Redbelly Dace, Iowa Darter | April 1 to June 15 | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-22A | - | Stream | Alternative-1 | Y | | | April 1 to June 15 | April 1 to June 15 | S | S | S | - | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | - | S | S | S | S | S | S | - | S | - |
| RA1-WC-22B | - | Stream | Alternative-1 | Y | | | April 1 to June 15 | April 1 to June 15 | S | S | S | - | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | - | S | S | S | S | S | S | - | S | - |
| RA1-WC-22C | - | Stream | Alternative-1 | Y | | | April 1 to June 15 | April 1 to June 15 | S | S | S | - | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | - | S | S | S | S | S | S | - | S | - |
| RA1-WC-23 | - | Lake | Alternative-1 | N | same crossing and WC as WC27; 40 m DS from WC27 and 5km DS from WA11; connected | Common Shiner, Northern Pike, Logperch, Walleye | - | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-26 | - | Watercourse | Alternative-1 | N | Tributary to Albany River (confluence is 500 m DS), WC 29 is 2.5 km from confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | - | September 15 to June 30 | H | H | S | - | - | - | H | H | S | S | S | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-27 | Albany River | Watercourse | Alternative-1 | N | same crossing and same WC as WC29 (Albany River); 0 m | Brook Trout, Cisco, Lake Sturgeon, Lake Whiterfish,Northern Pike, Walleye, Longnose Sucker, White Sucker, Silver Redhorse, Shorthead Redhorse, Finescale dace, Northern Redbelly Dace, Longnose Dace, Pearl Dace, Lake Chub, Emerald Shiner, Common Shiner, Blacknose Shiner, Spottail Shiner, Fathead Minnow, Burbot, Brook Stickleback, Ninespine Stickleback, Trout Perch, Yellow Perch, Sauger, Johnny Darter, Log Perch, Cyprinid sp, Sculpin sp | - | September 1 to June 30 | S | S | S | S | S | H | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| RA1-WC-28 | - | Watercourse | Alternative-1 | N | Tributary to Albany River (confluence is 500 m DS), WC 29 is 2 km from confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | - | September 15 to June 30 | S | S | S | - | - | - | H | S | S | S | S | S | S | S | - | - | - | S | H | - | S | H | H | S | - | H | S | - | - | - | H | H | S | S | - | - | - |
| RA1-WC-29 | - | Watercourse | Alternative-1 | N | Tributary to Albany River (confluence is 500 m DS), WC 29 is 2 km from confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | - | September 15 to June 30 | S | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | S | H | H | H | H | H | H | - | H | H | H | H | S | H | - | H | - |
| RA1-WC-30 | - | Watercourse | Alternative-1 | N | flows into same pond/lake as WC30; 3.5 km ds WC30, 2km ds fish-bearing lake (Saarimaki Lake) | Northern Pike, Yellow Perch (in u/s Saarimaki Lake) | - | April 1 to June 15 | S | S | S | - | - | - | H | S | S | S | S | S | S | S | - | - | - | S | H | H | S | H | S | S | S | S | S | - | H | H | H | H | S | S | - | H | S |
| RA1-WC-32 | - | Watercourse | Alternative-1 | N | Tributary (8 km) to WC30 and Saarimaki Lake, connected | - | - | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-38 | - | Watercourse | Alternative-1 | N | Cliffs ITS WC32 | Common Shiner, Blacknose Shiner Pearl Dace, White Sucker, Northern Pike, Brook Trout | - | September 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |

Table 1B: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | Fish Species[b] | | Proposed Window Based on Fish Habitat Assessment | Species Proposed Restricted Activity Timing Window | Fish Habitat Potential[c,d] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance to Cliffs (Golder 2013) | Fish Species Documented | | | Blacknose Shiner | Bluntnose Minnow | Brook Stickleback | Brook Trout | Burbot | Cisco | Common Shiner | Emerald Shiner | Fathead Minnow | Finescale Dace | Golden Shiner | Iowa Darter | Johnny Darter | Lake Chub | Lake Sturgeon | Lake Trout | Lake Whitefish | Logperch | Longnose Dace | Longnose Sucker | Mimic Shiner | Mottled Sculpin | Ninespine Stickleback | Northern Pearl Dace | Northern Pike | Northern Redbelly Dace | River Darter | Sauger | Shorthead Redhorse | Silver Redhorse | Slimy Sculpin | Spoonhead Sculpin | Spottail Shiner | Trout-perch | Walleye | White Sucker | Yellow Perch |
| RA1-WC-39 | - | Watercourse | Alternative-1 | N | Cliffs ITS WC34 & WA17 | Common Shiner, Lake Chub, White Sucker, Shorthead Redhorse, Northern Pike, Log Perch, Walleye, Yellow Perch, Longnose Dace, Mottled Sculpin, | - | April 1 to June 20 | H | H | S | - | - | - | H | H | S | S | S | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-40 | Gourlie Creek | Watercourse | Alternative-1 | N | Gourlie Creek, also indirectly connected, but far away from WC32 (15km DS) and WC34/WA17 (12 km DS). | Brook Trout, Common Shiner, Lake Chub, White Sucker, Northern Pike, Log Perch, Walleye, Yellow Perch, Longnose Dace, Mottled Sculpin, Blacknose Shiner, Pearl Dace | - | September 1 to June 20 | S | S | S | H | S | - | H | H | H | H | H | S | S | H | - | - | - | S | H | H | S | H | H | S | H | H | S | S | S | H | H | S | S | S | H | H |
| RA1-WC-41 | - | Watercourse | Alternative-1 | N | Tributary connected to WC34/WA17 (9 km DS) and WC32 (17 km DS) | Common Shiner, Lake Chub, White Sucker, Northern Pike, Log Perch, Walleye, Yellow Perch, Longnose Dace, Mottled Sculpin, Blacknose Shiner, Pearl Dace | - | September 1 to June 15 | H | H | S | H | - | - | H | S | S | S | S | S | S | S | - | - | - | H | H | - | S | H | S | H | S | S | H | - | H | H | H | H | H | H | - | H | S |
| RA1-WC-42 | - | Watercourse | Alternative-1 | N | Tributary connected to WC34/WA17 (9 km DS) and WC32 (17 km DS) | Common Shiner, Lake Chub, White Sucker, Northern Pike, Log Perch, Walleye, Yellow Perch, Longnose Dace, Mottled Sculpin, Blacknose Shiner, Pearl Dace | - | April 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-44 | - | Watercourse | Alternative-1 | N | Tributary connected to WC34/WA17 (13 km DS) and WC32 (22 km DS) | Common Shiner, Lake Chub, White Sucker, Northern Pike, Log Perch, Walleye, Yellow Perch, Longnose Dace, Mottled Sculpin, Blacknose Shiner, Pearl Dace | - | April 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-51 | Wabassi River | Watercourse | Alternative-1 | N | Same crossing and WC (Wabassi River) as WC38; 300m US from WC38 and 1.9 km US from WA21 | Northern Pike, Walleye, Brook Trout, Shorthead Redhorse, White Sucker, Common Shiner, Lake Chub | - | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-52 | - | Watercourse | Alternative-1 | N | Cliffs ITS WC38 and WA21 | Common Shiner, Lake Chub, Shorthead Redhorse, White Sucker, Northern Pike, Brook Trout, Walleye, Spottail Shiner | - | September 1 to June 20 | H | H | S | - | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | - | S | H | S | H | S | S | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-53 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 2km DS), WC 38 is another 750m from confluence, WA21 is also 750m from confluence | Northern Pike, Walleye, Brook Trout, Shorthead Redhorse, White Sucker, Common Shiner, Lake Chub | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | - | H | H | H | H | H | H | - | H | H |
| RA1-WC-54 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 2km DS), WC 38 is another 750m from confluence, WA21 is also 750m from confluence | Northern Pike, Walleye, Brook Trout, Shorthead Redhorse, White Sucker, Common Shiner, Lake Chub | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | - | H | H | H | H | H | H | - | H | H |
| RA1-WC-56 | - | Watercourse | Alternative-1 | N | 8km from WC38, not connected | - | - | April 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | S | H | H | - | H | H | H | H | H | H | - | H | S |
| RA1-WC-57 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 8 km DS), WA21 is 13km from confluence, WC38 is 15km from confluence | Brook Trout, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Northern Pike, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Walleye, Pearl Dace | - | September 1 to June 20 | S | S | S | H | S | - | H | H | S | S | S | S | S | H | - | - | - | S | H | H | S | H | S | S | S | S | S | H | H | H | H | H | S | S | H | H | S |
| RA1-WC-58 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 8 km DS), WA21 is 13km from confluence, WC38 is 15km from confluence | Brook Trout, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Northern Pike, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Walleye, Pearl Dace | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | - | H | H | H | H | H | H | - | H | H |
| RA1-WC-60 | - | Watercourse | Alternative-1 | N | Tributary with potential connectivity to Wabassi River (confluence is 8km DS), WC 38 is 25 km away | Brook Trout, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Northern Pike, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Walleye, Pearl Dace | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA1-WC-66 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 1 km DS), WA21 is 26 km from confluence, WC38 is 28 km from confluence | Brook Trout, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Northern Pike, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Walleye, Pearl Dace | - | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |

Table 1B: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | Fish Species[b] | | Proposed Window Based on Fish Habitat Assessment | Species Proposed Restricted Activity Timing Window | Fish Habitat Potential[c,d] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance to Cliffs (Golder 2013) | Fish Species Documented | | | Blacknose Shiner | Bluntnose Minnow | Brook Stickleback | Brook Trout | Burbot | Cisco | Common Shiner | Emerald Shiner | Fathead Minnow | Finescale Dace | Golden Shiner | Iowa Darter | Johnny Darter | Lake Chub | Lake Sturgeon | Lake Trout | Lake Whitefish | Logperch | Longnose Dace | Longnose Sucker | Mimic Shiner | Mottled Sculpin | Ninespine Stickleback | Northern Pearl Dace | Northern Pike | Northern Redbelly Dace | River Darter | Sauger | Shorthead Redhorse | Silver Redhorse | Slimy Sculpin | Spoonhead Sculpin | Spottail Shiner | Trout-perch | Walleye | White Sucker | Yellow Perch |
| RA1-WC-67 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 2.5 km DS), WA21 is 33 km from confluence, WC38 is 35 km from confluence | Brook Trout, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Northern Pike, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Walleye, Pearl Dace | - | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA1-WC-68 | - | Watercourse | Alternative-1 | N | Tributary to Wabassi River (confluence is 2.5 km DS), WA21 is 33 km from confluence, WC38 is 35 km from confluence | Brook Trout, Blacknose shiner, Common Shiner, Lake Chub, Longnose Dace, Northern Pike, Longnose Sucker, Shorthead Redhorse, White Sucker, Brook Trout, Trout-Perch, Johnny Darter, Iowa Darter, Log Perch, Walleye, Pearl Dace | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4B-WC-01 | Ogoki River | Watercourse | Alternative-4 | N | same crossing and WC as WC9 (Patience Lake/Ogoki River); 97 m DS | Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin, Brook Trout | - | September 1 to June 30 | S | S | S | S | S | H | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| RA4B-WC-02 | - | Watercourse | Alternative-4 | N | - | Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin, Brook Trout | - | September 1 to June 20 | H | H | S | - | - | - | H | H | S | S | S | S | H | - | - | - | H | H | - | S | H | S | H | S | S | H | - | - | - | H | H | H | H | - | - | S |
| RA4B-WC-03 | - | Watercourse | Alternative-4 | N | - | Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin, Brook Trout | - | September 1 to June 20 | H | H | S | H | H | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| RA4B-WC-04 | - | Watercourse | Alternative-4 | N | - | Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin, Brook Trout | - | September 1 to June 20 | H | H | S | H | H | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| RA4-WC-00 | - | Watercourse | Alternative-4 | N | - | Iowa Darter, Brook Stickleback | - | September 1 to June 20 | S | S | S | H | - | - | S | S | S | S | S | S | S | S | - | - | - | S | H | H | S | S | S | S | S | S | S | S | H | S | H | S | S | S | H | H | S |
| RA4-WC-02 | Colpitts Creek | Watercourse | Alternative-4 | N | same crossing and WC as WC2, 70 m DS froms WC2 (Colpitts Creek) | Brook Trout, Common Shiner, Lake Chub, Longnose Dace, White Sucker, Northern Pike, Burbot, Iowa Darter, Log perch, Johny Darter, Yellow Perch, Spottail Shiner | - | September 1 to June 20 | H | H | S | H | H | - | H | S | S | S | S | S | S | S | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA4-WC-05 | - | Lake | Alternative-4 | N | same crossing and WC as WC3; 12 m US from WC3 | Common Shiner, Lake Chub, White Sucker, Northern Pike, Yellow Perch. | - | September 1 to June 20 | H | H | S | H | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA4-WC-12 | - | Watercourse | Alternative-4 | N | Tributary to Patience Lake/Ogoki River (1.4 km to confluence) and another 2.8 km to WC9 | Lake Sturgeon, Lake Chub, White Sucker, Northern Pike, Lake Whitefish, Walleye, Yellow Perch | - | September 1 to June 20 | H | H | S | H | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | H | S |
| RA4-WC-13 | - | Watercourse | Alternative-4 | N | Tributary to Patience Lake/Ogoki River (800 m to confluence) and another 1 km to WC9 | Lake Sturgeon, Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-14 | - | Lake | Alternative-4 | N | Tributary to Patience Lake/Ogoki River (400 m to confluence) and another 200 m to WC9 | Lake Sturgeon, Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-15 | Patience Lake | Lake | Alternative-4 | N | same crossing and WC as WC9 (Patience Lake/Ogoki River); 97 m DS | Lake Sturgeon, Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | - | September 1 to June 30 | S | S | S | S | S | H | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |

Table 1B: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | Fish Species[b] | | Proposed Window Based on Fish Habitat Assessment | Species Proposed Restricted Activity Timing Window | Fish Habitat Potential[c,d] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance to Cliffs (Golder 2013) | Fish Species Documented | | | Blacknose Shiner | Bluntnose Minnow | Brook Stickleback | Brook Trout | Burbot | Cisco | Common Shiner | Emerald Shiner | Fathead Minnow | Finescale Dace | Golden Shiner | Iowa Darter | Johnny Darter | Lake Chub | Lake Sturgeon | Lake Trout | Lake Whitefish | Logperch | Longnose Dace | Longnose Sucker | Mimic Shiner | Mottled Sculpin | Ninespine Stickleback | Northern Pearl Dace | Northern Pike | Northern Redbelly Dace | River Darter | Sauger | Shorthead Redhorse | Silver Redhorse | Slimy Sculpin | Spoonhead Sculpin | Spottail Shiner | Trout-perch | Walleye | White Sucker | Yellow Perch |
| RA4-WC-16 | - | Watercourse | Alternative-4 | N | over 5 km from WC9 and WC11, not connected | Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | - | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-17 | - | Watercourse | Alternative-4 | N | over 5 km from WC9 and WC11, not connected | Lake Whitefish, White Sucker, Shorthead Redhorse, Northern Pike, Emerald Shiner, Lake Chub, Spottail Shiner, Trout Perch, Yellow Perch, Walleye, Iowa Darter, Johnny Darter, Log Perch, Mottled Sculpin | - | September 1 to June 15 | H | H | S | H | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | - | H | H | H | H | H | H | - | H | S |
| RA4-WC-18 | - | Lake | Alternative-4 | N | same crossing and WC as WC11, 95 m DS | Lake Chub, Northern Pike, Yellow Perch | - | September 1 to June 20 | S | S | S | S | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | S | H | S | S | S | S | S | S |
| RA4-WC-19 | - | Watercourse | Alternative-4 | N | Tributary to same watercourse as WC11 (2km to confluence and another 3.5 km to WC11) | Lake Chub, Northern Pike, Yellow Perch | - | January 1 to June 15 | S | S | S | - | H | - | H | H | S | S | S | S | S | H | - | - | - | S | H | H | S | H | S | S | S | S | S | - | H | H | H | H | S | S | - | H | S |
| RA4-WC-20 | - | Watercourse | Alternative-4 | N | 3km to WC 15, different WC, not connected | - | - | April 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-21 | - | Watercourse | Alternative-4 | N | 1.5 km to WC 15, different WC, not connected | - | - | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA4-WC-22 | - | Watercourse | Alternative-4 | N | same crossing and WC as WC15; 95m DS | Common Shinner, Blacknose Shiner, Lake Chub, Longnose Dace, White Sucker, Northern Pike, Burbot, Johhny Darter, Log Perch, Yellow Perch | - | September 1 to June 30 | H | S | S | S | S | - | S | S | S | S | S | S | S | S | S | H | H | S | S | S | S | S | S | S | H | S | S | S | S | S | S | S | H | S | S | S | S |
| RA4-WC-23 | - | Watercourse | Alternative-4 | N | 5 km from WC 15, indirectly connected; not on same WC | Common Shinner, Blacknose Shiner, Lake Chub, Longnose Dace, White Sucker, Northern Pike, Burbot, Johhny Darter, Log Perch, Yellow Perch | - | January 1 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | H | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-24 | - | Watercourse | Alternative-4 | N | 2.2 km to WC 18, different WC, not connected | - | - | April 1 to June 15 | H | H | S | - | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | - | S | H | S | H | S | S | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-25 | - | Watercourse | Alternative-4 | N | same crossing and WC as WC18, 200 m US from WC18, Tributary to WA8 | Finescale Dace, Pearl Dace, Brook Stickleback, Common Shiner, White Sucker, Longnose Dace, Northern Redbelly Dace, Iowa Darter | - | September 1 to June 15 | S | S | S | S | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | - | S | S | S | S | S | S | - | S | S |
| RA4-WC-26 | - | Watercourse | Alternative-4 | N | same WC as WA8; 600m DS from WA8 and 1.5 km from WC18 | Finescale Dace, Pearl Dace, Brook Stickleback, Common Shiner, White Sucker, Longnose Dace, Northern Redbelly Dace, Iowa Darter | - | September 1 to June 20 | S | S | S | S | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| RA4-WC-27 | - | Lake | Alternative-4 | Y | same crossing and WC as WC27; 400 m DS from WC27 and 5 km DS from WA11; same WC as MFFN crossing RA1-WC-23 | Common Shiner, Northern Pike, Logperch, Walleye | April 1 to June 15 | September 1 to June 20 | H | H | S | H | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA4-WC-29 | - | Watercourse | Alternative-4 | Y | Tributary to WC at WC27 (300 m from confluence, then another 3.2km to WC27) | Common Shiner, Northern Pike, Logperch, Walleye | September 1 to June 15 | September 1 to June 20 | S | S | S | S | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | - | S | S | H | S | S | S | - | S | - |
| RA4-WC-31 | - | Watercourse | Alternative-4 | Y | Tributary to Albany River confluence 4 km away, 7.5 km more to WC29, 8 km to WC27 | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | April 1 to June 15 | September 1 to June 20 | S | S | H | H | - | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | H | S | H | H | S | H | S | S | H | S | S | S | H | H | - |
| RA4-WC-32 | - | Watercourse | Alternative-4 | Y | Tributary to Albany River confluence 3km away, 7.5 km more to WC29, 10 km to WC27 | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | April 1 to June 15 | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | H | H | H | - | - | - | H | H | H | H | - | - | - |

Table 1B: Stream and Fish Habitat Characteristics

| WCID[a] | Waterbody Name | Waterbody Type | Route | Prefered Route | Fish Species[b] | | Proposed Window Based on Fish Habitat Assessment | Species Proposed Restricted Activity Timing Window | Fish Habitat Potential[c,d] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance to Cliffs (Golder 2013) | Fish Species Documented | | | Blacknose Shiner | Bluntnose Minnow | Brook Stickleback | Brook Trout | Burbot | Cisco | Common Shiner | Emerald Shiner | Fathead Minnow | Finescale Dace | Golden Shiner | Iowa Darter | Johnny Darter | Lake Chub | Lake Sturgeon | Lake Trout | Lake Whitefish | Logperch | Longnose Dace | Longnose Sucker | Mimic Shiner | Mottled Sculpin | Ninespine Stickleback | Northern Pearl Dace | Northern Pike | Northern Redbelly Dace | River Darter | Sauger | Shorthead Redhorse | Silver Redhorse | Slimy Sculpin | Spoonhead Sculpin | Spottail Shiner | Trout-perch | Walleye | White Sucker | Yellow Perch |
| RA4-WC-34 | Albany River | Watercourse | Alternative-4 | Y | same WC as WC29 (Albany River); 6km from WC29 | Lake Sturgeon, Cisco, Northern Pike,Walleye, Lake Whitefish, Longnose Sucker, White Sucker, Silver Redhorse, Shorthead Redhorse, Finescale dace, Northern Redbelly Dace, Longnose Dace, Pearl Dace, Lake Chub, Emerald Shiner, Common Shiner, Blacknose Shiner, Spottail Shiner, Fathead Minnow, Burbot, Brook Stickleback, Ninespine Stickleback, Trout Perch, Yellow Perch, Sauger, Johnny Darter, Logperch. Cyprinid sp, Sculpin sp | September 1 to June 30 | September 1 to June 30 | S | S | S | S | S | H | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| RA4-WC-35 | - | Stream | Alternative-4 | Y | Cliffs ITS WC29 | Brook Stickleback, Lake Sturgeon, Lake Chub, Longnose Dace, Shorthead Redhorse, Silver Redhorse, White Sucker, Northern Pike, Lake Whitefish, Sculpin sp. Johnny Darter, Logperch, Walleye | April 1 to June 15 | September 1 to June 20 | S | S | S | - | - | - | S | S | S | S | S | S | S | S | - | - | - | S | H | S | S | S | H | S | - | H | S | - | S | S | H | S | S | S | - | S | - |
| RA4-WC-36 | - | Watercourse | Alternative-4 | Y | - | - | April 1 to June 15 | April 1 to June 15 | S | S | S | - | - | - | S | S | S | S | S | S | S | S | - | - | - | S | H | S | S | S | H | S | - | H | S | - | S | S | H | S | S | S | - | S | - |
| RA4-WC-37 | - | Watercourse | Alternative-4 | Y | Tributary - 8 km to Albany River confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | April 1 to June 15 | September 1 to June 20 | H | H | S | - | H | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | H | H | H | H | H | H | H | H | S |
| RA4-WC-41 | Gourlie Creek | Watercourse | Alternative-4 | Y | Tributary - 12km to Albany Rver confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp, Trout Perch | April 1 to June 20 | September 1 to June 20 | S | S | S | H | S | - | H | H | H | H | H | S | S | H | - | - | - | S | H | H | S | H | H | S | H | H | S | S | H | H | H | H | S | S | S | H | H |
| RA4-WC-42 | - | Watercourse | Alternative-4 | Y | over 13 km to nearest Cliffs site (WC 32), not connected | - | April 1 to June 15 | September 1 to June 20 | H | H | S | - | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | H | S | H | S | H | S | S | H | - | H | H | H | H | H | H | - | H | S |
| RA4-WC-43 | - | Watercourse | Alternative-4 | Y | Cliffs ITS WC38 and WA21 | Common Shiner, Lake Chub, Shorthead Redhorse, White Sucker, Northern Pike, Brook Trout, Walleye, Spottail Shiner | April 1 to June 15 | September 1 to June 20 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | - | H | H | H | H | H | H | - | H | - |
| RA4-WC-45 | - | Watercourse | Alternative-4 | Y | over 15 km to nearest Cliffs site (WC 32), not connected | - | April 1 to June 15 | April 1 to June 15 | H | H | S | - | - | - | H | H | S | S | S | H | S | H | - | - | - | H | H | H | H | H | H | H | H | H | H | - | H | H | H | H | H | H | - | H | H |
| RA4-WC-50 | - | Watercourse | Alternative-4 | Y | Cliffs ITS WC29 | Brook Stickleback, Lake Sturgeon, Lake Chub, Longnose Dace, Shorthead Redhorse, Silver Redhorse, White Sucker, Northern Pike, Lake Whitefish, Sculpin sp. Johnny Darter, Logperch, Walleye | April 1 to June 15 | September 15 to June 15 | H | H | S | - | - | - | H | H | H | H | H | H | S | H | - | - | - | H | H | - | H | H | H | H | - | H | H | - | - | - | H | H | H | H | - | - | - |
| RA4-WC-55 | Wabassi River | Watercourse | Alternative-4 | Y | same WC as WC38 (Wabassi River), over 45 km DS from WC 38 | Northern Pike, Walleye, Brook Trout, Shorthead Redhorse, White Sucker, Common Shiner, Lake Chub | September 1 to June 20 | September 1 to June 20 | S | S | S | S | S | - | S | S | S | S | S | S | S | S | - | - | - | S | S | S | S | S | S | S | S | S | S | S | S | S | H | S | S | S | S | S | S |
| RA4-WC-57 | - | Watercourse | Alternative-4 | Y | Tributary - 8 km to Albany River confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | April 1 to June 15 | September 15 to June 30 | S | S | S | - | - | - | H | S | S | S | S | S | S | S | - | - | - | S | H | - | S | H | S | S | S | S | S | - | - | - | H | H | S | S | - | - | - |
| RA4-WC-58 | - | Watercourse | Alternative-4 | Y | Tributary - 8 km to Albany River confluence | Walleye, Lake Sturgeon, Northern Pike, Longnose Dace, Lake Chub, Brook Stickleback, Johnny Darter, Logperch, Shorthead Redhorse, Silver Redhorse, Lake Whitefish, White Sucker, Cyprinid sp, Sculpin sp | April 1 to June 15 | September 15 to June 30 | H | H | S | - | - | - | H | H | S | S | S | S | S | H | - | - | - | H | H | - | S | H | S | H | S | S | H | - | - | - | H | H | H | H | - | - | - |

(a) Waterbodies with fish habitat potential are listed in this table. Waterbodies with no defined bed or banks and therefore no fish habitat potential are listed in Appendix C. All waterbodies are in the Nipigon MNRF District.

(b) Sources: COSEWIC 2006a, b, Eakins 2020, Holm et al. 2010, Golder 2013b, Government of Ontario 2015a, Marshall and Jones 2011, MNRF 2020a, 2015b, 2004, 2003, Scott and Crossman 1998.

(c) Blacknose Shiner (Notropis heterolepis), Bluntnose Minnow (Pimephales notatus), Brook Stickleback (Culaea inconstans), Brook Trout (Salvelinus fontinalis), Burbot (Lota lota), Cisco (Coregonus artedi), Common Shiner (Luxilus cornutus), Emerald Shiner (Notropis atherinoides), Fathead Minnow (Pimephales promelas), Finescale Dace (Phoxinus neogaeus), Golden Shiner (Notemigonus crysoleucas), Iowa Darter (Etheostoma exile), Johnny darter (Etheostoma nigrum), Lake Chub (Couesius plumbeus), Lake Sturgeon (Acipenser fulvescens), Lake Trout (Salvelinus namaycush), Lake Whitefish (Coregonus clupeaformis), Logperch (Percina caprodes), Longnose Dace (Rhinichthys cataractae), Longnose Sucker (Catostomus catostomus), Mimic Shiner (Notropis volucellus), Mottled Sculpin (Cottus bairdii), Ninespine Stickleback (Pungitius pungitius), Northern Pearl Dace (Margariscus nachtriebi), Northern Pike (Esox lucius), Northern Redbelly Dace (Phoxinus eos), Pearl Dace (Margariscus margarita), River Darter (Percina shumardi), Rock Bass (Ambloplites rupestris), Sauger (Sander canadensis), Shorthead Redhorse (Moxostoma macrolepidotum), Silver Redhorse (Moxostoma anisurum), Slimy Sculpin (Cottus cognatus), Smallmouth Bass (Micropterus dolomieu), Spoonhead Sculpin (Cottus ricei), Spottail Shiner (Notropis hudsonius), Trout-perch (Percopsis omiscomaycus), Walleye (Sander vitreus), White Sucker (Catostomus commersonii), Yellow Perch (Perca flavescens)

(d) H = potential for rearing, feeding, or overwintering habitat; S= potential for rearing, feeding, overwintering, and spawning habitat

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