Appendix I

Final Peatlands Technical Support Document

MARTEN FALLS FIRST NATION
COMMUNITY ACCESS ROAD

Peatlands 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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Executive Summary

Marten Falls First Nation, a remote First Nation community in northern Ontario, has proposed a Community Access Road that will connect the Marten Falls First Nation community to Ontario's provincial highway network (the Project).

This *Peatlands Technical Support Document: Existing Conditions & Effects Assessment Report* has been prepared in support of the *Marten Falls First Nation Community Access Road Environmental Assessment / Impact Statement Report*. Where applicable, this document integrates data presented in other technical support documents prepared by other disciplines, but that influence peatland ecosystems, specifically:

- *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h);
- *Physiography, Terrain and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d);
- *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e);
- *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c);
- *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report (Volumes 1 and 2)* (Dillon, 2026); and
- *Climate Adaptation and Resiliency Technical Support Document: Existing Conditions & Effects Assessment Report* (AECOM, 2026).

Additional natural science reports also informed the functional assessment for peatlands, including:

- Wildlife Technical Support Document: Existing Conditions & Effects Assessment Report (WSP, 2026g);
- Birds Technical Support Document: Existing Conditions & Effects Assessment Report (WSP, 2026a); and
- Ungulate Technical Support Document: Existing Conditions & Effects Assessment Report (WSP, 2026f).

The *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021) provided guidance for data collection and reporting and has largely been followed, with deviations noted in **Table 4-1**. Peatlands has one Valued Component: peatland ecosystems, and four indicators:

- **Availability**–availability refers to the spatial representation (amount) of the Valued Component. Ecosystem availability is primarily affected by physical changes (e.g., vegetation clearing) and is represented as the area in hectares of each peatland type;
- **Distribution**–distribution refers to the way the Valued Component is distributed on the landscape. Distribution focuses on the spatial configuration (or arrangement) and connectivity of ecosystems rather than the amount;
- **Composition and Function–**ecosystem composition refers to species richness (or diversity) and abundance. Peatland function incorporates a variety of criteria, including hydrologic and biogeochemical functions, wildlife habitat, and biodiversity; and
- **Carbon Storage and Flux–**refers to the Valued Components ability to act as a natural carbon sink.

As outlined in the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021), peatlands are an interdisciplinary field, and as such, the study plan outlined an approach that relied on other discipline results to inform the assessment. A separate Peatlands Study Plan and associated report highlights the global importance of peatlands in this landscape, and acknowledges their contribution to providing specialized habitat, carbon sequestration and storage, hydrological and climate regulating functions.

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 First Nation, approximately 175 km north of Nakina. The peatlands assessment used the same spatial boundary for the Local Study Area as the vegetation and physiography, terrain, and soils disciplines (i.e., a 3 km buffer on either side of the centreline of the Community Access Road route alternatives and a 500 m buffer around areas of the associated infrastructure falling outside of the original Local Study Area defined in the Study Plan); however, the Regional Study Area for peatlands is larger than that for these other disciplines. The peatlands existing conditions Regional Study Area, as defined in the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021), is the border of overlapping quaternary watershed boundaries, which comprises an area of 1,118,154 hectares (ha). This larger Regional Study Area for peatlands was selected so the connectivity of the large peatland complexes that dominate the landscape could be considered in the effects assessment, acknowledging the surface and groundwater connections within these large wetlands.

The Project intersects two of Ontario's three ecozones: the Ontario Shield and the Hudson Bay Lowlands (Crins et al., 2009). Approximately 85% of the existing conditions Local Study Area occurs in the Ontario Shield ecozone, and 15% occurs within the Hudson Bay Lowlands. However, much of the existing conditions Local Study Area contained within the Ontario Shield ecozone are similar to the characteristics of the Hudson Bay Lowlands.

Existing Conditions

Peatland is a collective term for wetlands that accumulate more than 40 centimetres (cm) of organic soils (Asada and Warner, 2005; National Wetlands Working Group, 1988,1997; Sims and Baldwin, 1996). Peatlands can be characterized and described using different classification systems but can generally be grouped into one of four main peatland community types: bog, fen, organic swamp, and organic marsh. Wetlands that develop on mineral soils, or organic soils less than 40 cm deep, are not considered peatlands and are therefore not included in the peatlands assessment.

The existing conditions Local Study Area is dominated by wetland ecosystems, with 73% (145,206.9 ha) mapped as wetland communities. Of that area, a total of 85% of the wetlands are considered peatland communities (i.e., the remaining 15% are mineral wetlands).

Fen communities are the most common wetland and peatland community types mapped within the existing conditions Local Study Area, representing 60% of all peatland communities. The mapped fen communities also comprise 37% of the existing conditions Local Study Area and 22% of the existing conditions Regional Study Area. Organic swamp communities are the next most abundant wetland community type mapped in the existing conditions Local Study Area representing 37% of all peatland communities. Organic swamps comprise 23% of the existing conditions Local Study Area and swamp communities comprise 25% of the existing conditions Regional Study Area. Both organic marsh and bog communities comprise less than 2% of the peatland communities and together comprise less than 4% of the existing conditions Local Study Area and less than 18% of the existing conditions Regional Study Area.

The mapped wetland vegetation cover within the existing conditions Local Study Area is generally representative of Ecoregions 2E (James Bay) and 2W (Big Trout Lake) except for bog cover, which is lower than what has been estimated across the general landscape in those ecoregions. Ecoregion 2E is dominated by fen (30%) and bog (39%) communities, while Ecoregion 2W has a greater proportion of upland forest (49%) (Crins et al., 2009). The discrepancies between bog cover in the existing conditions Local Study Area and Regional Study Area as well as the general coverage within Ecoregion 2W are further addressed in **Attachment B – Peatlands Technical Support Document**.

Generally, peatland ecosystems are more frequent in the northern portion of the existing conditions Local Study Area, north of Dusey Lake. Likewise, fen and swamp communities are most common in the northern portion of the existing conditions Local Study Area. The northern portion of the existing conditions Local Study Area is characteristic of Ecodistricts 2W-2 and 2E1, which are both dominated by wetlands on organic substrates (Wester et al., 2018).

Wetlands, including peatland ecosystems in the existing conditions Local Study Area and Regional Study Area, provide a range of functions that are categorized as hydrological, biogeochemical, or habitat. The ability of each peatland vegetation community (i.e., organic swamp, organic marsh, fen, bog) to perform the associated functions varies depending on characteristics such as landscape position (e.g., riparian, basin), depth of organics, and size. The relative importance of each function also varies and may be related to the type and proximity of other vegetation communities.

Overall, the results from the *Peatlands Technical Support Document: Carbon Storage and Flux* (AECOM, 2026) report indicate that peatland systems within the existing conditions Local Study Area function as carbon dioxide sinks, whereby more carbon dioxide is stored in peatlands than is released back into the atmosphere. On a peatland group scale, both fens and bogs were found to be sinks for carbon dioxide while organic swamp communities were sources of carbon dioxide, where more carbon is being released into the atmosphere daily and seasonally, compared to what is being stored.

Results from the *Peatlands Technical Support Document: Carbon Storage and Flux* (AECOM, 2026) report also indicate that peatlands within the existing conditions Local Study Area are sources of methane. All peatland groups were identified as sources of methane, with organic swamps accounting for the largest daily and seasonal releases of methane into the atmosphere.

Additional details of the carbon storage and flux study can be found in **Attachment C – Peatlands Technical Support Document: Carbon Storage and Flux**.

Potential Residual Effects and Proposed Mitigation

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

- Mobilization of equipment and supplies;
- Temporary construction staging areas;
- Temporary access roads and trails;
- Temporary construction camps;
- Right-of-way clearing and grubbing;

- Pits and quarries;
- Temporary concrete batch plants;
- Drilling / blasting / aggregate production;
- Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching);
- Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls);
- Construction site restoration;
- Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act*;
- Decommissioning of temporary camps, roads / trails and staging areas;
- Road usage; and
- Maintenance.

As part of the pathways analysis, proposed mitigation measures were considered to determine whether effects on peatland ecosystems could be avoided, or whether effects could be reduced to negligible levels. Given their dominance in the landscape, effects on peatland ecosystems cannot be avoided; however, variety of environmental design features and mitigation measures have been proposed to minimize the Project's effects on peatlands, including:

- Limit vegetation clearing to the extent possible; specifically,
  - Minimize clearing widths in peatland ecosystems to the extent feasible, given the difficulty of effective restoration of these ecosystems.
  - Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction.
- Conduct clearing and construction activities in winter months where feasible, to minimize compaction of peat;
- Prepare and implement a Vegetation Restoration Plan that includes measures specific to peatland communities and peatland restoration, including peat stockpile management. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols;

- Construct the Community Access Road through peatland communities using a "floating road" construction methodology to allow for groundwater movement below and through the road embankment. This approach will involve:
  - Completion of a detailed ground survey, characterizing the peat and local hydrology at a later stage of the project / detailed design.
  - Site-specific identification of appropriate values for peat strength.
  - Use of a geogrid base to act as a separator and strengthener between the road subgrade fill materials and the peat.
  - Use of additional geogrid and geotextile materials in layers combined with road aggregate material above the embankment fill to form a mechanically stabilized layer. This layer will provide the required strength and stiffness for the road to perform during all seasons, including spring thaw.
  - Design the Floating Road Plan, profile and cross-section for each road section based on context-sensitive design standards, geometry and loading.
  - Provide transitions between "floating road" sections, excavated and fill sections.
  - Schedule construction to allow for primary settlement of the peat without risk of shear failure.
  - Monitor the work through construction, measuring and recording lateral movement and settlements. Be prepared to adjust the design based on observation and monitoring.
- During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of groundwater;
- Design and implement a pre-, during and post-construction monitoring program that assesses surface and groundwater movement and allows for the maintenance of pre-construction conditions to the extent feasible (see **Section 9**). This includes the creation of a monitoring program that involves geochemical testing on exposed bedrock and soils to assess the potential for acid rock drainage and / or metal leaching as it relates to methylmercury production in peatland communities present within the Construction Disturbance Area. The program will also monitor potential increases in methylmercury production related to changes in groundwater levels as a result of the construction of the Community Access Road;
- An Environmental Protection Plan will be developed, and will be implemented during construction to prevent, detect, control (i.e., remove), and monitor areas with invasive species;
- Require that the road operator follow Ministry of Transportation Ontario *Provincial Standard Specification 803* to avoid spreading invasive plant species;

- Herbicides 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; and
- Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed.

Additional mitigation measures outlined in other discipline reports will also serve to minimize effects on the peatland ecosystem. The reader is referred to those reports for additional mitigation measures, where applicable.

Residual Effects Assessment

A residual effects assessment was conducted to determine the potential Project effects on peatland ecosystems. After mitigation 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 residual effects on peatland ecosystems from the following residual effects pathways:

- Changes to availability and distribution, composition and function of peatland ecosystems as a result of direct peatland loss: **2,150.6 ha** which equates to **<1%** of the peatland ecosystems within the effects assessment Regional Study Area;
- Changes to availability and distribution, composition and function of peatland ecosystems as a result of changes to groundwater;
- Changes to availability and distribution, composition and function of peatland ecosystems as a result of fragmentation and edge effects; and
- Changes to availability and distribution, composition and function of peatland ecosystems as a result of fugitive dust emissions.

Significance Determination

Based on the weight of evidence from the analysis, uncertainty in effects predictions, specifically those associated with the “floating road” approach to construction and operation (refer to *Appendix W* under the *Final Environmental Assessment / Impact Statement Report*), and application of the precautionary approach, Project-related changes in the availability, distribution, composition, and function of peatland ecosystems could occur. The magnitude of the predicted residual effects to peatland ecosystems is either negligible, low or medium and the extent ranges from being confined to the Construction Disturbance Area to the Local Study Area. Based on these and other ratings, **most** residual effects are considered **not significant** because they are not expected to compromise the long-term viability of peatland ecosystems.

However, a high uncertainty rating is assigned to one residual effect (i.e., residual changes to peatland ecosystems due to changes that may alter groundwater quantity and quality). The high uncertainty related to these effects is based on a lack of a full understanding of peatland hydrogeology in the effects assessment Local and Regional Study Areas, as well as uncertainty regarding the effectiveness of the primary design-related mitigation measure (i.e., the "floating road"). Given the high uncertainty and probable likelihood of occurrence, a precautionary approach has been taken and the residual effects associated with groundwater (quantity and quality) are determined to be **significant** at this time. There are commitments to address gaps in knowledge during future stages of the project (See **Section 9** and **Section 10**), thereby reducing the high uncertainty that has been conservatively assigned in this assessment.

Due to the predicted changes to groundwater quantity and quality and their influence on the peatland assessment endpoints, the overall determination of Project impacts to peatland ecosystems is **significant**. However, with an improved understanding of peatland hydrogeology in the study areas and associated refined road design within peatlands that will be developed during future stages of the Project, it is expected that the uncertainty associated with these residual effects will be lessened and peatland ecosystems will continue to be self-sustaining and ecologically effective.

Prediction Confidence and Uncertainty

Overall, there is a **moderate** degree of uncertainty in the predictions of direct loss of peatland ecosystems because there were baseline data for the effects assessment Local Study Area, the Project-related direct effects are mostly understood, and the level of certainty associated with the effectiveness of proposed mitigations ranges from low to high. Uncertainty was primarily addressed by rolling-up the peatland mapping from ecosites to peatland community groupings, completing the effects assessment on these groupings, and applying conservative assumptions regarding the footprint area and related Project activities that may cause disturbance or direct peatland loss to increase confidence that the effects were not underestimated. Two residual effects determined to have high uncertainty (i.e., effects of changes to groundwater quantity and quality) will be addressed during future project stages and detailed design through commitments to conduct additional existing conditions studies (**Section 9** and **Section 10**), thereby reducing the high uncertainty that has been conservatively assigned. With an improved understanding of peatland hydrology and hydrogeology in the study areas and associated refined road design within peatlands that will be developed during detailed design, it is expected that the uncertainty associated with the two residual effects will be lessened.

Cumulative Effects

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

- Residual changes to peatland ecosystems through direct peatland loss;
- Residual changes to peatland ecosystems through changes to groundwater;
- Residual changes to peatland ecosystems through fragmentation and edge effects; and
- Residual changes to peatland ecosystems through fugitive dust emissions.

Overall, the peatland ecosystems are expected to remain self-sustaining and ecologically effective within the effects assessment Regional Study Area.

Most residual cumulative effects on peatland ecosystems are considered **not significant**, as the residual effects are assessed to be negligible, low or medium in magnitude and within the resilience limits and the adaptive capacity of the existing peatland ecosystems. However, a high uncertainty rating is assigned to one residual effect (i.e., residual changes to peatland ecosystems due to changes that may alter groundwater quantity and quality). The high uncertainty related to these effects is based on a lack of a full understanding of peatland hydrogeology in the effects assessment Local and Regional Study Areas, as well as uncertainty regarding the effectiveness of the primary design-related mitigation measure (i.e., the “floating road”). Given the high uncertainty and probable likelihood of occurrence, a precautionary approach has been taken and the residual cumulative effects associated with groundwater (quantity and quality) are determined to be **significant** at this time. There are commitments to address gaps in knowledge during future stages of the project (See **Section 9** and **Section 10**), thereby reducing the high uncertainty that has been conservatively assigned in this assessment.

Overall, confidence levels for the cumulative effects assessment are **moderate** because there were baseline data for the effects assessment Local and Regional Study Areas, the Project-related effects are mostly understood, the level of certainty associated with the effectiveness of proposed mitigations range from low to high, and conservative assumptions were applied.

Monitoring and Follow-up

Additional studies during detailed design as well as monitoring programs for the pre-construction, Construction, and Operation and Maintenance Phases of the Project will be implemented to verify effects predictions and effectiveness of mitigation measures for peatland ecosystems and apply adaptive management, if required.

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Attachment A – Draft Study Plan, Workplan and Regulator Comments
Attachment B – Peatlands Technical Support Document
Attachment C – Peatlands Technical Support Document: Carbon Storage and Flux

1. Introduction

This Report presents the existing conditions and effects assessment for the peatlands 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 River (Oji-Cree translation, *Keshijih'wano Wih Ziibih*) and Ogoki River (Oji-Cree translation, *Zakamosgwanih' Ziibih*). Marten Falls First Nation is proposing a multi-purpose Community Access Road (the Project) that will connect the community to the Ontario provincial highway network.

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

- Approximately 184 km (See **Section 6** for further details on the selection of the Preferred Route) of two-lane gravel all-season road on a new right-of-way;
- Approximately 100 metre (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 an 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.

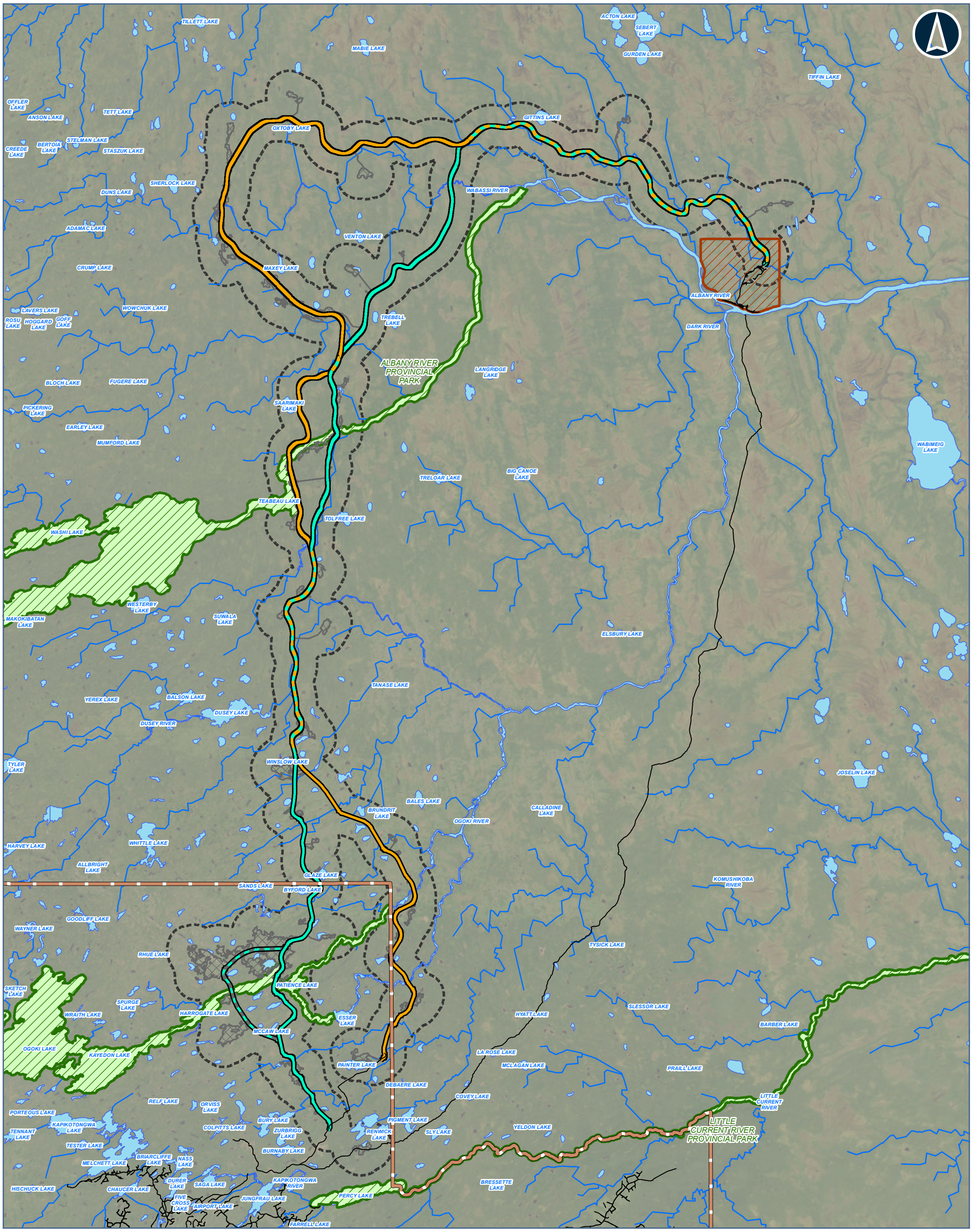
1.1 Project Overview

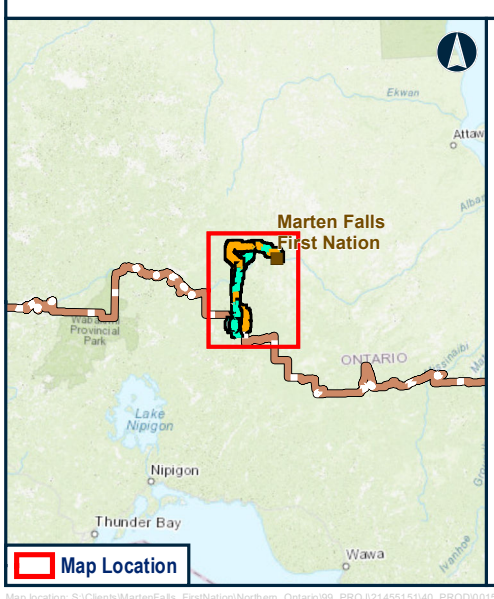
The Project consists of a Community Access Road from Painter Lake Road located approximately 57 km north of Nakina, Ontario to the Community of Marten Falls First Nation (**Figure 1-1**). The Community Access Road will serve community access and industrial supply needs for both the community (e.g., fuel, construction supplies, and water treatment supplies) and industrial proponents (e.g., mining and forestry). Therefore, to minimize infrastructure corridors in the Far North, the Project will be for a multi-purpose road 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, (Government of Ontario, 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 kilometres 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 Act (Government of Canada, 2019b). After considering the detailed Project Description, the Agency determined that a federal Impact Assessment is required for the Community Access Road and an Impact Statement needs to be submitted to the Agency for review and approval. The Agency 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 (Government of Canada).





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
- 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.
Aerial photography provided by:
Service Layer Credits: Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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

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\0015_Aquatics_WaterCrossings\21455151-0015-RT-0001.mxd
Date Saved: 11/20/2024 1:28:39 PM User Name: INGU06951

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 peatlands (**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 peatlands (**Section 5, Existing Conditions**);
- A summary of the selection of the Preferred Route as it relates to peatlands (**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 peatlands (**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 (Alternatives 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
Andrew Minielly	Terrestrial Ecologist	8	BES
Heather Drost	Senior Ecologist	23	B.Sc.
Amber Sabourin	Senior Ecologist (authored Draft Report, departed WSP staff)	14	B.Sc.
Laurence Grimond	Environmental Scientist	3	M.Sc.
Max Emile Kessler-Nadeau	Environmental Scientist	4	M.Sc.
Michael Simpson	Senior Vegetation Ecologist	15	Ph.D.
Erin Greenaway	Technical Director - Ecology	28	B.Sc.
Colin McCarter	Canada Research Chair, Assistant Professor (review undertaken on Draft Report)	8	Ph.D.

BES = Bachelor of Environmental Studies; B.Sc. = Bachelor of Science; Ph.D. = Doctor of Philosophy; 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 in width 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 per 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 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 developed specifically to support construction of the Project (**Section 2.1.3**).

Early investigations on permafrost have shown the Project is located within the isolated patches permafrost zone (Heginbottom et al., 1995), with some possible locations identified in test holes and helicopter reconnaissance by KGS Group Inc. (2019a,b). 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 along access roads 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 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 the 1-in-100-years-flood scenario design, 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 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 at locations where it is determined that 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. The purpose of equalization culverts is to maintain the existing surface water drainage patterns in the area. Culverts will be put in place as construction progresses along the Project.

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.

All materials will be subject to a geotechnical verification process in order 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 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 metres 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 Operations and Maintenance. The following Project activities will occur over in each phase, including:

- Construction Phase Project activities:
  - Clearing of the right-of-way for the Community Access Road and supporting access roads (e.g., remove and dispose of trees, shrubs, fallen timber, and surface litter and strip organic materials and 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, remove unsuitable soil, place and compact rock and granular material, trim and shape the 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 of temporary infrastructure (e.g., access roads, construction camps, laydown areas, and staging areas);
  - Decommissioning temporary infrastructure (e.g., remove temporary culverts and bridges and remediate channels); 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).
- Operations 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 surface (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., mow grass and remove brush and small trees);
- Removing snow (e.g., plow);
- Conducting bridge and culvert maintenance (e.g., seasonal inspections debris removal);
- Conducting ditch maintenance (e.g., maintain drainage to design standard by excavating, filling, trimming, and shaping ditches); and
- Conducting road maintenance (e.g., fix settlement, break-up of road surface, slope failures).

3. Information Shared by Indigenous Peoples & 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 are described in **Section 3.1**. 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 *Aboriginal and / or Treaty Rights and Interests Technical Support Document (*Dillon, 2026b).

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 [Oji-Cree translation, *atigwag*] 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 impacts 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*;
- Illustrating 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 assessment of impacts on Aboriginal and Treaty Rights and Interests. Further information on how potential impacts 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
■ Occurrence of peatland areas ■ Importance of conserving peatland vegetation ■ Traditional use plants	■ Marten Falls First Nation (Dillon, 2024a; Eabametoong First Nation, n.d.; Marten Falls First Nation, 2023)	■ Thirty-nine of the 43 plants identified as traditional use plants and plants of importance to Indigenous communities are known to be found in peatland communities or were identified in peatland communities during vegetation field investigations. Traditional use plant species and species of importance to Indigenous communities were identified through a review of desktop resources and Indigenous Knowledge provided by the Eabametoong First Nation, Marten Falls First Nation, and Aroland First Nation. ■ Marten Falls First Nation provided information about existing peatlands distribution in areas between Albany River and Pahtegosing River. A community member noted that they used to travel from the Albany River south channel to the Pahtegosing River and that there was a large expanse of peatlands and felled trees in this area. ■ Marten Falls First Nation noted concerns related to the Indigenous / traditional use and conservation of valuable resources available in peatlands. In particular, the importance of peatland vegetation including: ○ Moss, as food source for caribous spotted along the northern sections of the proposed Marten Falls First Nation Community Access Road route(s), between the proposed route(s), and the Marten Falls First Nation community. ○ Muskrat root, which can be found in swamp areas.	■ **Section 5.3.2** ■ **Section 5.3.4.3**
■ Cultural significance ■ Role of peatland ecosystems ■ Concerns related to: ○ Changes to peatland vegetation composition ○ Contamination / pollution	■ Aroland First Nation (Dillon, 2024b) ■ Fort Albany First Nation (Fort Albany First Nation, 2020; Firelight Research Inc., 2024)	■ Aroland First Nation noted concerns related to the potential spread of invasive species. Some Aroland First Nation community members have expressed concerns related to impacts on berries due to herbicide use. ■ Fort Albany First Nation noted an overall importance of the muskeg (peatland) to their community and Indigenous Peoples throughout the region. The community highlighted this, by stating that the meaning of *Omushkegowuk* (the people of the muskeg), speaks to the central importance of the muskeg to the community's lives and well-being, noting that that they are vital to sustaining life across their traditional territory. The community also noted that the muskeg supports water	■ **Section 5.3.4.1** ■ **Section 5.3.4.3** ■ Informed **Section 7.3.1** ■ **Section 7.3.1.2** ■ **Section 7.3.1.2.1** ■ **Section 7.3.1.3** ■ **Section 7.3.1.5**

Topic	Indigenous Community	Details	Section Reference
○ Drying / water storage capability ○ Fire hazards ○ Invasive species ○ Carbon storage capability ○ Engineering and land stability ○ Barriers to water flow ○ Permafrost ○ Herbicide use	■ Kashechewan First Nation (MNP LPP, 2024) ■ Marten Falls First Nation (Marten Falls First Nation, 2023) ■ Weenusk First Nation (MNP LPP, 2024b)	storage and filtration throughout the seasonal cycles and often is a major contributor to streamflow and groundwater conditions. ■ Fort Albany First Nation highlighted the potential negative effects of removing muskeg habitats and mossy areas, including a reduction in the muskeg's important air and water filtering function, as well as its role as diet and habitat for small mammals and rodents. ■ Fort Albany First Nation provided an outline of a number of concerns related to impacts on the muskeg and peatlands including: ○ Changes in the composition to peatland ecosystems, such as the reduction of low-growing mosses and wetland plants and replacement with larger shrubs and vegetation which thrive in drier conditions; ○ Contamination due to surface level spills / pollution (e.g., oil or chemical spill contamination in muskeg due to interconnectedness with nearby surface water). ○ The peat drying up in some places and flooding in others; ○ Changes to the muskeg causing native species to decline and / or invasive species to encroach; ○ Significant release of carbon dioxide or methane (and lowered ability of the muskeg to act as a carbon sink); ○ Fire hazards from the peat drying out; ○ Impacts on the underground water systems; ○ Changes to the stability of the land; ○ Problems caused by digging down to the clay in the construction zone; ○ The roads acting as dams and blocking the flow of water; and ○ Potential impacts and interactions relating to peatland disturbance and permafrost degradation. ■ Members of the Kashechewan First Nation community have shared concerns related to observed changes to flow patterns in the rivers that run through their traditional territory, attributed to historic damming and diversion activities upriver of their community, resulting in drying of peatlands.	■ Informed **Section 7.3.1.8** ■ **Section 7.3.1.8.1** ■ Informed **Section 7.3.1.9** ■ **Section 7.3.1.10.1** ■ **Section 7.3.1.11.1** ■ **Section 7.3.1.12.1**

Topic	Indigenous Community	Details	Section Reference
		■ Marten Falls First Nation noted concerns related to how the construction of the road would safely traverse peatlands, particularly one that will support heavy trucks without rapidly sinking. ■ Additionally, the Marten Falls First Nation provided concerns related to illegal dumping of waste in peatlands, and contamination related to potential spills or collisions that could introduce potential leaching into the water table. The community noted that illegal dumping of waste is already a problem with the Winter Access Road (such as people leaving behind drums, vehicles, and other materials). One community member noted the importance of the muskeg, highlighting that "*the muskeg is just like our bodies, if we get sick, and then the whole body gets sick*", referring to the interconnections between the muskeg and other components of the environment. ■ Weenusk First Nation noted concerns about: ○ The removal of bogs and peatlands, as well as related effects specific to the reduction of carbon storage capability. ○ The potential for impacts related to air quality as a result of fugitive dust from movement and operations of construction equipment and vehicles. ○ Impacts on harvestable species within the community's traditional territory as a result of increased access.	

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 community-specific engagement input 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
■ Input on field programs ■ Construction approach ■ General concerns related to peatlands	■ Mushkegowuk Council (Mushkegowuk Council, 2022)	■ Mushkegowuk Council noted general concerns related to potential impacts on peatlands and highlighted the importance of considering information on peat depth and stratification in Project studies (from a carbon perspective). ■ Peat depth was measured during field studies completed for the *Physiography, Soils and Terrain Existing Conditions and Effects Assessment Report* (WSP, 2026d) and the *Vegetation Existing Conditions and Effects Assessment Report* (WSP, 2026h) which informed peatland community classification, and the carbon storage and flux analysis documented in the *Peatlands Technical Support Document: Carbon Storage and Flux* (**Attachment C**). ■ Mushkegowuk Council also inquired about construction methods and inquired if the Project was considering floating roads.	■ **Section 5.3.4.4** ■ **Informed Section 7.3.1** ■ **Section 7.3.1.4** outlines methodologies related to the construction of “floating roads”. ■ **Attachment C**
■ Peatland Ecosystems	■ Neskantaga First Nation (Neskantaga First Nation, 2020)	■ Neskantaga First Nation noted the overall importance of the consideration of peatlands. ■ The Environmental Assessment includes the definition of peatlands as Valued Component, as well as a full evaluation on peatlands, including the development of a peatlands-specific Local Study Area and Regional Study Area and peatlands-specific study.	■ **Peatlands Study Plan** ■ **Peatlands Existing Conditions and Effects Assessment Report**

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. Comments received on this Report during the review period have been reviewed and considered by the Marten Falls First Nation Community Access Road Project Team and this Report was updated, where warranted.

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 *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

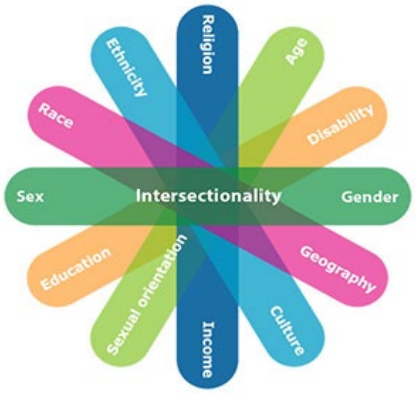
Topic	Provided By	Details	Section Reference
Study Plans	■ Impact Assessment Agency of Canada (2024) ■ Ministry of the Environment, Conservation and Parks (2022)	■ The Impact Assessment Agency of Canada noted that any edits to the Physiography, Terrain, and Soils and Vegetation and Peatlands Work Plan methodology as a result of agency comments should be reflected in the Environmental Assessment. ■ Deviations were anticipated to be required as the Project evolved due to challenges encountered in the field, alternative methodologies being developed, comments from regulators, and as updated guidance became available. These deviations are captured within the study methods and assessment scope.	■ **Section 4.1** ■ **Table 4-1**

3.4 Gender-Based Analysis Plus

The *Impact Assessment Act* (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 impacted and / or being engaged.

Gender-Based Analysis Plus is an approach to assessing inequalities and impacts of policies, programs, 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.

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, 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, 2021b).

It is important to understand that vulnerability in Impact Assessment is understood primarily, but not solely, as a structural vulnerability. This means that in many cases it is the systems and power structures that make certain groups more vulnerable (Impact Assessment Agency of Canada, 2021b). For Indigenous Peoples, this includes historical and ongoing colonialism, loss of lands and culture, intergenerational trauma, and the residential school system that have resulted in significant social, economic, and health and well-being disparities relative to the non-Indigenous Canadian population (Kim, 2019).

Exceptions to this are where vulnerability may be associated with biological sex, pregnancy, or age in relation to environmental determinants of health and exposure to contaminants, for example.

For each discipline of the Impact Assessment, a Gender-Based Analysis Plus approach was employed. This approach and extent of its application also varied, however, depending on the type of study, and the relevance of Gender-Based Analysis Plus to that study. The details of the approach for the discipline are outlined below.

3.4.1 Peatlands Gender-Based Analysis Plus Approach

The Gender-Based Analysis Plus approach for the peatland study involved a more limited, but still important application of Gender-Based Analysis Plus. This approach varied from the Gender-Based Analysis Plus approach in other disciplines, for example, within the socio-economic disciplines, in that it primarily involved identifying how vulnerable groups that could be disproportionately impacted by the Project informed the study which included:

- Weaving Project specific Indigenous Knowledge from Indigenous Elders that has been provided, verified, and made available through the Indigenous Knowledge program into this report (**Section 3.1**). Indigenous Knowledge provided on peatlands utilized the terms “peatlands” and “muskeg” interchangeably. For consistency purposes, the term “peatlands” will be utilized in the remainder of the report (with some exceptions); and
- Identifying and including interests and concerns specific to this study through the Consultation and Engagement program from groups who could be more vulnerable to, and disproportionately impacted by the Project which include Indigenous communities (**Sections 3.3** and **3.4**).

4. Study Methods and Assessment Scope

This section contains excerpts from the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021) prepared for the Impact Assessment Agency of Canada at the outset of this Project. The original Draft Study Plan, including comments from regulators can be found in **Attachment A – Draft Study Plan, Workplan and Regulator Comments.** A peatlands-specific Workplan was not prepared; data gathered as part of the Vegetation Workplan and Soils and Terrain Workplan informed peatlands reporting.

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, 2020), study plans and work plans were developed for disciplines as required. The purpose of the study plan is 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; and
- Developing the discipline specific effects assessment methodology.

Work plans included details on how to action the study plans; containing information such as location of sampling sites, scheduling, and sequencing.

As noted above the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021) can be found in **Attachment A**.

Deviations from the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021) in **Attachment A** were anticipated to be required as the Project evolved due to challenges encountered in the field, alternative methodologies being developed, comments from regulators, and as updated guidance became available. **Table 4-1** outlines these deviations. General changes such as changes to section headings, organization of sections and subsections and, changes to phrasing and tense have been made throughout. These administrative changes 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 changes column provides a more detailed expression of the indicator.
4.2.2 Valued Components and Indicators	Peatland climate has not been included as an indicator.	While it is acknowledged that there will be changes to temperature, rainfall, seasonal snow accumulation, freeze thaw cycles, and evapotranspiration rates as a result of climate change and that these changes will ultimately influence peatland climate, data to assess the changes to peatland climate as a result of the Project were not available. Climate change is considered as a cumulative effect in **Section 8**.
4.2.3 Spatial Boundaries	The Draft Study Plan previously used the term *"Local Study Area"* to define the 5 km corridor which is being studied in the Existing Conditions section, and within which the footprint of the Project will 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. The term "Local Study Area" in this report refers to the peatlands Local Study Area which is a 6 km corridor (i.e., 3 km either side of the centreline of the route alternatives). It also includes a 500 m buffer around areas of the associated infrastructure falling outside of the original Local Study Area defined in the Study Plan.
4.3.3 Data Management	**Section 8.1** of the Peatlands Study Plan identified that data would be verified and backed up "daily." In **Section 4.7.1**, this wording has been revised to state that data would be verified and backed up on a "regular basis".	This change brings alignment with the Proponent's various data backup policies.
4.3.3 Data Management	In **Section 4.7.2** 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.
4.3.4.1 Peatlands Functional Assessment	The methods for undertaking the peatland functional assessments are not defined in the Peatland Study Plan. However, data to be collected at ground inspection sites	The data specified for collection at ground inspection sites are very site-specific and not all data were appropriate for the Project context (i.e., could not be extrapolated appropriately

Section Reference	Description of Change	Rationale
	are specified and a scoring system is recommended (i.e., "*each peatland visited during the ground survey locations will be assigned a function ranking / score [i.e. high, moderate, low] based on its relative contribution of various peatland functions [i.e., habitat, hydrology, biogeochemical] to the surrounding ecological systems*"). While the site-specific data specified in the Study Plan were collected during ground inspections, they were not used for the functional assessments but will remain on file. Likewise, a score for each peatland visited during ground inspections was not determined.	across the study areas). For example, documenting "vegetation density and open water components", or "water storage and decomposition rates" while informative for a site-specific functional assessment, is not informative when the ground inspection occurs at a single point in a much larger polygon and when the number of polygons of each ecosite or community type visited, is a small fraction of the entire Project area. Using the site-specific data collected to inform a "score" for a polygon and then extrapolating that score to all ecosites or peatland groupings of that type was determined to be of limited value for the Project. An alternate approach to inform the peatland and functional assessments was developed. See below.
4.3.4.1 Peatlands Functional Assessment	An alternate approach for peatland functional assessments was developed using a conservative, landscape-level framework.	A functional assessment approach that provides a meaningful and Project-specific analysis is more appropriate than following a Study Plan that was developed early in the Project. Functional assessments are most useful in disturbed landscapes where there are external pressures that act to impair functions, or where wetlands are rare on the landscape. Within the Project area, wetland ecosystems, including peatlands, are characterized by large and highly interconnected complexes in an undisturbed landscape. A landscape-level approach recognizes the connectivity of wetland ecosystems in the Project area, as well as the cultural importance of these features.
4.4.2 Assessing Residual Effects	The Peatland Study Plan noted that residual effects would be described in terms of the direction, magnitude, geographic extent, duration, frequency, likelihood, and whether effects are reversible or irreversible. In addition, the Study Plan acknowledged that **Section 13.1** of the *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) identifies additional effects characteristics for certain disciplines (e.g., wetlands, birds, terrestrial wildlife, and species at	Project effects for peatlands were not classified using all criteria described in the *Tailored Impact Statement Guidelines*. Most of the criteria outlined in the *Tailored Impact Statement Guidelines* are taken from *NatureServe Conservation Status Assessment: Factors for Evaluating Species and Ecosystem Risk* (Master et al., 2012) and are useful for assessing and assigning the conservation status of species at risk from different threats. However, these criteria are less appropriate

Section Reference	Description of Change	Rationale
	risk) and that these additional effects characteristics will be described.	for characterizing residual effects in an Environmental Assessment. Although the criteria and method of combining criteria (i.e., matrices) outlined in *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) were not explicitly applied in this report, the criteria are captured in the residual effects characterization for the peatland Valued Component. Magnitude is discussed in in a reasoned narrative with other categorical criteria, such as geographic extent, duration, reversibility and probability of occurrence, that are used to characterize residual effects and determine significance. Effects on wetland and riparian functions are difficult to quantify based on the data collected and therefore a reasoned narrative was used to discuss the relative impacts on function based on the assessments of other disciplines. Additional details are described in **Section 4.4.2.5**.
5.3 Wetland Classification System (Technical Support Document)	Wetland ecosites (including peatlands) were not classified according to the *Canadian Wetland Classification System.* Rather *Ecosites of Ontario* (Banton et al., 2009) was used for all wetland and upland ecosystems.	There is not a 1:1 relationship between wetland ecosites described in *Ecosites of Ontario* and wetlands as described in the *Canadian Wetlands Classification System*. Given that the desktop ecosite classification had limitations for accurate desktop delineation of ecosites (e.g., low-resolution aerial imagery), using the desktop wetland ecosite dataset to create a crosswalk to the *Canadian Wetlands Classification System* would have introduced another layer of uncertainty to the mapping. Rather, effort was put towards improving the wetland ecosite classification by overlaying the organic soils dataset and making manual ecosite corrections where appropriate.

Section Reference	Description of Change	Rationale
5.3.5 Carbon Storage and Flux	The Peatlands Study Plan states that peatland carbon storage and flux will be determined based on methods outlined in the *Assessment of the vulnerability of peatland carbon in the Albany Ecodistrict of the Hudson Bay Lowlands, Ontario, Canada to climate change* (McLaughlin et al., 2018) and that estimating carbon storage will be evaluated from the area of peatlands and the carbon mass will be estimated per the regression equation provided in McLaughlin et al., 2018. The linear regression equation from McLaughlin et al. (2018) was compared with the results from a more recent study from Magnan et al. (2023).	The results of linear regression equations from Magnan et al. (2023) and McLaughlin et al. (2018) were compared to determine the current overall soil organic carbon mass, with the equation from Magnan et al. (2023) being carried forward given the use of more detailed peatland groupings and relatively minor differences in the results of both equations.

km = kilometre; m = metre.

4.2 Study Scoping

4.2.1 Temporal Boundaries

Project phases, which are temporal boundaries, are developed to establish the timeframes within which potential effects of the Project will be considered. As indicated in **Section 2.2** 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 operations 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 impacted 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, 2021a).

Indicators represent the resource, feature, or issue related to the Valued Component that, if changed, may demonstrate an effect on the environment. Indicators may be characterized quantitatively or qualitatively. For example, effects from changes to the availability and distribution of Valued Components are often expressed through quantitative assessment of direct vegetation removals as well as predicted indirect effects on retained vegetation.

For the peatland ecosystems Valued Component, the following indicators are used:

- **Availability**–availability refers to the spatial representation (amount) of the Valued Component. Ecosystem availability is primarily affected by physical changes (e.g., vegetation clearing) and is represented as the area in hectares of each peatland type;
- **Distribution**–distribution refers to the way the Valued Component is distributed on the landscape. Distribution focuses on the spatial configuration (or arrangement) and connectivity of ecosystems rather than the amount;
- **Composition and Function–**ecosystem composition refers to species richness (or diversity) and abundance. Peatland function incorporates a variety of criteria, including hydrologic and biogeochemical functions, wildlife habitat, and biodiversity; and
- **Carbon Storage and Flux–**refers to the Valued Components ability to act as a natural carbon sink.

The Draft Study Plan presented indicators and rationale for selection known to the Proponent at the time of drafting. The draft table and the factors that influenced it can be found in *Section 9.2* of the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021) in **Attachment A**.

An updated list of Peatland Indicators can be found in **Table 4-2**.

Table 4-2: Peatland Indicators

Valued Component	Indicators	Rationale for Selection	Measures of Change
Peatland Ecosystems	■ Availability (decrease / increase of overall amount of peatland area)	■ Social / cultural importance ■ Available habitat for wildlife ■ Ecosystem and landscape level biodiversity	Changes in availability (area in ha) and distribution within the Local Study Area
	■ Distribution (changes to the arrangement and connectivity of peatlands)		
	■ Function and Composition (change in plant species composition or ecological function).	■ Peatlands provide hydrologic and biogeochemical functions ■ Peatlands are sensitive to changes in climate, hydrology, and anthropogenic disturbance ■ Peatlands can affect subsurface water flow in response to hydrological changes (Devito et al., 1997)	Qualitative assessment of changes to function and composition
	■ Carbon Storage and Flux	■ Northern peatlands represent a large portion of the Earth's total terrestrial carbon stores (Thompson and Waddington, 2008) ■ Peatland disturbance is a source of greenhouse gas emissions to the atmosphere (Nugent et al., 2018)	Soil Organic Carbon storage change measured in tonnes Carbon Dioxide Flux measured in tonnes by day and tonnes by growing season Methane Flux measured in tonnes by day and tonnes by growing season

ha = hectare.

4.2.3 Spatial Boundaries

4.2.3.1 Project Study Areas

Study areas identify the geographic extents within which potential effects of the Project are likely to occur and will be considered in the *Environmental Assessment / Impact Statement Report*. General Project boundaries were established for the scoping of field programs, and to delineate study areas for discipline specific surveys. These general Project boundaries 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 construction access roads, work areas, worker camps, pits, quarries, and permanent access roads
Project Study Area	Area where most of the direct effects of the Project are likely to occur	The area within 2.5 km (total of 5 km) of the centreline of the route alternatives

m = metre; km = kilometre.

4.2.3.2 Peatland Study Areas

Discipline-specific Local Study Areas and Regional Study Areas have been defined for the Project. In defining these areas, the following was 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 communities;
- 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.

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 (Alternatives 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 (Alternatives 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 only considered one route.

4.2.3.2.1 Existing Conditions Study Areas

The existing conditions spatial boundaries for peatlands are defined by a Local Study Area and 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 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 8**.

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 pits and 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.

The **Local Study Area** for the peatlands assessment consists of the area within 3 km on either side of the centreline of the Community Access Road route alternatives. It also includes a 500 m buffer around areas of the associated infrastructure falling outside of the original Local Study Area defined in the Study Plan. The total area of the existing conditions Local Study Area for the peatlands assessment is 197,960 ha.

The extent of the existing conditions Local Study Area is designed to allow for the documentation of existing conditions and to address the areas where direct and indirect effects of the Project are likely to occur beyond the Construction Disturbance Area. A 6 km wide study area also allows for route refinement during the development of Project design (e.g., adjustment of the alignment to avoid sensitive features).

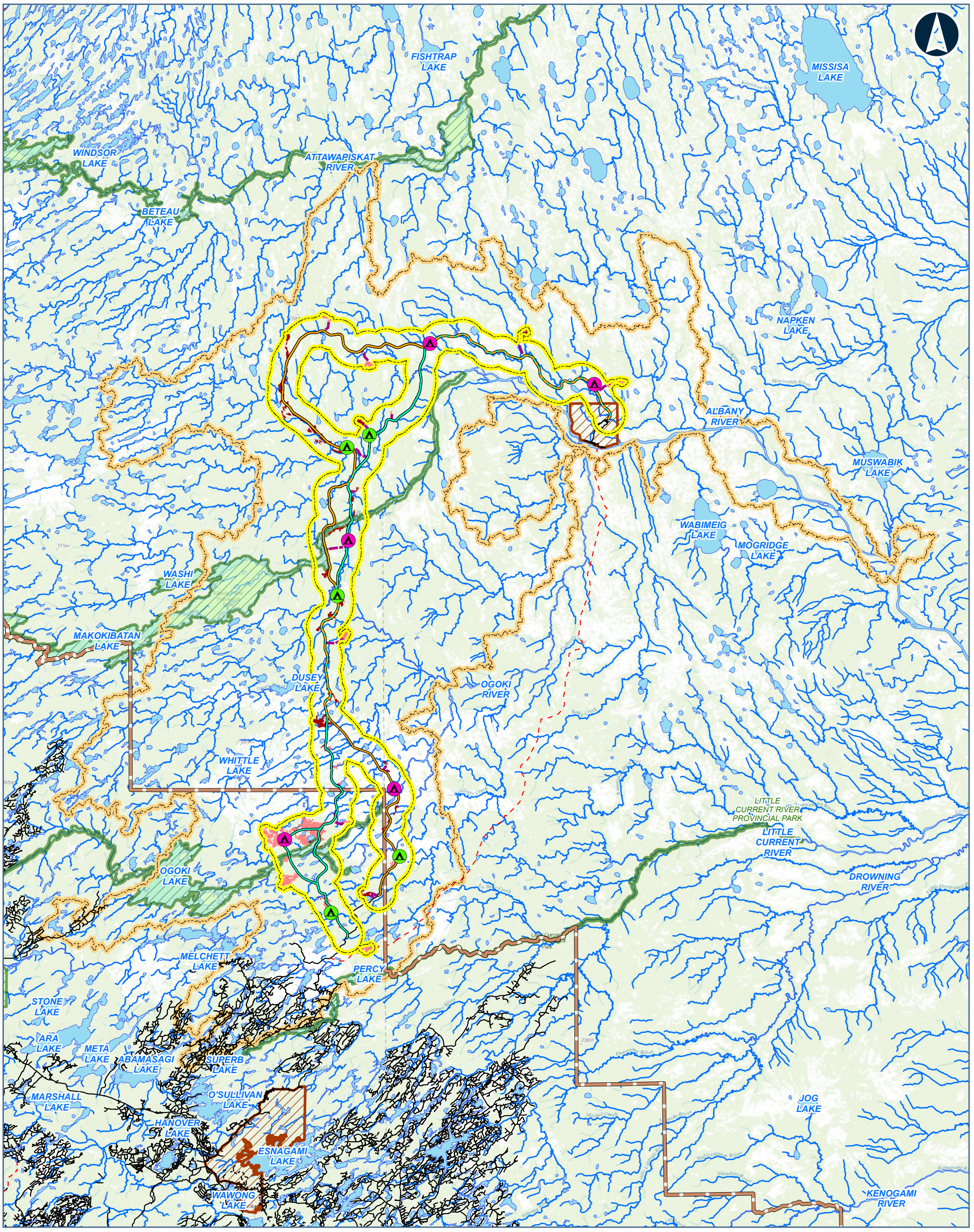
The **Regional Study Area** for peatlands encompasses the quaternary watersheds that overlap the peatlands existing conditions Local Study Area. The Regional Study Area represents the area where incremental and cumulative effects of the Project and other developments are likely to occur on peatland Valued Components. The existing conditions Regional Study Area is 1,118,154 ha.

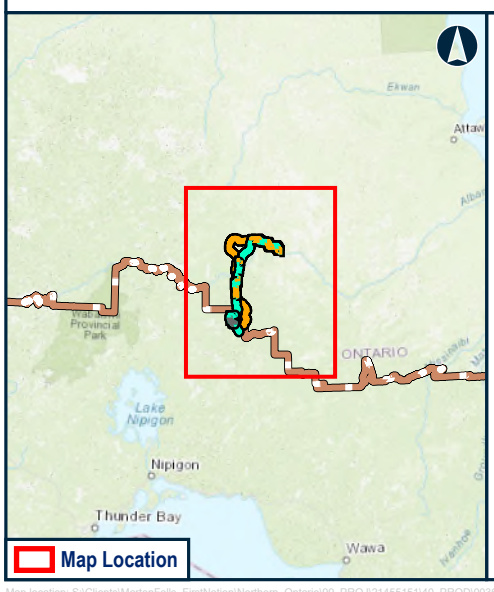
The existing conditions spatial boundaries of the peatlands Local Study Area and Regional Study Area are summarized in **Table 4-4** and illustrated on **Figure 4-1**and **Figure 4-2.**

Table 4-4: Peatlands Existing Conditions Study Areas Description and Rationale

Study Area	Geographic Extent	Rationale	Area Size (ha)
Construction Disturbance Area	■ 100 m wide Community Access Road right-of-way and associated infrastructure (i.e., temporary construction access roads, work areas, worker camps, pits, quarries, and temporary access roads)	■ Area of direct disturbance	12,665
Local Study Area	■ 3 km buffer on either side of the centreline of the Community Access Road route alternatives ■ 500 m buffer around areas of the associated infrastructure falling outside of the original Local Study Area defined in the Study Plan	■ Designed to address the area where direct effects of the Project are likely to occur beyond the Project footprint ■ Allows for route refinement during the Project design (e.g., adjustment of the alignment to avoid sensitive features)	197,960
Regional Study Area	■ Quaternary watersheds that overlap peatlands existing conditions Local Study Area	■ Will allow for assessment of cumulative and indirect effects of the Project on the broader landscape, while remaining representative of the types of habitats found within the Project Area	1,118,154

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





Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP

- BEDROCK
- SAND AND GRAVEL

- ROAD
- WINTER ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- 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: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, AAFC, NRCan
World Topographic Map: Esri, © OpenStreetMap contributors, HERE, Garmin, FAO, USGS, NGA, EPA, NPS, AAFC, NRCan

MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Existing Conditions Local and Regional Study Area

0 4.25 8.5 17 25.5 34
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Feb, 2026	1:750,000 * when printed 11"x17"
Rev:0	

Figure 4-1

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Date Saved: 1/28/2026 1:40 AM User Name: INGU06951

4.2.3.2.2 Effects Assessment Study Areas

The selection of a Preferred Route resulted in refined study areas which represent the same geographic extents of the existing conditions study areas; however, they are only applied to one route corridor instead of two. The revised study areas that will be used for the effects assessment are described in **Table 4-5**. These areas include temporary features such as pits and quarries, temporary access roads, and worker camps.

Table 4-5: Peatlands Effects Assessment Study Areas Description and Rationale

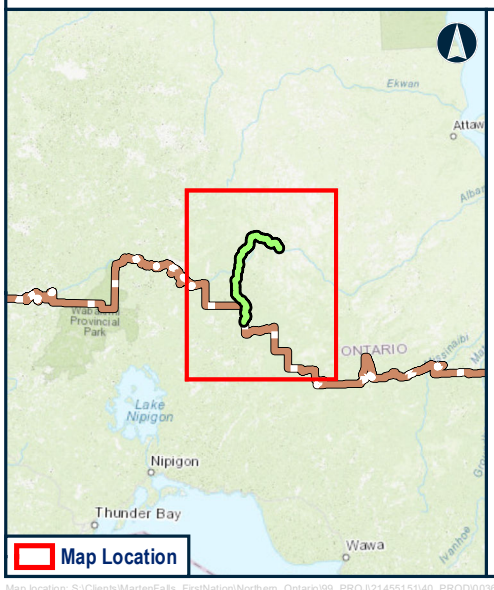
Study Area	Geographic Extent	Rationale	Area (ha)
Construction Disturbance Area	■ 100 m wide Community Access Road right-of-way and associated infrastructure (i.e., temporary construction access roads, work areas, worker camps, pits, quarries, and temporary access roads) of the Preferred Route	■ Area of direct disturbance	4,700
Local Study Area	■ 3 km buffer on either side of the centreline of the Community Access Road Preferred Route ■ 500 m buffer around areas of the Preferred Route associated infrastructure falling outside of the original Local Study Area defined in the Study Plan	■ Designed to address the area where direct effects of the Project are likely to occur beyond the Project footprint ■ Allows for route refinement during the Project design (e.g., adjustment of the alignment to avoid sensitive features)	115,961
Regional Study Area	■ Quaternary watersheds that overlap the peatlands effects assessment Local Study Area	■ Will allow for assessment of cumulative and indirect effects of the Project on the broader landscape, while remaining representative of the types of habitats found within the Project Area	971,417

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

OTOSKWIN-ATTAWAPISKAT RIVER PROVINCIAL PARK

ALBANY RIVER PROVINCIAL PARK

LITTLE CURRENT RIVER PROVINCIAL PARK



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 CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- 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

Peatland Effects Assessment Local and Regional Study Area

0 5 10 20 30
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Rev:0	

Figure 4-2

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Date Saved: 1/27/2026 2:35:12 PM User Name: INGU06951

4.3 Existing Conditions Study Design and Methods

Characterization of the existing peatland conditions was completed by undertaking a desktop background information review and desktop mapping exercise for the Project, supplemented by a multi-year field program to assess a subset of the peatland ecosites and to collect soil and botanical data to characterize peatland community composition in a subset of each ecosite type. Both the desktop review and field investigations for peatlands was completed in tandem with the vegetation studies and as such, methods presented below largely mirror those outlined in *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h) with a specific focus on wetlands.

4.3.1 Desktop Assessment

A desktop review of existing information sources was completed to identify information gaps that needed to be addressed through further study. A preliminary list of applicable information sources including federal and provincial guidance was reviewed in development of this approach.

Existing data were used to support the characterization of existing conditions in the Regional Study Area, Local Study Area, and Construction Disturbance Area. The data were gathered from provincial databases, provincial mapping resources, provincial guidance documents, published maps and reports, previous investigations, and publicly available literature. Key resources are outlined below. A full list of references is provided in **Section 11**.

4.3.1.1 Information Sources

For the purpose of characterizing the existing vegetation conditions within the Regional Study Area, Local Study Area, and Construction Disturbance Area, the following mapping sources were reviewed:

- Land Information Ontario base mapping data including the following datasets:
  - *Waterbodies and Watercourses* (Government of Ontario, 2013).
  - *Ecodistricts, Ecoregions, and Ecozones* (Government of Ontario, 2015).
  - *Ontario Land Cover Compilation* version 2.0 (Government of Ontario, 2020), which is a compilation of *Far North Land Cover* version 1.4 and *Provincial Land Cover 2000 Edition*.
- Digital terrain and soils mapping prepared for the current Project by WSP Canada Inc. terrain and soils scientists. Refer to the *Physiography, Terrain and Soils Technical Support Document* for detailed methodology and data sources that were used to develop this mapping.

Other data sources reviewed included:

- *Ecosystems of Ontario, Part 1: Ecozones and Ecoregions* (Crins et al., 2009);
- Ecosystems *of Ontario, Part 2: Ecodistricts* (Wester et al., 2018);
- *Ecosites of Ontario* (operational draft) (Banton et al., 2009);
- *Forest Regions of Ontario* (Rowe, 1972);
- *Ramsar Canada Sites* (Ramsar Canada, 2020);
- *Far North Biodiversity Project* (Ontario Biodiversity Council, 2020);
- Ogoki Forest 2020-2030 Forest Management Plan and supporting maps (GreenForest Management Inc., 2020); and
- *Alberta Wetland Policy Implementation* (Ministry of Environment and Protected Areas of Alberta, 2020); *The Wetland Ecological Functions Assessment* (Environment Canada, 2008); *Wetland Network* (2020).

4.3.1.2 Desktop Vegetation Community Mapping Methodology

An iterative process was used to develop the desktop vegetation community mapping for the Construction Disturbance Area and the Local Study Area. The process first involved the development of the preliminary terrain mapping (as described in **Attachment B – Peatlands Technical Support Document** and further detailed in the *Physiography, Terrain, and Soils Technical Support Document*). This preliminary terrain mapping informed the ecosite mapping completed by KBM Resources Group (2021), as described below.

Vegetation community mapping in the Regional Study Area was assembled using the Ontario Land Cover Compilation Version 2.0. Ecosites in the Local Study Area were rolled up into wetland community groupings that align with categories in the provincial dataset to allow consistent mapping, and at the same level of detail, across both study areas. However, while peatland community types such as fen and bogs have matching counterparts in the Ontario Land Cover Compilation mapping, the Ontario Land Cover Compilation mapping does not differentiate between organic and mineral swamp and marsh communities. For the calculation of organic swamp and organic marsh communities within the Regional Study Area, a conservative approach was taken with all marsh and swamp communities from the Ontario Land Cover Compilation mapping in the Regional Study Area being included in the peatland area calculations.

4.3.1.3 Ecosite Classification

The following outlines the process in which ecosites were classified between upland and wetland communities and further refined into more specific ecosite classifications. It is important to describe the process as it is the basis for how peatland ecosite mapping was

developed. Preliminary terrain mapping was provided in digital format to KBM Resources Group, who assigned ecosite types to each of the polygons identified in the terrain mapping (the ecosite-typing process is further described below). This process included assigning ecosite types to wetland and peatland communities. The original intent was to provide KBM Resources Group with a completed preliminary terrain mapping dataset for the full Local Study Area, to inform the desktop ecosite classification process. However, due to time constraints the polygon delineation and ecosite classification became an iterative process whereby KBM Resources Group also completed some of the polygon delineation which WSP Canada Inc.'s soils and terrain specialists then integrated into their terrain mapping dataset. The mapping dataset was updated and expanded by both teams until all polygons were delineated and classified within the Local Study Area.

The ecosite mapping product that formed the basis of the vegetation mapping was completed by KBM Resources Group in September 2021. The desktop photo interpretation mapping exercise completed by KBM Resources Group included assessment using two imagery sources viewed in 3D, using software called Summit Evolution (Audet, S., pers. comm., 2023):

- 1:60,000 scale black and white aerial photos acquired in 1973, 1975, and 1976 from the National Air Photo Library in Ottawa, Ontario (covering the Local Study Area); and
- 1:33,000 scale 20-cm resolution colour aerial photographs acquired in 2019 by KBM Resources Group's aerial survey division (within 1 km either side of the Project centreline).

The vegetation mapping was completed using the specifications outlined in the *Ontario Forest Resources Inventory Photo Interpretation Specifications* (Ontario Ministry of Natural Resources, 2012a) and all polygon attribution was completed by experienced Ontario Boreal Certified photo interpreters (Audet, S., pers comm., 2023). Where not already delineated by WSP Canada Inc.'s soil and terrain specialists, polygons were delineated by KBM Resources Group (2021) based on the defined criteria for forested and non-forested land types (Audet, S. pers comm., 2023).

All the delineated polygons (excluding water) were assigned a primary ecosite code (PRI_ECO) based on the *Ecosites of Ontario* ecosite keys (Banton et al., 2009). An ecosite is defined as "*an ecological unit comprised of relatively uniform geology, parent material, soils, topography, and hydrology and consists of related vegetation conditions*" (Ontario Ministry of Natural Resources, 2012a, p. 11). Where a secondary ecosite represents at least 20% of the area of a polygon and is not equal to or greater than 8 ha, a secondary ecosite was assigned (SEC_ECO) to the polygon.

Polygons were first divided into upland versus lowland (wetland) polygons. Polygons were then grouped into areas with similar species, height, age, densities, and crown closures. Forested polygons were typed based on standard forestry inventory metrics including species composition, stocking, stand height, site class, year of origin, depletion type, and development stage. The *Ecosites of Ontario* (Banton et al., 2009) ecosite keys were then used to choose an appropriate ecosite for each polygon. Given the limitations of desktop ecosite classification, some default ecosite key selections were made based on interpreter experience and expected conditions within the Local Study Area, as follows (Audet, S., pers. comm., 2023):

- Key 5: Fresh, Sandy or Dry to Fresh Coarse Loamy Ecosites was *the* default key used for upland ecosites. Exceptions to this rule were:
  - Key 4: Dry, Sandy Ecosites *was* used for areas that appeared dry and sandy.
  - Key 6: Moist, Sandy to Coarse Loamy Ecosites *was* used for areas that appeared moist.
- Key 10: Permanently Flooded or Hydric Ecosites was used for wetlands.

Additionally, ecosites were further refined in 2023 using a combination of data from field investigations described in **Section 4.3.2,** soils data from field-verified borehole locations, and light detection and ranging mapping. This work was undertaken by the soils and terrain and peatlands teams, as further detailed in **Attachment B**.

4.3.1.3.1 Desktop Mapping Limitations

It must be recognized that there are limitations to desktop ecosite typing, particularly when using older, low-resolution imagery. Key assumptions and limitations are outlined below:

- A higher confidence should be applied to ecosite typing within one km of the Community Access Road route alternatives centreline where higher resolution 2019 colour imagery was available;
- A lower confidence should be applied to ecosite typing within the outer two km of the Local Study Area where only low resolution black and white imagery from the mid-1970s was available; and
- A typical Forest Resource Inventory desktop mapping approach involves a process of ground-truthing / calibration according to the Calibration Plot Specifications (Ontario Ministry of Natural Resources, 2012b). No field verification occurred during the desktop ecosite typing exercise to validate the desktop mapping process.

Field Verification of Upland Ecosites and Field Verification of Wetland Ecosites provide a preliminary assessment of the accuracy of desktop upland and wetland ecosite typing based on the field verified sites that were completed once the desktop ecosite-typing was complete. This is summarized in **Section 5.2.2**.

4.3.1.3.2 Carbon Storage and Flux

In support of the Project, AECOM Canada ULC prepared the *Peatlands Technical Support Document: Carbon Storage and Flux* Report (AECOM, 2026) which summarizes the existing conditions related to carbon storage and flux in the Local Study Area, providing a baseline from which the overall Project impact on the carbon and methane cycle can be assessed. It has been appended to this Report as **Attachment C**. The carbon storage and flux study considered data prepared by the vegetation, peatlands and soils and terrain disciplines including their respective geographic information system datasets. This included the distribution of the eight peatland groupings identified previously which were further summarized into Bog, Fen, Organic Marsh, and Organic Swamp, as well as field measurements of peat thickness taken from both the vegetation, and soils and terrain auger and borehole locations. The results of linear regression equations from Magnan et al. (2023) and McLaughlin et al. (2018) were compared to determine the current overall soil organic carbon mass.

The results of the soil organic carbon mass exercise were then used to calculate the soil organic carbon storage within the Construction Disturbance Area. Equations from Webster et al. (2018) were used to obtain the daily and seasonal carbon flux of carbon dioxide and methane. Greenhouse gas fluxes were not calculated for Organic Marsh communities due to insufficient data from background literature on greenhouse gas fluxes for Organic Marsh systems and its limited presence in the Construction Disturbance Area (less than 1%). Results of the daily and seasonal carbon flux were used to determine the total carbon flux. A description of the methodologies used is included in **Attachment C**.

4.3.2 Field Investigations

Field investigations for peatlands were completed as part of the vegetation field program in 2021 through 2023 and were completed to assess a subset of the pre-typed ecosites. Pre-typed ecosites refer to the ecosites assigned by KBM Resources Group to each of the desktop-delineated polygons. Soil and botanical data were collected to characterize plant community composition in a subset of each ecosite type. Field surveys were conducted during the appropriate season (i.e., leaf-on season which typically occurs from June through September). Field sites were located within the Construction Disturbance Area and the Local Study Area. No field investigations were completed within the Regional Study Area.

Field sites were divided between upland, wetland, and riparian ecosystems. While all ecosites were mapped as either a wetland or upland ecosite, those that were within 30 m of a watercourse or waterbody were also identified as riparian ecosystems. Riparian communities were identified by buffering all watercourses and waterbodies by 30 m. This was completing using provincial layers (i.e., Ontario Hydro Network Waterbody and Ontario Hydro Network Watercourse) intersected with the mapped ecosites.

Two types of field surveys were conducted: ground inspections and visual checks. Ground inspections consisted of a point sample at a representative location within a desktop delineated and classified vegetation community polygon. The purpose of ground inspections was to confirm or correct the desktop ecosite classification and to collect data to inform the riparian, wetland, and peatland functional assessments. Visual checks consisted of an assessment from helicopter as well as assessments of representative photographs taken during other field programs (e.g., bird surveys).

4.3.2.1 Site Selection

Field verification survey plot site selection considered both access (i.e., proximity to existing helipad locations) and the objective to survey all ecosite types present within the existing conditions Local Study Area, based on the pre-typed ecosite mapping. The following sections describe the process for selecting sites for vegetation field surveys, ensuring coverage in both the Construction Disturbance Area and the existing conditions Local Study Area.

The field study design for the existing conditions Local Study Area generally followed the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (Ecosystems Working Group, 1998). Although these guidelines originate in British Columbia, a similar guideline to provide consistency across projects has not been developed for Ontario and therefore is considered to be an acceptable approach. Establishing the field survey intensity varies depending on the purpose of the surveys, size of the Study Area, project objectives, and funding; the British Columbia standards describe six survey intensity levels (Ecosystems Working Group, 1998). Based on the size of the vegetation existing conditions Local Study Area (197,960 ha), the survey intensity for the Project falls within the “reconnaissance level” intensity range with the percentage of polygon inspections falling between 0% and 4%, and a ground inspection to visual check ratio of 25:75 (Ecosystems Working Group, 1998).

Although every effort was made to adhere to this sampling intensity, the Project is located in a remote part of Canada with limited access. Access to vast portions of the existing conditions Local Study Area was only available by air, therefore survey locations were limited to within one km of where a helicopter was capable of landing (e.g., cut helicopter landing pads and open grassy riparian areas). Considering that not all randomly selected points were accessible, a number of oversample sites were also selected. The intent was to provide the best chance of obtaining a robust sample size but also with the objective of visiting a sub-set of each pre-typed ecosite.

As outlined in the Vegetation Study Plan, vegetation field surveys were selected to be most intensive within the Construction Disturbance Area (approximately 60% of the survey locations), with a reduced level of effort within the existing conditions Local Study Area (approximately 40% of the survey locations). No field surveys were completed within the Regional Study Area.

Field sites were also divided between upland, wetland, and riparian ecosystems. While all ecosites were mapped as either a wetland or upland ecosite, those that were within 30 m of a watercourse were also identified as riparian ecosystems. Riparian communities were identified by buffering all watercourses and waterbodies by 30 m.

4.3.2.2 Field Surveys

Two types of field surveys were conducted: ground inspections and visual checks. Each survey type is described in more detail in the bullets that follow.

- **Ground Inspections**—Ground inspections consisted of a point sample at a representative location within a desktop delineated and classified vegetation community polygon. The purpose of ground inspections was to confirm or correct the desktop ecosite classification and to collect data to inform the riparian, wetland, and peatland functional assessments. Ground inspection methodologies for wetland and peatland communities are described in more detail below; and
- **Visual Checks**—Visual checks consisted of an assessment from helicopter as well as assessments of representative photographs taken during other field programs (e.g., bird surveys). Visual checks were also completed on the ground, where possible (e.g., while walking from one ground plot to another). The purpose of visual checks was to assess whether the desktop ecosite mapping was accurate or needed to be revised to the proper classification.

Where visual checks were completed by helicopter, data collected consisted of (where possible): location (Universal Transverse Mercator coordinates), photos, dominant species (those that could be identified from air), estimate of community relative age (i.e., mature, semi-mature, immature, or recent burn), and stand composition.

Where visual checks were completed by photo interpretation, surveyors photographically documented the vegetation community with 13 photos. At each cardinal direction: one photo at shoulder height with arm and camera extended parallel to ground, one photo with arm at 45° (from body position) pointing down, and one photo with arm extended at 135° (from body position) pointing up, and one photo with arm extended straight up (i.e., vertically). The photos were interpreted (where possible) to confirm the pre-typed vegetation community, estimate of community age and stand composition, and estimate of soil moisture regime.

The data collection protocol for Wetland Communities was adapted from the *Wisconsin Rapid Assessment Methodology* (Wisconsin Department of Natural Resources, 2001), *Ontario Wetland Evaluation System* (Ministry of Natural Resources and Forestry, 2022), and the *Wetland Ecological Functions Assessment: An Overview of Approaches* (Hanson et al., 2008) which are complementary of recommended approaches from Environment and Climate Change Canada.

Ground inspections in wetland ecosystems included a point sample from a representative location within a pre-selected vegetation community polygon. At each point location, and while travelling through the polygon to reach a representative point, a botanical inventory of plant, fungi, lichen, and moss was recorded to the greatest extent possible. Specifically, the following data were gathered in wetland ecosystems, to the extent possible:

4.3.2.2.1 General Information

- Photographs;
- Dominant vegetation type;
- Community composition; and
- Ecosite classification according to *Ecosites of Ontario* (Banton et al., 2009).

4.3.2.2.2 Habitat Function Information

- Presence of invasive species or species of special interest (Indigenous importance or Species of Conservation Concern or Species at Risk);
- Habitat suitability (emergent vegetation for waterfowl nesting, standing water for amphibian breeding, vegetation suitable for ungulate grazing); and
- Incidental wildlife observations and evidence of wildlife activity.

4.3.2.2.3 Hydrological Function Information

- Geomorphology of the wetland (e.g., depressional, riverine, lake fringe, and extensive peatlands [Oji-Cree translation, *maashkiigwabo*]);
- Presence of surface water, flow patterns, connectivity, inputs, outputs, water depth, and evidence of groundwater influence;
- Existing hydrology alterations (e.g., ditching and beaver [Oji-Cree translation, *amikwag*] activity);
- Biogeochemical function information;
- Soil moisture regime;
- Substrate composition (mineral or organic); and
- Substrate decomposition rates described using the von Post scale (Ekono, 1981).

4.3.3 Data Management

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

4.3.3.1 Field Investigations

To maintain consistency and for quality assurance / quality control of the data collected, standardized datasheets paired with mapping software were used in the field. Field studies followed technical protocols that outlined specific work instructions were developed to follow provincially acceptable methods. Completeness and accuracy of field data was verified daily during field verification, and field photos and coordinate information were backed up regularly. Field datasheets were scanned and filed digitally in the appropriate Project folder.

4.3.3.2 Data Management

Field data were manually entered into excel spreadsheets for future collation and analysis. When the data analysis and reporting was undertaken, any data anomalies were cross-checked back with the field datasheets and / or field mapping to correct the anomaly. Pre-typed ecosites that were determined to be a different ecosite during the field verification process were updated in the digital mapping.

4.3.4 Data Analysis

4.3.4.1 Peatland Functional Assessment

A functional assessment identifies the capacity of a particular wetland, and in the case of this report, a particular peatland community, to perform hydrological, biogeochemical, climate and habitat functions and measures the differences in that capacity among all the peatland communities present in the assessment area. Functional assessments are often undertaken in disturbed landscapes, or where wetlands / peatlands are rare in the landscape, as a means of assessing the effects of wetland alteration, setting appropriate mitigation measures, and identifying management goals (Committee on Characterization of Wetlands et al., 1995).

Within the existing conditions Local Study Area and Regional Study Area, peatland communities are characterized by large and highly interconnected complexes in a relatively undisturbed landscape. Because of this high connectivity and similarity in ecological setting, peatland communities function at a broad scale as part of these large complexes.

Assessing individual functional performance of each peatland community in isolation would be confounded because the spatial extent of each function is not discrete (i.e., confined to the boundary of the particular ecosite), but rather shared and interdependent among numerous wetland communities within the complex. Defining and implementing a scale to compare the relative importance of each individual community therefore becomes less useful in the effects assessment.

Limitations in the desktop mapping (**Section 4.3.1.3**) combined with the small sample size used for field investigations (**Section 4.3.2.1**) also means characterizing functions of a community by ecosite type based on field data and extrapolating for the entire Local and Regional Study Areas would be of low accuracy and therefore of limited value. For example, the site-specific data collected from a single B139 ecosite or Fen vegetation community in the field does not necessarily mean all other B139 ecosites or Fen vegetation communities mapped in the Local and Regional Study Areas share the same site-specific influences. The results of any functional comparison between ecosite or vegetation community types would therefore be of low value in the effects assessment.

Based on the above factors, ranking the functional contributions (i.e., relative importance) of individual communities would be difficult, of limited accuracy, value, and usefulness, and risks underestimating the ecological functions of the large peatland complexes on the landscape. Further, Marten Falls First Nation has highlighted the importance of water and highlighted that water is life-giving to the land and all species of life (Marten Falls First Nation, 2021). This reinforces that all peatland communities are important in this landscape.

Therefore, a conservative landscape-level approach was taken for the functional assessment whereby all peatland ecosystems were treated as high-functioning and equally important ecologically. General peatland functions were described and differentiated on a finer scale where possible (e.g., by the four peatland vegetation community groupings [fen, organic marsh, organic swamp, and bog]). The assessment then focused on characterizing the relationship of peatland ecosystems and their functions to the landscape rather than an individual functional analysis resulting in rankings. This approach recognizes the connectivity of these ecosystems and is consistent with guidance provided by Environment and Climate Change Canada (Hanson et al., 2008) following a tiered monitoring and assessment framework. This is also consistent with the approach taken for the function assessment of general wetland communities and riparian communities completed for and presented in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h).

4.4 Effects Assessment

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

- Review construction and operations activities to identify potential interaction(s) that could result in environmental effects;
- Characterize the existing environment for both route alternatives which considers past, present and approved projects;
- Identify potential environmental effects for the Preferred Route and recommend 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 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 discipline-specific input and considerations as they pertain 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, including revised study areas which have been used to in the effects assessment.

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 peatlands Valued Components. These interactions support the identification of potential effects, both direct and indirect, that may result in changes to peatlands. 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 4-6** provides the preliminary analysis of Project–environment interactions for peatlands that was presented in the *Draft All Season Community Access Road: Peatlands*

Study Plan (AECOM, 2021). The analysis of Project–environment interactions for peatlands that are likely to have a potential effect is provided in **Section 7.2**.

Table 4-6: Project–environment Interactions

Project Phases	Project Activities	Peatlands
Construction Phase	Mobilization of equipment and supplies	**X**
	Temporary construction staging areas[(a)]	**X**
	Temporary access roads and trails[(a)]	**X**
	Temporary construction camps[(a)]	**X**
	Right-of-way clearing and grubbing	**X**
	Brush and timber disposal	**X**
	Pits and quarries[(a)]	**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**
	Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act*	**X**
	Decommissioning and reclamation temporary camps, roads / trails and staging areas	**X**
Operation and Maintenance Phase	Road usage	**X**
	Maintenance	**X**

Notes:

(a) Includes *general maintenance (e.g., grading, erosion control, quarrying, and borrow pits), seasonal maintenance (e.g., snow clearing and bridge and culvert maintenance), and special maintenance (e.g., slope failures and road settlement / break-up).*

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 peatlands are described as either direct or indirect, and the potential effects on other disciplines are described as Discipline Interactions. The potential direct and indirect effects resulting from the Project–environment interactions were based on 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 component, which may occur later in time or at a different location but are reasonably foreseeable.

Residual effects are the effects that remain after the application of mitigation measures. These effects are described in **Section 7** and include descriptions in detail of the potential adverse and positive residual effects in relation to each temporal phase of the Project as outlined in **Section 4.2.1**.

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 peatland availability or distribution could indirectly affect the associated wildlife habitat availability).

Peatlands may be indirectly affected by changes to other environmental disciplines. For example, the Atmospheric Environment can affect vegetation in peatlands by aerial deposition of dust and pollutants from Project activities. Changes to physiography, geology, terrain and soils, surface water, and groundwater can alter flow patterns and the interaction of water with peatlands potentially resulting in changes to their composition and function.

Table 4-7 provides a preliminary identification of how changes to other environmental disciplines may result in indirect effects on peatlands.

Table 4-7: Potential Discipline Interactions

Indirect Interactions Peatlands	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 peatlands as a result of changes in other disciplines	X	X	X	-	X	X	X	X		X	-	X	X	X	-	X	X

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.

4.4.2.2 Mitigation 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. These measures consist 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 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 potential environmental effects predicted, evaluate the effectiveness of mitigation measures, and identify the process the Proponent will follow if mitigation measures are not effective.

The *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) Section 20 requirements for peatlands are provided in **Table 4-8**. The *Terms of Reference* Requirements (AECOM, 2020) for vegetation can be found under *Table 4-8* in the *Vegetation Technical Support Document: Existing Conditions and Effects Assessment* (WSP, 2026). The applicability of these requirements has been evaluated and will be adapted to the needs of the site, environment, and Project activities.

Table 4-8: *Tailored Impact Statement Guidelines* Section 20 Requirements

***Tailored Impact Statement Guidelines* Section 20 Requirement**	**Section Addressed In**
Describe the measures to be used for stockpiling all stripped peat for use during site reclamation or describe the plan for stockpiling stripped peat and mitigate effects related to its long-term stockpiling or removal.	■ Peat is not planned to be stripped and stockpiled, rather a “floating road” construction methodology will be used. ■ **Section 7.3.1**
Provide the best technically and economically feasible mitigation approaches to habitat mitigation that follow the hierarchy: ■ Avoid potential impact; ■ Minimize potential impact; ■ Restore the potential impact; ■ Provide biodiversity offsets to address any residual adverse environmental effects that cannot be avoided or sufficiently minimized; and ■ Provide justification for moving from one mitigation alternative to the next.	■ **Section 6** ■ **Section 7.3.1** ■ **Section 9** and Preliminary Biodiversity Offset Plan

***Tailored Impact Statement Guidelines* Section 20 Requirement**	**Section Addressed In**
In relation to wetlands, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement. In addition, the following mitigation measures should be considered by the Proponent: ■ Demonstrate what efforts have been made to avoid and minimize effects on wetlands, and that the mitigation hierarchy has been followed; ■ Demonstrate that mitigation measures have taken into account the health, integrity, and availability of wetland (including peatlands) habitats for the species that rely on them; ■ Explain why alternative locations or means to carry out the project, or alternatives to the project were not possible, and how effects on the wetlands will be minimized; ■ explain how avoidance was considered as the first option and how it can be achieved by identifying alternate means of carrying out the project (e.g., project location or design) and by considering alternatives to the project; ■ explain how minimization can be achieved through project modification or implementation under special conditions after alternative means to the project have been considered; and ■ Describe how the following were considered: o Standard procedures and techniques if available for sector or jurisdiction. o Procedures and techniques based on sound ecological principles and the best science available. o Proven measures over new or experimental techniques. o Minimization techniques that take natural succession into account, and should provide for environmental variability over time. o Compensation for any residual effect that could not be minimized through the following order: restoration, enhancement of existing wetlands, or creation of new wetlands. o Evidence that functions can be replaced by the proposed offset activities. o Note that the above requirements are particularly important for peatlands as there is little experience in carrying out restoration or offsets.	■ **Section 6** ■ **Section 7.3.1** ■ **Section 9** and Preliminary Biodiversity Offset Plan
Explain mitigation measures developed specifically for peatlands. For example, mitigation measures to reduce chance of fire, or build fire-resilience; measures to mitigate changes in permafrost; and measures to mitigate changes in hydrological regime.	■ **Section 7.3.1**

Tailored Impact Statement Guidelines Section 20 Requirement	Section Addressed In
In relation to designing offsets for wetlands, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement. In addition, the following mitigation measures should be considered by the Proponent: ■ Indicate if it is not possible to compensate for lost functions in cases where wetlands are unique, or have habitat functions that support large proportions of migratory birds, or provide habitat required by species at risk, and take that into account when designing offsets; ■ Use a minimum ratio of 2:1 of area of wetland restored / created to original wetland area; ■ Clearly indicate the amount of wetlands (location, extent) for which residual effects should be addressed through offset measures; ■ Prioritize restoration of drained or altered naturally occurring wetlands of the same type and function as those impacted. Restored wetlands are preferred over enhanced wetlands, both of which are preferred over newly created wetlands; ■ Compensate lost wetland functions on-site if site conditions are suitable for wetland functions. Second preference is in the same watershed from which they were lost. Third preference is in the same ecosystem from which they were lost; ■ Incorporate compensation measures to minimize the time lag in availability of habitat and functions between when the adverse effects occur to when they have been fully replaced; and ■ In relation to designing offsets for species at risk, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement.	■ Refer to Preliminary Biodiversity Offset Plan

4.4.2.3 Predicting Residual Effects

Following the identification of direct and indirect effects on peatlands and identification of mitigation 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 (i.e., all residual effects greater than “negligible”) 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, will be described in terms of the effects assessment characteristics presented in **Table 4-9.** These effect characteristics are 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 4-9: Residual Effects Characteristics

Effects Characteristic	Definition	Description
Context	■ Ecological and social context ■ Timing of effect in relation to sensitive activities	■ Qualitative discussion ■ See description below in Discipline-Specific Characteristics
Direction	■ Direction of change from existing conditions	■ Positive: net gain or positive effect ■ Neutral: no change to existing condition ■ Negative: net loss or adverse effect
Magnitude	■ Magnitude is the expected change from existing conditions	■ Negligible, low, medium, high ■ See description in Discipline-Specific Characteristics
Geographic Extent	■ The spatial area in which the effect is expected to occur	■ Construction Disturbance Area: effect is confined within the direct physical disturbance of the Project ■ Local: effect extends into the Local Study Area ■ Regional: effect extends into the Regional Study Area ■ Beyond Regional: effect extends beyond the Regional Study Area
Duration	■ The period of time in which the effect is expected to occur	■ Short term: effect ends before the end of construction ■ Medium term: the effect occurs during construction and ends soon after operation begins and / or maintenance ends soon after the activity causing the effect ends. ■ Long term: the effect occurs during construction and persists into operation and / or the effect is considered permanent, or the likelihood of reversibility is low or uncertain.
Frequency	■ How often the effect is expected to occur	■ Infrequent: the effect is expected to occur rarely ■ Frequent: the effect is expected to occur intermittently ■ Continuous: the effect is expected to occur continuously
Reversibility	■ The ability to return to existing conditions	■ Reversible: the effect is not permanent ■ Irreversible: the effect is permanent
Likelihood	■ Probability that the effect will occur	■ Unlikely: the effect is not likely to occur ■ Possible: the effect may occur, but is not likely ■ Probable: the effect is likely to occur ■ Certain: the effect will occur

Effects Characteristic	Definition	Description
Uncertainty	■ The potential for observed results to deviate from predictions made	■ See description under **Section 4.4.2.7**
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.

4.4.2.5 Discipline Specific Characteristics

In addition to the residual effects characteristics described in **Table 4-9**, the following discipline-specific characteristics were used to characterize residual effects of the Project and determine the significance of those effects on peatlands.

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, 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 peatland ecosystems considers sensitivity, resilience, and adaptive capacity, applicable legislation and best management practices. The current and future sensitivity and resilience of peatland ecosystems to change caused by the Project are considered and includes Indigenous Knowledge, where available. Consideration of ecological context includes timing, such as when the effect could occur. Context also informs whether the residual effect would alter the ability of the peatland ecosystems to be self-sustaining (i.e., the determination of significance). Ecological context is discussed in a reasoned narrative with other characteristics such as magnitude, geographic extent, duration, reversibility, and probability of occurrence used to characterize residual effects (**Table 4-9**) and determine significance (**Section 4.4.2.6**).

4.4.2.5.2 Magnitude

Magnitude refers to the amount of change in an indicator relative to the existing conditions of a Valued Component and / or to known thresholds, standards or guidelines. Magnitude is categorized as negligible, low, moderate, or high using numeric quantification or qualitative expression and supported by the literature through a reasoned narrative.

Integrating ecological context to understand the point at which a given magnitude is large enough to be critical for a Valued Component is directly linked to the self-sustaining and ecologically effective status (i.e., function) of the ecosystem, and therefore directly linked to significance (**Section 4.4.2.6**).

For magnitude, environmental discipline-specific descriptions are required and are provided in **Table 4-10**. These descriptions informed the reasoned narrative magnitude discussions. Magnitude of effects are Project-related and exclude variations due to climate change.

Table 4-10: Peatlands Magnitude Descriptions

Magnitude Level	Description	Rationale
Negligible	Limited to no variation predicted in the measurement indicators for peatland ecosystems	Changes to peatland ecosystems are minor and largely **indiscernible**; therefore, no effect on ecosystem resilience
Low	A small variation predicted in the measurement indicators for peatland ecosystems	Minor incremental effects on peatland ecosystems are anticipated to be **discernible** but remain within the limits of ecosystem resilience
Medium	A moderate variation predicted in the measurement indicators for peatland ecosystems	Incremental effects on peatland ecosystems are anticipated to be **measurable** but is inferred to remain within the limits of ecosystem resilience
High	A large variation predicted in the measurement indicators for peatland ecosystems	Effects on peatland ecosystems are anticipated to be **severe** and likely to impair ecosystem resilience

4.4.2.5.3 Peatland Functional Assessment

Effects on peatland functions are difficult to quantify based on the data collected and the sizes of the effects assessment Local Study Area and Regional Study Area. Therefore, a reasoned narrative was used to discuss the relative effects on function based on the assessments of other disciplines, including vegetation, surface water, groundwater, air quality and greenhouse gas, wildlife, birds, and ungulates.

4.4.2.6 Determination of Significance

A conclusion on significance was made using the characteristics described in **Section 4.4.2.4** and **Section 4.4.2.5** as well as by taking professional judgement into consideration.

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 concerns of Indigenous communities, interested agencies, groups, and individuals raised during engagement.

The significance of adverse residual effects on peatland ecosystems was evaluated using the assessment endpoints of self-sustaining and ecologically effective ecosystems as significance thresholds. The significance of effects was predicted as a binary response, with effects classified as significant or not significant. Adverse residual effects were determined to be significant if the peatland ecosystem is not expected to be self-sustaining or ecologically effective at the scale of the effects assessment Regional Study Area. The effects assessment Regional Study Area was defined using ecological and watershed boundaries and is at a scale suitable for the application of cumulative effects and management strategies for peatland ecosystems; it is therefore an appropriate and relevant scale for evaluating ecosystem integrity.

Self-sustaining ecosystems are ecosystems that will be maintained into the future. They are healthy, functioning, and robust ecosystems that are capable of withstanding environmental change and accommodating stochastic processes (i.e., random or unpredictable changes in variables). Ecologically effective ecosystems are those that can support the range of native species and ecological and evolutionary processes normally provided by the ecosystem (Noss, 1990). These processes vary by ecosystem type and are not easily quantified.

Most ecosystems can adapt to, or otherwise accommodate, some changes without altering the functional state of the system, and some changes, positive or negative, to ecosystem availability, distribution, or composition would have little effect on self-sustaining and ecologically effective ecosystems at scales typically considered for conservation planning (Swift and Hannon, 2010).

However, the amount of change required to cause a significant adverse effect is heavily dependent on context, including ecological resilience and the effects of previous and existing developments on ecosystems. Both factors (i.e., adaptability and context) were considered when determining significance of the effects on peatland ecosystems.

Ecosystem resilience is the capacity of an ecosystem to cope with disturbances without shifting into a qualitatively different state (Holling, 1973). A resilient ecosystem can tolerate change and, if disturbed, can renew itself. This renewal can be accelerated with reclamation practices. If an ecosystem has limited resilience, it is vulnerable to the effects of disturbance such that it may shift into a different state and become functionally different (Folke et al., 2004). Ecosystem resilience can vary by Valued Component, and this variation has important implications for assessing effects on ecosystem function (Peterson et al., 1998; Folke et al., 2004; Thompson et al., 2008).

Resilience, adaptability, and existing conditions provide important ecological context for the determination of significance. Existing conditions represent the combined effects of previous and current human activities and natural factors that have shaped the observed condition or patterns of peatland ecosystems in the effects assessment Local Study Area and effects assessment Regional Study Area. These conditions represent the starting point for assessing Project effects and were considered as context to help define how close peatland ecosystems may be to its resilience limits when making the significance determination for the Project and reasonably foreseeable developments.

Critical thresholds, such as the amount or distribution of ecosystems required to maintain ecosystem function or the ability of an ecosystem to accommodate changes in condition, are rarely known with certainty. Moreover, ecological thresholds vary by community composition, landscape type, and spatial scale (Environment Canada, 2013; Swift and Hannon, 2010).

A detailed and transparent account of whether the predicted effects from the Project and other developments would cause the defined significance threshold to be exceeded was prepared for peatland ecosystems by combining residual effects criteria, available scientific literature, data collected in the study areas, and logical reasoning (i.e., a weight of evidence, or reasoned narrative approach). Using ecological context combined with residual effects criteria in a reasoned narrative, or rationale, to determine significance is a method accepted by the Impact Assessment Agency of Canada (IAAC, 2018).

Although significance was assigned to each interaction and associated measurement indictor(s), an overall determination of significance was provided. The relative and combined contribution of the effects from each interaction was used to determine the significance of potential adverse effects of the Project and other developments on peatland ecosystems in context of the associated assessment endpoint(s).

The approach was based on a "weight of evidence" or an evaluation of the collective evidence considering the concepts described above, including the magnitude, geographic extent, duration, and likelihood of the effect, as well as resilience and adaptive capacity. Effects were predicted to be less harmful if the likelihood of the effect was unlikely as supported by the assessment results and scientific studies. The relative effect from each interaction on peatland ecosystems and the assessment endpoint is discussed; however, interactions that were predicted to have the largest influence on the assessment endpoint were assumed to contribute the most to the determination of significance for peatland ecosystems. The weight-of-evidence approach included the process of assembling, weighing, and evaluating information to come to a scientifically defensible conclusion. Significance was generally as follows (with consideration of context):

- **Significant**—Residual effects are measurable at the ecosystem level and are likely to decrease resilience and increase the risk to the maintenance of a self-sustaining and ecologically effective peatland ecosystem. Loss of habitat that causes permanent adverse changes at the ecosystem level would likely be significant. A significant effect may also result from direct loss and fragmentation of peatland habitats that reduces the function of peatland communities to the point that it disrupts (breaks) the connectivity of larger peatland ecosystems; and
- **Not Significant**—Residual effects are measurable at the individual peatland community level and are detectable at the peatland ecosystem level but are not likely to decrease resilience and increase the risk to the maintenance of a self-sustaining and ecologically effective peatland ecosystem.

Confidence in the significance prediction was identified and discussed for peatland ecosystems as part of the reasoned narrative. If the threshold for where a significant effect would occur in the range of potential values had high uncertainty (low prediction confidence), and if the effect could be assessed as significant or not significant, a precautionary approach was applied, and the effect was identified as significant. The greater the uncertainty, the earlier a significant effect would be identified on the continuum of cumulative change from the Project and Reasonably Foreseeable Developments, where applicable.

Considering the significance for each residual effect, along with the context, an overall significance determination was completed for peatland ecosystems.

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 measures, overall scope of factors considered, and natural and human-induced influences on the biophysical and human environment. Accuracy of the data (e.g., vegetation mapping) used for the assessment also influences prediction confidence and has been considered for this assessment.

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 have 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 measures. Each potential residual effect was assigned a confidence level as a means of ranking potential effects on peatland ecosystems.

The confidence levels are defined as:

- **Low**–Confidence levels were considered to be low if there were no baseline data available and the ecology of the Valued Component is poorly understood, habitat models are based on assumptions with little to no field data or scientific literature, the Project-related effects are poorly understood, and the level of certainty associated with the effectiveness of proposed mitigations is low or unknown;
- **Moderate**–Confidence levels were considered to be moderate if there were baseline data for much of the study area and the ecological knowledge of the Valued Component is adequate to generate habitat models with confident assumptions and predictions supported by literature, the Project-related effects are mostly understood, and the level of certainty associated with the effectiveness of proposed mitigations is moderate to high; and
- **High**–Confidence levels were considered to be high if there were baseline data for almost all of the study area and the ecology of the Value Component is well known generating statistically and ecologically robust habitat models and effects predictions, the Project-related effects are clearly understood, and the level of certainty associated with the effectiveness of proposed mitigations is high.

Uncertainty in the assessment was reduced by:

- Rolling-up the peatland mapping from ecosites to peatland community groupings for ecosystem-level indicators where possible and completing the cumulative effects assessment on these groupings;
- Completing quality assurance and quality control of baseline data; and
- Comparing assessment results to relevant published scientific literature.

These uncertainties were managed using a number of conservative assumptions including:

- Applying conservative assumptions regarding the footprint area and related Project activities that may cause disturbance or direct peatland loss to increase confidence that the effects were not underestimated.

The levels of uncertainty are defined as:

- **Low**–Uncertainty was considered to be low if there was baseline data for almost all of the study area and the ecology of the Value Component is well known generating statistically and ecologically robust habitat models ad effects predictions, the Project-related effects are clearly understood, and 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 much of the study area and the ecological knowledge of the Valued Component is adequate to generate habitat models with confident assumptions and predictions supported by literature, the Project-related effects are mostly understood, and 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 and the ecology of the Valued Component is poorly understood, habitat models are based on assumptions with little to no field data or scientific literature, the Project-related effects are poorly understood, and 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.

4.4.2.8 Deviations from Tailored Impact Statement Guidelines

Project effects for peatlands were not classified using all criteria described in the *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020). Most of the criteria outlined in the *Tailored Impact Statement Guidelines* are obtained from *NatureServe Conservation Status Assessment: Factors for Evaluating Species and Ecosystem Risk* (Master et al., 2012). Although the criteria presented in NatureServe (Master et al., 2012) are useful for assessing and assigning the conservation status of species at risk from different threats, these criteria are less appropriate for characterizing residual effects in an Environmental Assessment. For example, characterizing magnitude using an ordinal scale (i.e., low, moderate, or high) in a manner meaningful for peatland ecosystems requires that the effect size be placed in the ecological context of the criterion, such as resilience, adaptability, and amount of existing disturbance.

Universal effect size boundaries, such as a 20% change at the Effects Regional Study Area scale used to define a high magnitude effect, work poorly because they fail to consider ecological context. A 20% additional habitat loss from the Project relative to existing conditions in the Effects Regional Study Area may be required to cause a high magnitude effect on some peatland communities, whereas a 2% habitat loss may be sufficient for others, depending on ecological context (Environmental Assessment Office, British Columbia, 2013).

It is important to note that although not all the criteria and methods of combining criteria (i.e., matrices) outlined in *Tailored Impact Statement Guidelines* (Impact Assessment Agency of Canada, 2020) were not explicitly applied in this report, the criteria are captured in the residual effects characterization for peatland ecosystems. For example, elements of "scope" and "severity" are used in the characterization of magnitude, geographic extent, and duration (**Table 4-9**). In addition, severity is captured through the inclusion of resilience and adaptive capacity of Valued Components, which provide necessary context for understanding the damage or disruption to species and ecosystems. Irreversibility / permanence is also a criterion used to describe and assess residual effects in this report (**Table 4-9**). The "degree of effect" criterion in the *Tailored Impact Statement Guidelines* is not classified in this report but is incorporated into the reasoned narrative for the characterization of residual effects and determination of significance (**Section 4.4.2.5**).

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, considering the application of technically and economically feasible mitigation 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 *Interim 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 will consider the incremental changes that are predicted to have a likely residual adverse effect on a Valued Component. The Valued Components that do not have a residual effect predicted, or the residual adverse effect is of negligible magnitude, the likelihood is unlikely or possible to occur, or positive in direction, will not be carried forward into the cumulative effects assessment. All residual effects on Valued Components identified will be brought into the cumulative effects assessment. The rationale for the exclusion of Valued Components from the cumulative effects assessment will be 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 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 each Valued Component selected (e.g., caribou). Finalization of the boundaries were informed through consultation with Indigenous communities, agencies and interested persons. The spatial boundaries used to assess cumulative effects are described in **Section 8.1.2.**

The Characteristics described in **Section 4.4.2** for the residual effects assessment have also been used to determine significance of cumulative effect, a summary of these is described in **Table 4-9**.

4.4.3.2.3 Identification of Past, Present, and Reasonably Foreseeable Developments

Activities that will be considered in the cumulative effects assessment will include 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 be 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 will not be 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 need to be identified. This information will help 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 peatlands cumulative effects assessment, the following questions will be answered. If effects of the activities of the projects are expected to overlap in type, time, and space with the residual effects of the identified Valued Components, it will be assumed that those activities will act cumulatively and be assessed for cumulative effects with the Project.

- Do the project's activities overlap in the type of effects (e.g., permanent removal of vegetation)?
- Do the project's activities overlap in the timing of effects (i.e., do they overlap with the cumulative effect spatial 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 temporal 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.

4.5 Identify Monitoring Programs and Future Commitments

Following the residual and cumulative effects assessments, effects monitoring programs are recommended to verify the prediction of the effects assessment and the effectiveness of the mitigation 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

To predict future conditions for peatland ecosystems, an assessment of the level of pre-existing disturbance versus new disturbance was assessed in the *Marten Falls First Nation Community Access Road: Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h). Both natural and anthropogenic disturbances were included as existing disturbance. Natural disturbances included fire and blowdown areas while anthropogenic disturbances included harvest areas, roads, camps, and trails. This assessment has included a qualitative review of landscape fragmentation prior to Project development and predicted effects post-development.

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 Field Surveys

To maintain consistency and for quality assurance / quality control of the data collected, standardized datasheets (either digital or paper) paired with mapping software were used in the field. Field studies followed technical protocols that outlined specific work instructions and were developed to follow federally and provincially acceptable methods. Completeness and accuracy of field data were verified daily during field verification and field photos, and coordinate information was backed up regularly.

4.7.2 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 as applicable with exclusion of 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, with 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 Natural Heritage Information Centre and the Ministry of the Environment, Conservation and Parks - Species at Risk Branch.

5. Existing Conditions

The existing conditions are described based on a combination of information obtained through engagement and consultation, desktop assessment, field investigation, and modelling.

5.1 Landscape Ecology

The Project intersects two of Ontario's three ecozones: the Ontario Shield and the Hudson Bay Lowlands (Crins et al., 2009). The western portion of the existing conditions Local Study Area occurs within the Ontario Shield ecozone, which extends north beyond the existing conditions Local Study Area by approximately 250 km, west approximately 585 km to Manitoba, southeast 200 km, and east to Quebec. The northeastern portion of the existing conditions Local Study Area occurs in the Hudson Bay Lowlands ecozone, which extends north to Hudson Bay, west to northern Manitoba, and east to James Bay (Oji-Cree translation, *Wee-nee-peg-kook*; **Figure 5-1**).

Separating the two ecozones is the interface between the Precambrian Shield underlying the Ontario Shield ecozone and the Paleozoic bedrock of the Hudson Bay basin underlying the Hudson Bay ecozone (ESWG, 1996; Crins et al., 2009). Approximately 85% of the existing conditions Local Study Area occurs in the Ontario Shield ecozone, and 15% occurs within the Hudson Bay Lowlands. However, much of the existing conditions Local Study Area that is within the Ontario Shield ecozone has similar geomorphological characteristics to the Hudson Bay Lowlands as outlined below.

5.1.1 Ontario Shield Ecozone, Ecoregions and Ecodistricts

The Ontario Shield Ecozone is subdivided into nine ecoregions. The majority of the existing conditions Local Study Area is located within Ecoregion 2W (Big Trout Lake) (**Figure 5-1**). Ecoregion 2W (Big Trout Lake) has a cold and dry climate with long winters and cool summers. The underlying geology in 2W is characterized as granite or gneiss of the Precambrian Shield. The surficial geology is a result of glacial processes that produced numerous moraines, exposed bedrock, as well as silt and clay deposits associated with glacial Lake Agassiz. The resulting topography is relatively flat with low ridges. The soil layer in 2W is largely organic in nature, consisting of peat and organic materials where drainage is poor, while a small proportion of well-drained areas consist of brunisols (Crins et al., 2009). Sparse forest, conifer (Oji-Cree translation, *shigobiig*) forest, and mixedwood dominate the landcover in 2W with small pockets of hardwood forest occurring naturally along large river valleys (Crins et al., 2009). Almost a third of 2W is covered by wetlands or waterbodies consisting mainly of open water and treed bog. Burns make up nearly a tenth of 2W, the highest proportional percentage in Ontario (Crins et al., 2009).

Extensive tracts of upland and lowland Black Spruce (Oji-Cree translation, *shikobaatik*) (*Picea mariana*) occur in this ecoregion; however, in areas with adequate drainage Jack Pine forms monocultures or mixedwood stands often with Trembling Aspen (Oji-Cree translation, *apijih pakoosh*) (*Populus tremuloides*) and White Birch (Oji-Cree translation, *wigwaasatik*) (*Betula papyrifera*) (Rowe, 1972).

At a finer scale, the existing conditions Local Study Area intersects Ecodistricts 2W-2 and 2W-3. The existing conditions Local Study Area lies mostly within the southern portion of 2W-2 (Kasabonika Lake) which is dominated by conifer forests and the primary substrate is organic deposits over calcareous material (Crins et al., 2009; Wester et al., 2018). The southern end of 2W-3 (Wunnumin Lake) is characterized as having exposed bedrock occasionally covered in a thin layer of mineral material; conifer forest is dominant (Crins et al., 2009; Wester et al., 2018).

5.1.2 Hudson Bay Lowlands Ecozone, Ecoregions and Ecodistricts

The Hudson Bay Lowlands Ecozone is subdivided into six ecoregions. The existing conditions Local Study Area bisects a portion of the western corner of Ecoregion 2E (James Bay Ecoregion) of the Hudson Bay Lowlands Ecozone (**Figure 5-1**). Ecoregion 2E is characterized by its cold and humid climate, high proportion of wetlands, and limited productive forest (Crins et al., 2009). Peatlands, including treed and open fen and bog, dominate more than half of the 2E landscape. Productive forest within the ecoregion is predominantly limited to conifer stands near large watercourses that contribute to the accumulation of mineral soils (Crins et al., 2009). Open water features are not prominent in 2E and are mainly represented as rivers and streams. Fires in this ecoregion tend to be small and low in frequency and distribution due to the predominance of wet organic substrates and an inherently cool humid climate (Crins et al., 2009). Vegetation cover is dominated by Black Spruce with scattered occurrences of Tamarack (*Larix larincina*) in intermediate to rich fen ecosites (Crins et al., 2009).

At a finer scale, the northeastern portion of the existing conditions Local Study Area enters Ecodistrict 2E-1 (Albany River) and just touches the northwestern border of 2E-4 (Lower Kenogami River) in the western portion of 2E. Ecodistrict 2E-1 is a level landscape composed mostly of fen and bog complexes, occasionally interspersed by conifer dominant forests. 2E-4 is relatively uniform with peatlands and little topographic relief (Wester et al., 2018).

OTOSKWIN-ATTAWAPISKAT RIVER PROVINCIAL PARK

ALBANY RIVER PROVINCIAL PARK

OGOKI RIVER PROVINCIAL PARK (WATERWAY CLASS)

LITTLE CURRENT RIVER PROVINCIAL PARK

NAKINA MORAINE

2E-1

2E

2E-4

2W

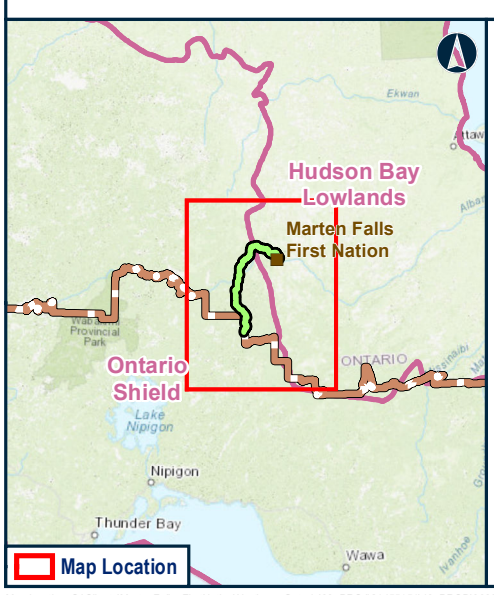
2W-2

2W-3

3W

3W-1

3W-4



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP

- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK

- LOCAL STUDY AREA
- REGIONAL STUDY AREA
- ECOZONE
- ECOREGION

ECODISTRICT

- 2E-1
- 2E-4
- 2W-2
- 2W-3

Data Source:
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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Landscape Context: Ecozones, Ecoregions and Ecodistricts

0 5 10 20 30
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Feb, 2026	1:750,000 * when printed 11"x17"
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Figure 5-1

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5.1.3 Desktop Vegetation Community Mapping

The desktop vegetation community mapping prepared by KBM Resources Group (2021), in association with the WSP soils and terrain specialists, produced a digital map for Project use. The full existing conditions Local Study Area was delineated to ecosite level, with a total of 15,027 polygons delineated and classified to ecosite (including water and anthropogenic polygons). Ecosites were refined from the initial desktop vegetation community mapping through a combination of field investigations as described in **Section 4.3.2,** and from field and desktop investigations further detailed in **Attachment B**.

5.1.4 Field Investigation Distribution and Coverage

A detailed summary of the distribution and coverage of the vegetation survey sites specific to wetland and riparian communities that were completed during the 2021 through 2023 field programs is outlined in **Table 5-1**. through **Table 5-3** and can be found in **Attachment B** and in the *Vegetation Existing Conditions & Effects Assessment Report* (WSP, 2026h). These tables provide the level of effort for ecosite verification at ground inspection sites, visual checks completed during aerial (helicopter) surveys, and visual checks completed through photo interpretation from site photos taken during wildlife surveys. There was a total of 314 vegetation survey sites in wetland and riparian communities, including 65 ground inspection sites, 208 visual checks (aerial surveys) and 41 visual checks (photo interpretation). Survey sites were distributed between the Construction Disturbance Area and existing conditions Local Study Area and included representative ecosites within wetland and riparian ecosystems. No field surveys were completed in the Regional Study Area.

Table 5-1: Vegetation Field Investigations – Ground Inspections

Year	Field Dates	Wetland	Riparian	Total
2021	September 19, 21-29 (10 days)	6	8	**14**
2022	July 13-18 and 22 (7 days)	5	11	**16**
2023	June 15, 17 and 18 (3 days)	10	0	**10**
2023	August 3-5 (3 days)	18	7	**25**
Total		**39**	**26**	**65**

Table 5-2: Vegetation Field Investigations – Visual Checks (Aerial)

Year	Field Dates	Wetland	Riparian	Total
2021	September 19, 21-29 (10 days)	32	32	**64**
2022	July 13-18 and 22 (7 days)	33	22	**55**
2023	June 15, 17 and 18 (3 days)	52	9	**61**
2023	August 3-5 (3 days)	27	1	**28**
Total		**144**	**64**	**208**

Table 5-3: Vegetation Field Investigations – Visual Checks (Photo Interpretation)

Year	Photograph Dates	Wetland	Riparian	Total
2022	June 1-10 and August 10-13	41	0	**41**

5.2 Vegetation Communities

5.2.1 Upland / Wetland Ecosystems Overview

The existing conditions Local Study Area is dominated by wetland ecosystems, with 73% (145,255.3 ha) mapped as wetland communities. A total of 85% of all wetlands within the existing conditions Local Study Area are considered peatland communities with bog, fen, organic swamp, and organic marsh communities comprising 63% of the existing conditions Local Study Area. Upland ecosystems represent 23% (45,272.3 ha) of the existing conditions Local Study Area, with water representing a further 4% (7,506.9 ha), and anthropogenic (human-altered) lands representing <1% (23.0 ha). It should be noted that a larger number of hectares (649.9 ha) of anthropogenic disturbance was identified during the disturbance analysis presented in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h) using a separate set of desktop data sources; however, both methods yielded a result of <1% of the total existing conditions Local Study Area. **Table 5-4** presents the availability of uplands and wetlands within the existing conditions Local Study Area and in the existing conditions Regional Study Area for broader context. **Figure 5-2** displays the distribution of peatlands, non-peatland wetlands and upland ecosystems within the existing conditions Local and Regional Study Areas.

As can be seen by the predominance of blue shading on **Figure 5-2,** the highest concentration of peatlands is in the northern portion of the existing conditions Local Study Area, north of Dusey Lake (Oji-Cree translation, *Atikameko Zakaihkan*), which is close to the boundary between Ecodistricts 2W-2 and 2W-3.

Likewise, **Figure 5-2, plates 1 and 2** show a prominence of green and orange shading, illustrating greater prominence of upland ecosystems or mineral wetland ecosystems south of Dusey Lake (i.e., within Ecodistrict 2W-3). This is consistent with the characteristics of Ecodistrict 2W-3, which is dominated by coniferous forests in the south part of the Ecodistrict, in contrast with Ecodistricts 2W-2, 2E-2, and 2E-4, which are dominated by wetlands (Wester et al., 2018). The transition between Ecodistricts 2W-3 and 2W-2 is also marked by a transition from shallow mineral substrates in 2W-3 to deeper, typically organic substrates in 2W-2 (Wester et al., 2018). The northern portion of the existing conditions Local Study Area is characteristic of Ecodistricts 2W-2 and 2E-1 which are both dominated by wetlands on organic substrates (Wester et al., 2018).

Table 5-4: Availability of Upland and Wetland Ecosystems (including Peatlands) within the Existing Conditions Study Areas

Ecosystem	Local Study Area (ha)	% Local Study Area	Regional Study Area (ha)	% Regional Study Area[(a)]
Upland	45,272.3	23%	327,008.9	29%
Wetlands (Mineral)	21,182.5	11%	713,545.5	64%
Wetlands (Peatlands)	123,975.8	63%		
Water	7,506.6	4%	77,355.1	7%
Anthropogenic	23.0	<1%	228.0	<1%
Other	N/A	N/A	16.1	<1%
Total	**197,960.2**	**100%**	**587,762.0**	**100%**

Notes:

(a) Wetland area values within the existing conditions Regional Study Area represent a combination of area values from delineated peatland communities completed for the Project within the existing conditions Local Study Area, and Ontario Land Cover Compilation Version 2.0 mapping for areas beyond the limits of the existing conditions Local Study Area. The Ontario Land Cover Compilation layer is a compilation of Far North Land Cover version 1.4, Southern Ontario Land Resource Information System version 1.2, and Provincial Land Cover 2000 Edition. The Ontario Land Cover mapping does not differentiate between organic and mineral wetland communities.

ha = hectare; % = percent; < = less than; N/A = not applicable.

5.2.2 Ecosite and Vegetation Community Mapping Accuracy

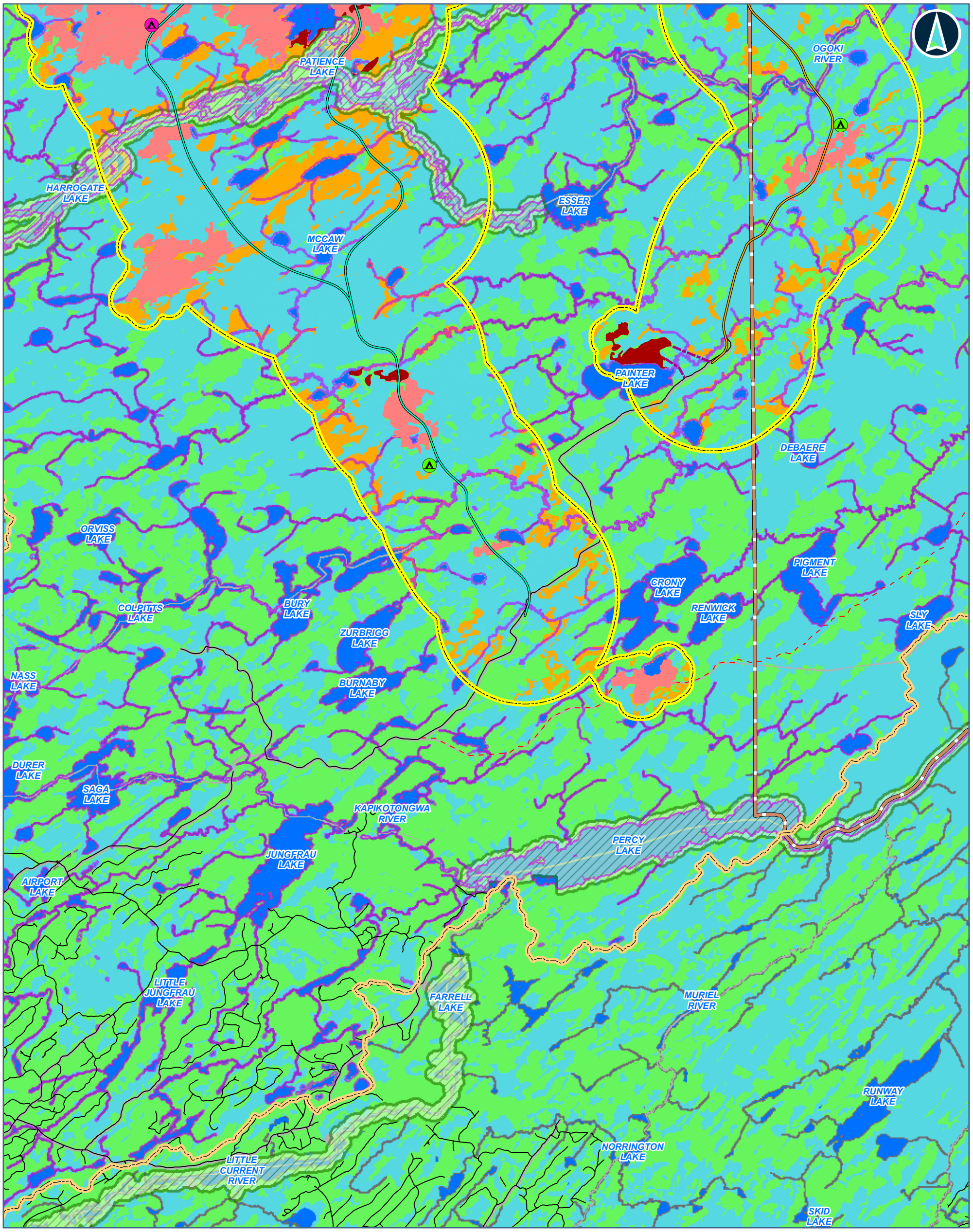
Upland and wetland ecosystem mapping is based on a combination of desktop pre-typed polygons and field-verified polygons. Ecosite classifications that were changed based on visual and ground investigations were updated in the digital mapping. Although the field-verified ecosites represent a very small proportion of the polygons in the existing conditions Local Study Area, these corrections helped to ensure that revised mapping and analyses would be based on the best available information.

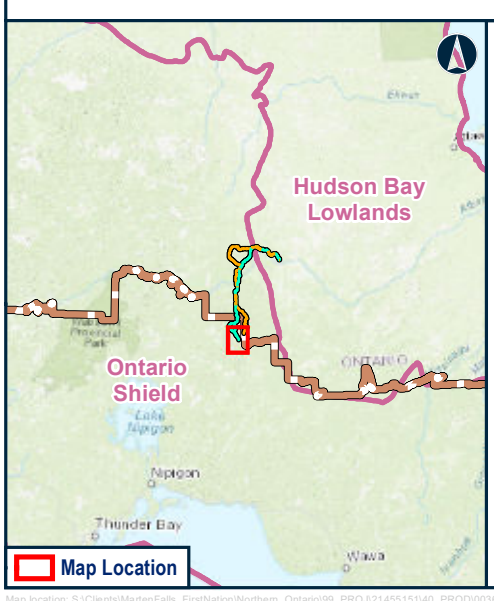
As noted in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h), the following mapping accuracy estimates were determined based on a confusion matrix analysis of the field-verified sites:

- 75% of the desktop communities mapped as upland were field verified as upland;
- 30% of desktop pre-typed upland ecosites were correct based on field verification (i.e., exact ecosite match);
- For incorrect upland ecosite matches that were still field verified as upland communities:
  - 58% had the correct cover type (e.g., conifer versus conifer) but differing species composition, or soil moisture.
- 95% of polygons that were pre-typed as wetland were confirmed to be wetland;
- 35% of polygons that were pre-typed as wetland were correct based on field verification (i.e., exact match); and
- For incorrect ecosite matches that were still field verified as wetland communities:
  - 56% had the correct wetland type (i.e., communities mapped as either bog, fen, or marsh at desktop were field verified as one of these communities).

Given the scale of the Project and the limitations identified in the desktop mapping exercise, ecosites were rolled up into four peatland community groupings (i.e., bog, fen, organic marsh, and organic swamp) for describing existing conditions and effects assessment purposes. The results of the field-verification process summarized above further support the decision to roll up the ecosites to broader peatland community groupings. Rolling up to the broader groupings also allowed the existing conditions Regional Study Area to be mapped consistently with, and at the same level of detail as, the existing conditions Local Study Area since the peatland community groupings generally correspond to categories in the *Ontario Landcover Compilation Version 2.0* (with the exception of not differentiating mineral and organic swamps and marshes).

Ecosites were further refined in 2024 through a combination of field and desktop investigations that are detailed in **Attachment B**. This resulted in an additional 267 changes in ecosite type for upland ecosystems and 2052 changes in ecosite type for wetland ecosystems.





Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- ANTHROPOGENIC
- ANTHROPOGENIC
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Wetland and Upland Ecosystems

0 3 6
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 5-2.1

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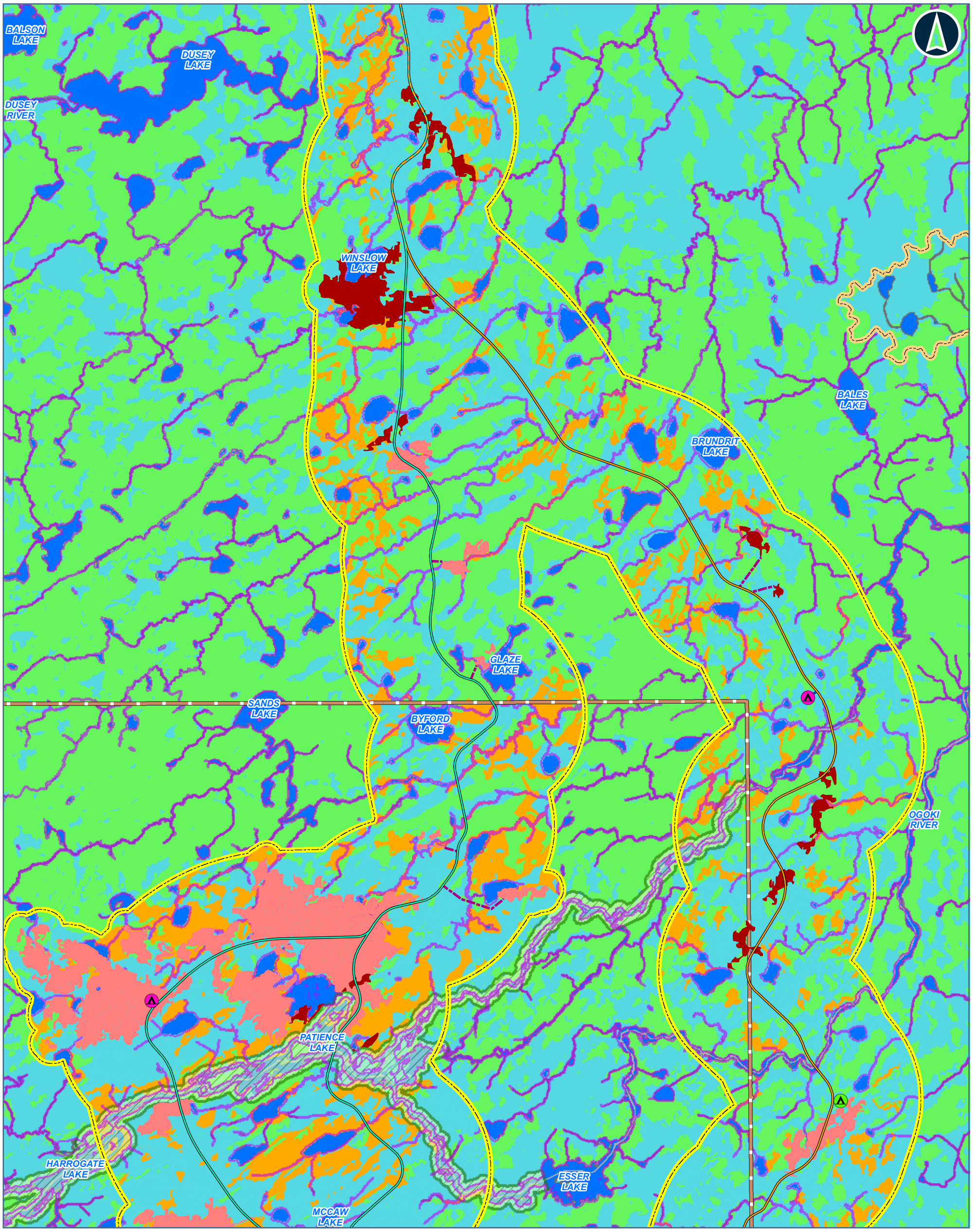

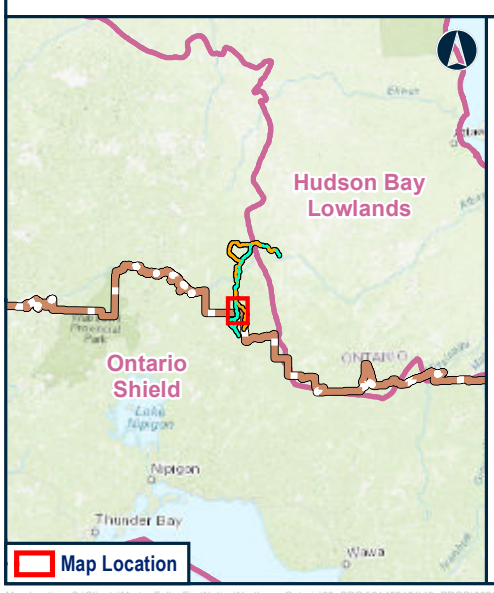

Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- ANTHROPOGENIC
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

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Existing Conditions - Wetland and Upland Ecosystems

0 3 6
Kilometres

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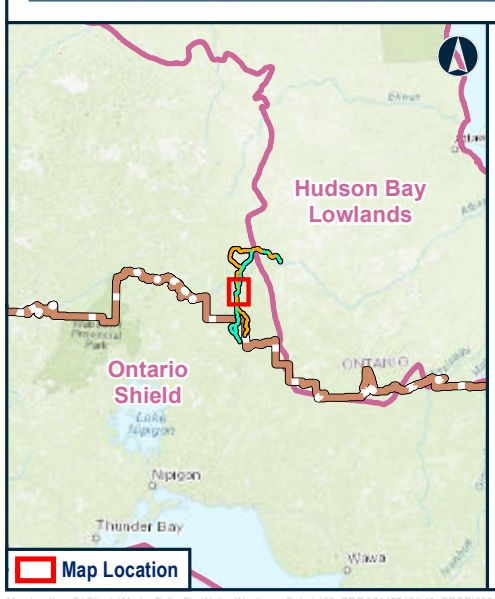
ALBANY RIVER
TRELOAR LAKE
TEABEAU LAKE
TOLFREE LAKE
SUWALA LAKE
DUSEY RIVER
TANASE LAKE
BALSON LAKE
DUSEY LAKE
WINSLOW LAKE



Legend

CONSTRUCTION DISTURBANCE

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND
- WATERCOURSE
- PROVINCIAL PARK
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY
- REGIONAL STUDY AREA

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WABASSI RIVER

VENTON LAKE

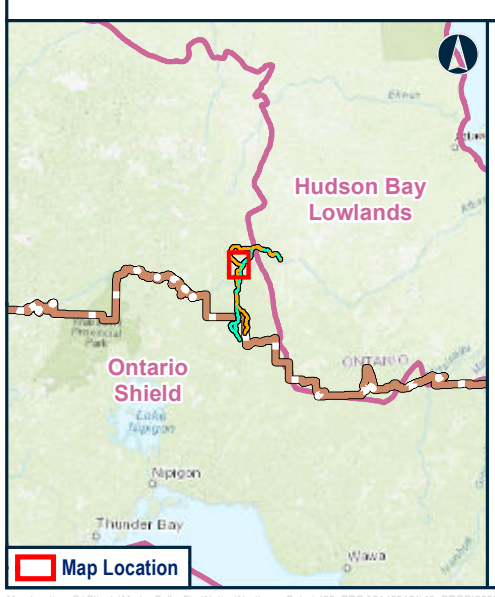
MAXEY LAKE

TREBELL LAKE

SAARIMAKI LAKE

ALBANY RIVER

TRELOAR LAKE



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CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

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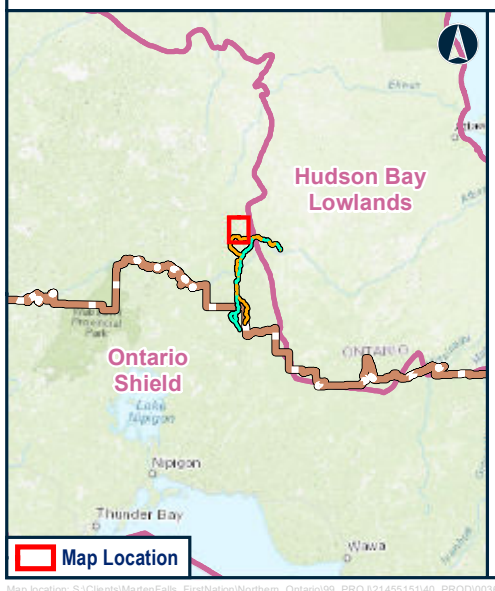
SEABROOK LAKE
GARVEY LAKE
SLADE LAKE
DAINTY LAKE
TILLETT LAKE
MABIE LAKE
OXTOBY LAKE
WABASSI RIVER



Legend

- ALTERNATIVE 1
- ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Wetland and Upland Ecosystems

0 3 6
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 5-2.5

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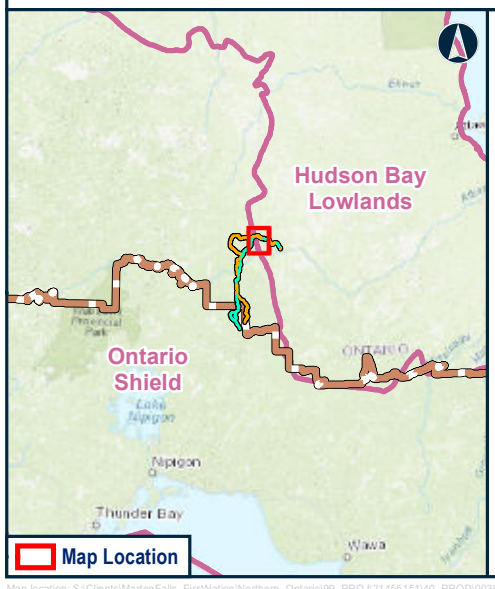
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
GITTINS LAKE
WABASSI RIVER
ALBANY RIVER
TREBELL LAKE



Legend

CONSTRUCTION DISTURBANCE

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND
- WATERCOURSE
- PROVINCIAL PARK
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY
- REGIONAL STUDY AREA

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Wetland and Upland Ecosystems

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Kilometres
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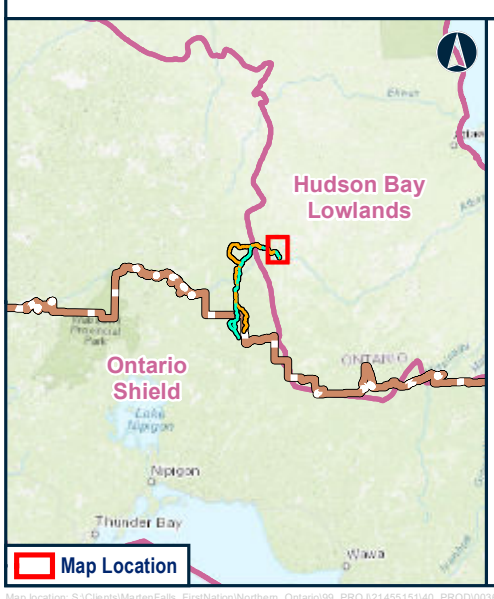
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
TIFFIN LAKE
ALBANY RIVER
DARK RIVER
OGOKI RIVER



Legend

CONSTRUCTION DISTURBANCE

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- ALTERNATIVE 1 and ALTERNATIVE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND
- ROAD
- WINTER ROAD
- WATERCOURSE
- FIRST NATION COMMUNITY
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL
- ANTHROPOGENIC
- ANTHROPOGENIC
- UPLAND
- WATER
- WETLAND
- RIPARIAN ECOSYSTEMS
- LOCAL STUDY
- REGIONAL STUDY AREA

Data Source:
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Aerial photography provided by:
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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Wetland and Upland Ecosystems

0 3 6
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

Feb, 2026	1:125,000 * when printed 11"x17"
Rev:0	

Figure 5-2.7

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Date Saved: 2/12/2026 2:02:32 PM User Name: gld_rduval

5.3 Peatland Ecosystems

As described in the *Draft All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021), peatland is a collective term for wetlands that accumulate more than 40 cm of organic soil (Asada and Warner, 2005; National Wetlands Working Group, 1988 and 1997; Sims and Baldwin, 1996). Factors such as water availability, climate, elevation, and terrain play significant roles in the development of peatland ecosystems. Bog, fen, organic marsh and organic swamp communities rely on stagnant to slow-moving water fed by groundwater, adjacent waterbodies, and / or precipitation, which allow peat to form by creating anoxic systems that slows the decomposition of dead plant material (Harenda et al., 2018).

Through desktop ecosite mapping and field verification, a total of 15 peatland ecosite types were identified within the existing conditions Local Study Area. This ecosite count does not include ecosite modifiers. For example, B128Tt is not counted separately from B128Tl. For the data summaries provided in **Attachment B**, the 15 peatland ecosite types were grouped into eight different peatland groupings: treed bogs, open bogs, sparse treed fen, open fen, shore fen, organic conifer swamps, organic thicket swamp, and organic marsh. However, given the scale of the Project and the limitations identified in the desktop ecosite mapping exercise described above in **Section 5.2.2**, ecosites have been rolled up into four peatland vegetation community groupings as outlined below for mapping and analysis purposes. **Attachment B** provides further information about the ecosites in each of these four peatland groupings:

- Bog;
- Fen;
- Organic Marsh; and
- Organic Swamp.

Bogs are distinct from other peatland and wetland types by being hydrologically isolated systems (ombrotrophic) with precipitation acting as the only input source for both water and minerals. Bogs can exist in isolated depressions or in areas where the build up of organic material has led to the system being elevated above the surrounding vegetation communities and isolated from surface or ground-water sources (e.g., a raised dome). These mineral deficient, and acidic systems are environments where plant growth is limited by excess moisture, low nutrient availability and pH (Banton et al., 2009).

Fens differ from bogs as they are minerotrophic systems predominately sustained by groundwater inputs, and to a lesser degree, surface water and groundwater inputs (Ducks Unlimited Canada, 2024). The diversity and composition of plant species in fens is largely dependent on the underlying hydrogeology, which dictates the nutrient availability in a system. Groundwater inputs can create nutrient rich systems compared with bogs.

However, the nutrient status of fens can range from poor to rich. Poor fen ecosites are weakly minerotrophic peatlands that occasionally flood or have low groundwater movement and a rooting zone in contact with minerotrophic groundwater (Banton et al., 2009). Moderately rich fen ecosites have moderate nutrient availability, with periodic flooding, groundwater movement, and rooting zone in contact with mineral-rich groundwater (Banton et al., 2009). Extremely rich fen ecosites have high nutrient availability and are subject to periodic flooding and groundwater movement and a rooting zone in contact with mineral-rich groundwater; these communities are often patterned with alternating raised ridges (strings) and depressions (flarks) that form perpendicular to the flow of water (Banton et al., 2009). The pH of fen waters also varies along the poor-to-rich gradient. Poor fen systems are acidic systems (i.e., pH levels of 4.5 to 5.5), moderately rich fens are slightly acidic (i.e., pH levels of 5.5 to 6.9) and extremely rich fens are neutral to basic in nature with a pH above 6.9 (United States Department of Agriculture, n.d.).

Organic Conifer Swamp communities are found in areas that experience periodic flooding or increased groundwater inputs resulting in a large hydroperiod that provide varying levels of nutrient availability while allowing for the accumulation of organic material (Banton et al., 2009). Like fens, organic swamps can be poor, intermediate, or rich in their nutrient availability, which influences their vegetation composition (Banton et al., 2009).

Organic marsh communities are considered nutrient rich, receiving nutrients from persistent groundwater inputs and periodic or sustained inputs from adjacent watercourses or waterbodies. Fluctuating water levels leading to exposure of the soils also lead to aeration of the substrate. Organic meadow marshes have high nutrient availability and are often situated adjacent to a lake or stream, where water is normally above the substrate surface, often forming because of a break in a beaver dam.

The following sections provide an overview of the availability, distribution, composition, and function of peatland ecosystems identified in the existing conditions Local Study Area and Regional Study Area.

5.3.1 Availability

The Peatlands of Canada map was developed in 2011 by the Geological Survey of Canada (Tarnocai et al., 2011). The map is based on the Soil Landscapes of Canada database including reconnaissance soil investigations, air photo interpretation and manual polygon delineation. The map identified peatland distribution by % cover of the four types of peatlands: bog, fen, swamp, and marsh. This map has formed the basis of several peatland studies as it has been widely available since 2011. The Peatlands of Canada map illustrates the distribution of peatlands by dividing the land into dominant types, and ranges of cover for each type (e.g., 55% to 75% bog). As bog and fen complexes often overlap within an area, separate maps for bog distribution and fen distribution, illustrated by cover class, are also presented.

An approximate overlay of the existing conditions Regional Study Area on the Peatlands of Canada map indicates that more than half of the existing conditions Regional Study Area is dominated by 40-60% bog cover. The northeast corner of the study area is dominated by 60-80% bog cover, and the southwest corner is composed of 1-40% bog cover. The majority of the Regional Study Area is also composed of approximately 20-40% fen cover based on the Peatlands of Canada mapping.

In contrast to the Peatlands of Canada mapping described above, the availability (i.e., area) of the four wetland vegetation groupings within the existing conditions Local and Regional Study Areas based on the desktop mapping exercise outlined in **Attachment B** is summarized in **Table 5-5** and illustrated on **Figure 5-3**.

Table 5-5: Peatland Vegetation Groupings in the Existing Conditions Study Areas

Peatland Vegetation Group	Area of each Peatland Vegetation Group in the Local Study Area (ha)[(a)]	% of each Peatland Vegetation Group in the Local Study Area	Area of each Peatland Vegetation Group in the Regional Study Area (ha)	% of each Peatland Vegetation Group in the Regional Study Area
Bog	2,172.0	<2%	184,580.7	17%
Fen	74,068.7	37%	244,992.8	22%
Organic Marsh	2,407.2	<2%	3927.4	<1%
Organic Swamp	45,327.9	23%	280,044.6	25%
Total	**123,975.8**	**63%**	**713,545.5**	**64%**

Notes:

(a) Wetland area values within the existing conditions Regional Study Area represent a combination of area values from delineated peatland communities completed for the Project within the existing conditions Local Study Area, and Ontario Land Cover Compilation Version 2.0 mapping for areas beyond the limits of the existing conditions Local Study Area. The Ontario Land Cover Compilation layer is a compilation of Far North Land Cover version 1.4, Southern Ontario Land Resource Information System version 1.2, and Provincial Land Cover 2000 Edition. The Ontario Land Cover mapping does not differentiate between organic and mineral wetland communities.

ha = hectare; % = percent; < = less than.

Fen communities are the most common wetland and peatland community types mapped within the existing conditions Local Study Area. The mapped fen communities comprise 37% of the existing conditions Local Study Area and 22% of the existing conditions Regional Study Area. Organic swamp communities are the next most abundant wetland community type mapped in the existing conditions Local Study Area. Organic swamps comprise 23% of the existing conditions Local Study Area and organic swamp communities comprise 25% of the existing conditions Regional Study Area. Both organic marsh and bog communities comprise less than 4% of the existing conditions Local Study Area and less than 18% of the existing conditions Regional Study Area.

The mapped wetland vegetation cover within the existing conditions Local Study Area is generally representative of the Peatlands of Canada mapping described above and the Ecoregions 2E (James Bay) and 2W (Big Trout Lake) vegetation cover described in The Ecosystems of Ontario, Part 1: Ecozones and Ecoregions (Crins et al., 2009) with the exception of bog cover, which is lower than what has been estimated across the general landscape in those ecoregions. Ecoregion 2E is reported to be dominated by fen (30%) and bog (39%) communities, while Ecoregion 2W has a greater proportion of upland forest (49%) (Crins et al., 2009). The discrepancies between bog cover in the existing conditions Local Study Area and Regional Study Area as well as the general coverage within Ecoregion 2W are further addressed in **Attachment B**.

5.3.2 Distribution

The distribution of peatland ecosystems within the existing conditions Local Study Area is illustrated on **Figure 5-2** and **Figure 5-3**. Generally, peatland ecosystems are more frequent in the northern portion of the existing conditions Local Study Area, north of Dusey Lake, as can be seen by the dominance of light blue shading on **Figure 5-2, plates 3 through 7**. Likewise, fen and swamp communities are most common in the northern portion of the existing conditions Local Study Area (**Figure 5-3, plates 3 through 7**).

The northern portion of the existing conditions Local Study Area is characteristic of Ecodistricts 2W-2 and 2E1 which are both dominated by wetlands on organic substrates (Wester et al., 2018).

Input from Marten Falls First Nation has included information about the distribution of peatland environments within the Study Areas. In particular, the Community has noted a large expanse of peatlands and felled trees within the lands between the southern channel of the Albany River to the Pahtegosing River (Marten Falls First Nation, 2023).

Although human development activities that typically fragment the landscape in southern Ontario (e.g., road, rail, and other linear infrastructure; agriculture; and land development) are absent from the majority of the Project Study Areas, some forestry operations, camps, communities, and road development are present towards the southern limits of the existing conditions Local Study Area, as well as associated with the First Nation Community at the northern-most limit of the existing conditions Local Study Area. This has resulted in some limited fragmentation of the landscape. Otherwise, the landscape has generally remained intact, influenced primarily by natural disturbances (e.g., fire). A summary of disturbance analyses (including fire and harvest disturbance data) within wetlands is presented in the *Vegetation Technical Support Document: Existing Conditions & Impact Assessment Report* (WSP, 2026h).

PATIENCE LAKE
HARROGATE LAKE
MCCAW LAKE
ESSER LAKE
OGOKI RIVER
PAINTER LAKE
DEBAERE LAKE
ORVISS LAKE
COLPITTS LAKE
BURY LAKE
ZURBRIGG LAKE
CRONY LAKE
RENWICK LAKE
PIGMENT LAKE
SLY LAKE
NASS LAKE
BURNABY LAKE
DURER LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
PERCY LAKE
JUNGFRAU LAKE
AIRPORT LAKE
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE
LITTLE CURRENT RIVER
NORRINGTON LAKE
SKID LAKE

Hudson Bay Lowlands
Ontario Shield
Map Location

Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

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Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 — 2.75 — 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 5-3.1

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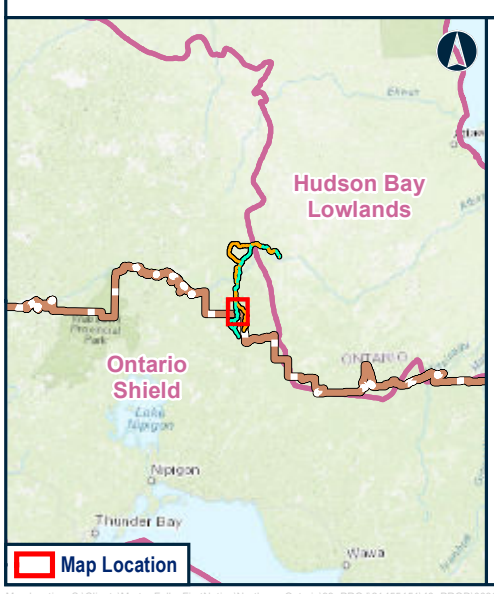
Date Saved: 2/18/2026 4:25:38 PM User Name: gld_rduval

BALSON LAKE
DUSEY LAKE
DUSEY RIVER
WINSLOW LAKE
BALES LAKE
BRUNDRIT LAKE
GLAZE LAKE
SANDS LAKE
BYFORD LAKE
OGOKI RIVER
PATIENCE LAKE
HARROGATE LAKE
ESSER LAKE
MCCAW LAKE



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 — 2.75 — 5.5
Kilometres

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Figure 5-3.2

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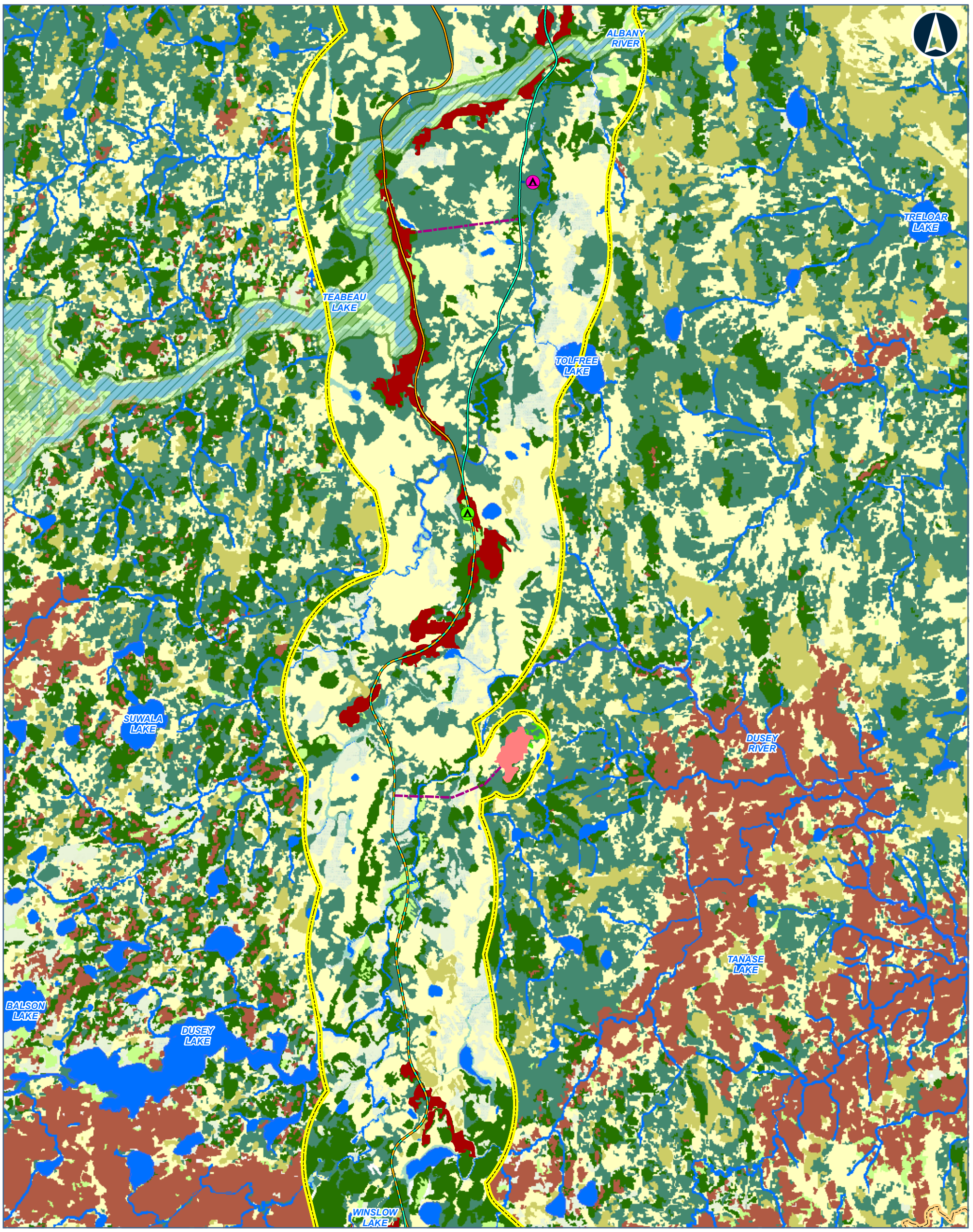

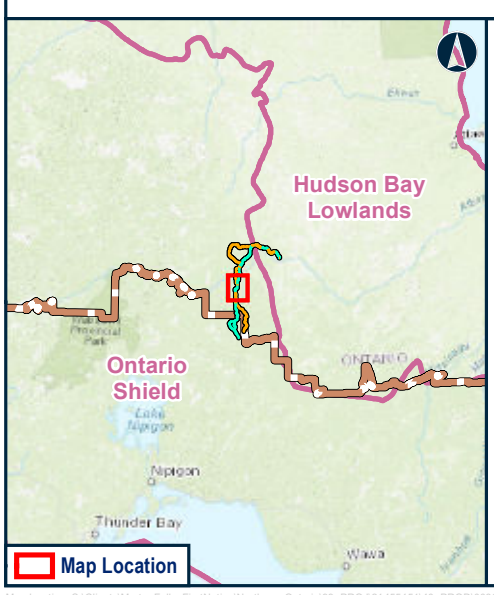

Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 — 2.75 — 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 5-3.3

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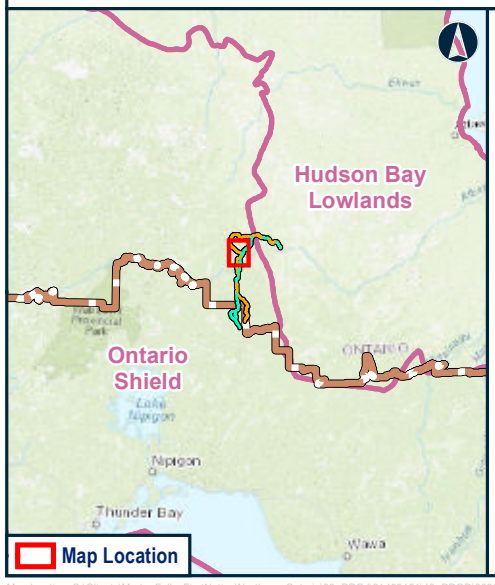
Date Saved: 2/18/2026 4:25:38 PM User Name: gld_rduval

WABASSI RIVER
VENTON LAKE
MAXEY LAKE
TREBELL LAKE
SAARIMAKI LAKE
ALBANY RIVER
TRELOAR LAKE



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 2.75 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 5-3.4

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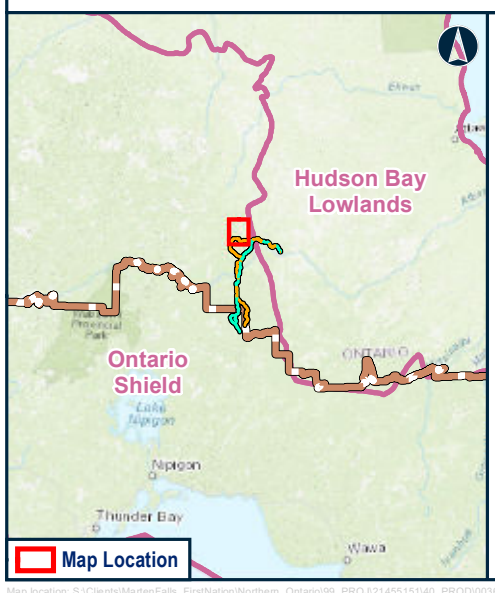
SEABROOK LAKE
GARVEY LAKE
SLADE LAKE
DAINTY LAKE
TILLETT LAKE
MABIE LAKE
OXTOBY LAKE
WABASSI RIVER



Legend

- ALTERNATIVE 1
- ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

Data Source:
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Aerial photography provided by:
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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 — 2.75 — 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 5-3.5

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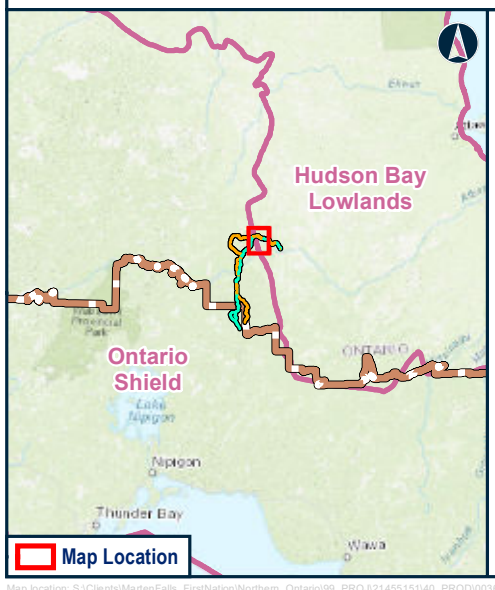
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
GITTINS LAKE
WABASSI RIVER
ALBANY RIVER
TREBELL LAKE



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- ALTERNATIVE 1
- ALTERNATIVE 4
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 2.75 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Feb, 2026	1:125,000 * when printed 11"x17"
Rev:0	

Figure 5-3.6

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Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0036_Peatland_EA_Reporting\21455151-0036-RT-0005_5-3.mxd
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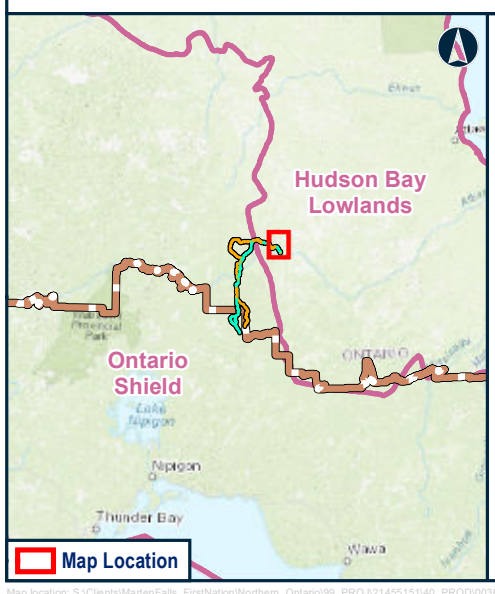
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
TIFFIN LAKE
ALBANY RIVER
DARK RIVER
OGOKI RIVER



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- ALTERNATIVE 1 and ALTERNATIVE 4
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FIRST NATION COMMUNITY
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE

- CONIFEROUS FOREST
- DECIDUOUS FOREST
- MIXED FOREST
- EARLY SUCCESSIONAL / SPARSE TREED
- ROCK / BARREN
- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH
- WATER
- ANTHROPOGENIC

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Existing Conditions - Peatland Community Types in the Local and

0 — 2.75 — 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Feb, 2026	1:125,000 * when printed 11"x17"
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Figure 5-3.7

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Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0036_Peatland_EA_Reporting\21455151-0036-RT-0005_5-3.mxd
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5.3.3 Composition

Through the desktop ecosite mapping and field verification, a total of 15 peatland ecosite types were identified within the Local Study Area. Given the scale of the Project and the limitations identified in the desktop mapping exercise, for mapping and analyses purposes, ecosites have been rolled up into four wetland types in the Regional Study Area and the following eight peatland vegetation community groupings in the Local Study Area. The rolled-up peatland vegetation groupings are:

- Sparse Treed Fen (B136Tl / B136Tt);
- Open Fens (B139N / B139S, B140N / B140S, B141N / B141S);
- Shore Fens (B146N / B146S, B147N / B147S);
- Treed Bogs (B126Tl / B126Tt, B137Tl / B137Tt);
- Open Bogs (B138N);
- Organic Conifer Swamps (B127Tl / B127Tt, B128Tl / B128Tt, B129Tl / B129Tt);
- Organic Thicket Swamps (B135S); and
- Organic Marshes (B144N, B149N).

The greatest proportion of the peatland ecosites within the Local Study Area are composed of fen and swamp communities, and specifically, treed fen and organic conifer swamp ecosites. The following is a summary of the peatland ecosystems within the Local Study Area:

- 63% of the Local Study Area is composed of peatlands;
- Fen ecosites comprise 73,917 ha or 37% of the Local Study Area which represents 51% of the peatland ecosystems:
  - The majority of the fen ecosites are mapped as Sparse Treed Fen (B136 / B136Tl / B136Tt), representing 34% of the Local Study Area.
  - The second most common fen ecosites are Open Fens, including Poor Fen (B139 / B139N / B139S), Open Moderately Rich Fen (B140N / B140S), and Open Extremely Rich Fen (B141 / B141N / B141S) together representing 3% of the Local Study Area.
  - The third most common fen ecosites are Shore Fens, including Open Shore Fen (B146N / B146S) and Shrub Shore Fen (B147S), together representing <1% of the Local Study Area.
- Organic Swamp ecosites comprise 45,328 ha or 23% of the Local Study Area which represents 31% of the peatland ecosystems:
  - The majority of the organic swamp ecosites are mapped as Organic Conifer Swamps, including Organic Poor Conifer Swamp (B127Tl / B127Tt), Organic

Intermediate Conifer Swamp (B128Tl / B128Tt), and Organic Rich Conifer Swamp (B129Tl / B129Tt), together representing 23% of the Local Study Area.

  - The second most common organic swamp ecosites are mapped as Organic Thicket Swamp (B135S), representing only <1% of the Local Study Area.

- Organic Marsh ecosites mapped as Organic Meadow Marsh (B144N) and Organic Shallow Marsh (B149N), together represent 1% of the Local Study Area which represents 2% of the peatland ecosystems; and
- Bog ecosites comprise only 1% of the Local Study Area which represents 2% of the wetland ecosystems.
  - Treed Bog (B126Tl / B126 Tt and B137Tl / B137Tt) are the most common bog ecosites, representing 1% of the Local Study Area.
  - Open Bog (B138N) represents <1% of the Local Study Area.

Additional detail on each peatland ecosite can be found in **Attachment B**.

5.3.4 Function

Wetlands, including peatland ecosystems in the existing conditions Local Study Area and Regional Study Area, provide a range of functions that are categorized as hydrological, biogeochemical or habitat. The ability of each peatland vegetation community (i.e., organic swamp, organic marsh, fen, and bog) to perform the associated function varies depending on characteristics such as landscape position (e.g., riparian and basin), depth of organics, and size. The relative importance of each function also varies and may be related to the type and proximity of other vegetation communities. A summary of wetland (including peatland) functions, as well as a general classification of the level of performance by each wetland vegetation community, is provided in **Table 5-6** (Hanson et al., 2008; Committee on Characterization of Wetlands et al., 1995; Ducks Unlimited, 2018). As discussed in **Section 5.3.1**, fen and swamp are the most abundant peatland community types within the existing conditions Study Areas, representing 97% of peatland ecosystems.

Table 5-6: Summary of Wetland Functions in the Existing Conditions Study Areas

Function Category	Function	Description	Function Performance by Wetland Community Type			
			Swamp	Marsh	Fen	Bog
Hydrological	Water storage	Storage of surface water, both short and long term. Capacity depends on wetland location within the landscape, size, and normal water level. May contribute to maintenance of base flows and seasonal flow distribution	Low to High	Low to High	Moderate	Low
	Groundwater recharge	Dependent on location within the landscape and watershed, as well as local groundwater gradients	Low	Variable	Variable	Variable
	Local climate regulation	Evapotranspiration rates provided by emergent herbaceous plants, mosses and shrubs	Moderate	High	Moderate	Low
Biogeochemical / Climate	Water quality treatment	Treatment of physical, chemical and biological inputs. Dependent on loading rates, hydroperiod, substrate and vegetation assemblage. Possible benefits for downstream aquatic life (e.g., fish)	High	High	High	Low
	Nutrient / organic export	Export of nutrients and organic carbon to streams may influence bacteria growth and can affect the aquatic food chain	Variable	Variable	High	Variable
	Carbon sequestration / storage	Related to the volume of peat, as well as woody and acidic biomass	Moderate to High	Moderate to High	High	High

Function Category	Function	Description	Function Performance by Wetland Community Type			
			Swamp	Marsh	Fen	Bog
Habitat	Biodiversity and biological productivity	Habitat for wildlife or significant species, such as species at risk, rare species, commercially or traditionally valued species	High	Moderate to High	Moderate to High	Moderate
		Habitat for significant vegetation species, such as species at risk, rare species, or traditionally valued species	High	Moderate	High	Moderate

5.3.4.1 Hydrological

The hydrology, or water flows and levels, of a wetland are dynamic and directly influence its chemical and physical processes (Mitsch and Gosselink, 2015). The duration and timing of when a wetland holds water are referred to as the hydroperiod (Mitsch and Gosselink, 2015). Water levels within wetlands are maintained by very low gradients, low substrate permeability, topography or adjacent aquatic systems (Ministry of Natural Resources and Forestry, 2022). Hydrological functions of a wetland are therefore closely connected to the basin that provides their water source (Ministry of Natural Resources and Forestry, 2022). As detailed in the *Physiography, Terrain and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d), much of the existing conditions Local Study Area is characterized by subdued topography and level organic areas. Further, the *Groundwater & Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c) indicates that across much of the existing conditions Local Study Area the groundwater table is nearly flat and horizontal groundwater velocities are slow (WSP, 2026c). Therefore, wetlands in the existing conditions Local Study Area are situated in a large, flat basin with hydrological functions connected across individual wetlands, resulting in a large wetland complex.

The subdued topography and large, flat basin play an important role in creating and maintaining peatland systems by providing areas where vegetation is in a continuously water-logged state, slowing down the decomposition of organic matter by inhibiting oxidation and allowing the organic matter to build up over time as peat (Craft, 2022). A peatland's position in the landscape and its connection to adjacent surface water and groundwater inputs and outputs largely drives its form and function. Indigenous communities including Fort Albany First Nation have also highlighted observations relating to the role of peatlands in hydrological function, noting the overall importance of peatland systems in relation to water storage, filtration, streamflow, and groundwater conditions throughout seasonal cycles (Fort Albany First Nation, 2024).

Fens have a complex hydrology, with interacting surface, sub-surface and groundwater flows that result in slow, lateral water movement capable of connecting wetland systems over large distances (Cohen et al., 2020). Persistent groundwater inputs mean fens are less dependent on surface inputs compared to other wetland types which helps to stabilize a fen systems water table throughout the year (Price et al., 2023). Swamps are characterized by fluctuating water levels influenced by surface run-off, precipitation, and / or groundwater resulting in standing or flowing water that may be seasonal with systems experiencing a large decrease in their water table during drier seasons or persisting for longer periods depending on the source of water and rate of transpiration from the local vegetation (Ministry of Natural Resources and Forestry, 2022; Price et al., 2023). Given the topographic and groundwater conditions of the existing conditions Local Study Area, it is not surprising that these two peatland community types are the most common in the landscape. Other peatland types such as raised bogs only rely on inputs from precipitation

events (rain and snowmelt) to maintain a flow of water to the lower levels of peat (Fraser et al., 2001; Devito et al., 1997; Price et al., 2023). During periods where output (i.e., evapotranspiration) exceeds inputs (i.e., precipitation) in these systems, reverse flow conditions can occur in where water from the lower levels of peat discharges to the higher levels, helping to maintain moist or wet conditions throughout the upper and lower peat layers through capillary processes (Devito et al., 1997; Price et al., 2023).These varying interactions by peatland type allow for waterlogged conditions to be maintained long enough for the continued accumulation of peat and the retention and sequestration of carbon to occur.

The capture of larger hydrological inputs (i.e., large precipitation or melt events) can also provide benefits to downstream watercourses and waterbodies by maintaining surface flows and by helping to maintain local and regional groundwater systems (Committee on Characterization of Wetlands et al., 1995; United States Environmental Protection Agency, 2016; Price et al., 2023) while also helping to reduce erosion of adjacent upland systems, particularly during periods of high flow (e.g., spring freshet and storms) (United States Environmental Protection Agency, 2016). While the ability of a system to control runoff is strongly influenced by seasonality and variation in annual precipitation (Lane et al., 2020) because the wetlands in this landscape are characterized as a large, interconnected complex, storage capacity in each existing conditions Study Area is expected to be large.

Based on the *Groundwater & Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c), most groundwater recharge is expected to occur in areas with permeable surficial geology, which is concentrated in the south portion of the existing conditions Local Study Area where wetland cover is lower. As described in the *Physiography, Terrain and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d), the northern portion of the existing conditions Local Study Area has a high cover of organic soils (high % cover of peatland communities) with poor drainage, indicating that wetlands in this landscape make a low contribution to groundwater recharge.

5.3.4.2 Biogeochemical

Peatlands play an important role in creating suitable conditions for biogeochemical cycling, or transformation of nutrients, especially of nitrogen, carbon, and phosphorus (United States Environmental Protection Agency, 2016). Peatlands filter the water that passes through, trapping suspended sediment and retaining or processing inorganic nutrients and organic wastes. This filter function improves downstream water quality and protects aquatic habitats from degradation associated with nutrient loading, such as algal blooms, dead zones and fish kills (United States Environmental Protection Agency, 2016).

In wetlands with flowing water or inflows from seasonal flooding, production and decomposition rates tend to be high resulting in rapid nutrient cycling. Conversely, in nutrient-poor wetlands, such as bogs or nutrient-poor fens, nutrient cycling is slower (Committee on Characterization of Wetlands et al., 1995).

Both fens and organic swamps have the potential to perform these biogeochemical functions at a high rate due to a combination of physical processes, high interaction between water and root-bacteria assemblages, flow through substrate and heterogeneity in oxidation. Fens and swamps may act as a sink for nutrients, reducing export to downstream environments. Performance is dependent on inflow and outflow, loading rates and the constituents of concern (Hanson et al., 2008). In general, the landscape is characterized as relatively undisturbed with low anthropogenic inputs (e.g., agricultural run-off and industrial or wastewater discharge). Therefore, sediment and nutrient loading in the existing conditions Study Areas are considered to be low. As described in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), the lakes and watercourses sampled at the waterbody crossing locations within the existing conditions Local Study Area generally meet applicable water and sediment quality guidelines, standards and objectives.

Peatland ecosystems are thought to store a third of the world's soil organic carbon stock (Ofiti et al., 2023). Studies on Ontario peatlands tend to be focused on the Hudson Bay Lowlands, the ecozone which covers the northern portion of the study area. Packalen, M. S., Finkelstein, S. A., & McLaughlin, J. W. (2016), studied how climate and peat types relate to peatland carbon mass in the Hudson Bay Lowlands (the area of the current study) and store more carbon than northern counterparts. Factors such as climate change are expected to have an impact on the ability of peatlands to sequester carbon in the future. Increases in global temperatures can cause drier conditions in the upper layers of peat, triggering increases in microbial decomposition rates in boreal environments, which in turn leads to increased release of carbon emissions from peatland environments (Ofiti et al., 2023). Under this scenario, peatland features that were once considered carbon sinks could start to act more like pools where carbon is readily released back into the atmosphere (Loisel et al., 2021). A more detailed assessment of carbon sequestration and storage functions with the existing conditions Local Study Area is provided in **Section 5.3.5**.

Another important biogeochemical relationship between peatlands and the health of downstream ecosystems and communities is the interaction between peatlands, the mercury cycle, and the methylation of inorganic mercury into methylmercury. Peatlands act as sinks for atmospheric mercury where it can be transformed into methylmercury through the gradual decomposition of organic matter by anerobic microbes, such as sulfate reducers and methanogens present in the peat (Price et al., 2023; Sun et al., 2023). The organic matter that comprises peat can have elevated mercury concentrations relative to upland mineral soils due to factors such as peatland communities receiving additional inputs of mercury from both atmospheric and upstream catchments and wetland plants typical of peatlands have been found to be effective in the uptake of mercury (Huckabee, 1973; Zillioux et al., 1993; St. Louis et al., 1994; Zhou et al., 2021). Methylmercury is a highly toxic organic compound that can bioaccumulate in fish and shellfish communities.

It can then impact downstream communities if those fish, shellfish, or other animals that have used those sources for food and water are harvested and consumed (United States Environmental Protection Agency, 2024; Price et al., 2023). The microbial-mediated sulphur cycle in peatlands impacts methylmercury production by triggering sulfate-reducing bacteria that methylate mercury as a byproduct of microbial sulphate reduction (Wang et al., 2022). Therefore, inputs from acidic drainage (i.e., sulfates) from acidic rock sources could lead to an increase in the generation of methylmercury in the local landscape. Additionally, climate change and the drying of peat could lead to an increase in microbial activity and the breakdown of organic material, which could also increase production of methylmercury and inorganic mercury concentrations in boreal peatlands (Sun et al., 2023). However, this does not necessarily translate to increased levels of methylmercury export to downstream sources as drier conditions may lead to decreased discharge from peatlands and thus a decrease in potential inputs of methylmercury to downstream receiving watercourses and waterbodies (McCarter et al., 2024).

5.3.4.3 Habitat

Given the abundance of peatlands in the overall landscape, their hydrology, and their limited nutrient availability compared to mineral wetland and upland environments, peatlands provide general and specific habitat conditions for a variety of plant and wildlife species within the existing conditions Local and Regional Study Areas. Habitat functions for vegetation and wildlife are summarized at a high-level in **Table 5-7** and **Table 5-8.** A more detailed characterization and assessment of wetland functions related to wildlife habitat is provided in the *Birds Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026a), *Ungulates Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026f), and *Wildlife Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026g). Wetland functions related to fish habitat are characterized and assessed in the *Fish and Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026b).

Indigenous Knowledge provided by the Marten Falls First Nation noted the importance of vegetation (e.g., moss) as a food source for caribou spotted along the northern sections of the proposed Marten Falls First Nation Community Access Road route(s), between the proposed route(s), and Marten Falls First Nation (Marten Falls First Nation, 2023). In addition, Marten Falls First Nation noted concerns related to the Indigenous / traditional use and conservation of valuable resources, including vegetation species, in peatlands. One of these species is muskrat root (Oji-Cree name, *wiikenh) (Acorus* sp.), which can be found in swampy areas (Marten Falls First Nation, 2023). Fort Albany First Nation has also noted an overall importance of peatlands to their community and Indigenous Peoples throughout the region. The community highlighted this by stating that the meaning of *Omushkegowuk* (the people of the muskeg) speaks to the central importance of the peatlands to the community's culture and well-being (Fort Albany First Nation, 2020).

Table 5-7 provides a summary of species that are associated with peatland vegetation communities and have been identified as Valued Components or Proxy Valued Components in the reports listed above. Habitat functional performance was qualitatively assessed by habitat using the habitat preferences of each species summarized in their respective technical discipline reports which also incorporates any received Indigenous Knowledge. **Table 5-8** lists the traditional use plant species that were assessed in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h) and are associated with peatland vegetation communities.

In general, swamps were assessed to support the highest diversity of wildlife in the existing conditions Study Areas. Swamps have higher structural complexity (i.e., different vegetation layers, such as canopy, subcanopy, shrub, and groundcover) and a greater variety of microhabitats than the other wetland types, which are more homogenous. Bogs tend to have the simplest habitat structure and support a less diverse wildlife community. However, the habitat functions they do support can be very specialized and represent important habitat in the landscape, such as for caribou.

Table 5-8 provides a summary of species that are associated with peatland vegetation communities and have been identified as Valued Components or Proxy Valued Components in the reports listed above as well as the *Draft Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h). **Table 5-8** lists the traditional use plant species that were assessed in the *Report Draft Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h) and are associated with peatland vegetation types.

5.3.4.3.1 Birds

- Of the 24 bird species identified as Proxy Valued Components in the *Birds Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026a), 20 were recorded in peatland environments during field investigations or are known to use peatland communities for either nesting or foraging. These species include: Dark-eyed Junco (Oji-Cree translation, *binechiinch gaanitaanigamoch*) (*Junco hyemalis*), Wilson's Snipe (Oji-Cree translation, *nibiikaang gaa'ayaach binechiinch*) (*Gallinago delicata*), Mallard (Oji-Cree translation, *ininiship*) (*Anas platyrhynchos*), Palm Warbler, Common Yellow Throat, Northern Waterthrush, Sora, Chimney Swift, Bank Swallow, Barn Swallow, Common Nighthawk, Eastern Whip-poor-will, Eastern Wood-pewee, Olive-sided Flycatcher, Bald Eagle, Short-eared Owl, Black Tern, Lesser Yellowlegs, Rusty Blackbird, and Yellow Rail (WSP, 2026a).

5.3.4.3.2 Ungulates

- Boreal Caribou use peatland habitats throughout their various life stages in the Boreal Shield West Ecoregion, Boreal Shield West Central Ecoregion and Hudson Plain Ecozone. Peatlands provide habitat for calving, post-calving, and rutting as well as winter habitat (WSP, 2026f); and
- Moose life processes are supported by vegetation communities within the Local Study Area that include treed swamps (WSP, 2026f).

5.3.4.3.3 Wildlife

- Of the wildlife species other than ungulates that are identified as Valued Components in the *Wildlife Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026g), amphibian and reptile species can be found in bogs, fens, marshes and swamps throughout the Local Study Area. Amphibian and reptile species that were examined include Spring Peepers, Boreal Chorus Frog, Mink Frog, Wood Frog, Northern Leopard Frog, American Toad, Western Painted Turtle, Common Snapping Turtle and Eastern Gartersnake (WSP, 2026g);
- Other species examined that are likely to be found in peatland systems include Beavers in vegetation communities like marshes, fens, and thicket swamps with enough open water, American Marten in mature coniferous swamp communities, and Wolverine (WSP, 2026g); and
- Forage plants for pollinating insect species are present throughout the Study Area and peatland communities (WSP, 2026g).

Table 5-7: Summary of Habitat Functions by Wetland Community Type in the Existing Conditions Local and Regional Study Areas

Function Category	Wildlife Valued Component	Function Performance by Wetland Community Type			
		Swamp	Marsh	Fen	Bog
Habitat	Wetland Birds (including species at risk)	Moderate	High	High	Low
	Caribou	Moderate	Low	High	High
	Moose	High	Moderate	Moderate	Low
	Beaver	Low	High	High	Low
	Amphibians	High	High	High	High
	Bats	High	Low	Low	Low
	Marten	High	Low	Low	Low
	Wolverine	High	High	High	Moderate
	Overall	High	Moderate to High	Moderate to High	Low

5.3.4.3.4 Vegetation

- Given their abundance on the landscape, peatlands provide general habitat conditions for a large number of species within the existing conditions Local Study Area while their unique characteristics, including hydrology and nutrient availability, provide niche habitat conditions for species that have evolved to only be found in peatland environments (Antala et al., 2022);
- A total of 193 plant species were recorded in peatland communities during the vegetation field investigations completed between 2020 and 2023 (WSP, 2026h);
- Two plant species that are Species at Risk and Species of Conservation Concern Value Components in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h) are found in peatland environments: Black Ash (Oji-Cree translation, *agimagwatik)* (*Fraxinus nigra*) and Northern Marsh Violet (Oji-Cree translation, *gaamiskwaadoogaag waabigwanii*) (*Viola epipsila*); and
- Of the 43 plants species used to develop the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h) Traditional Use Plant Habitat Suitability and Accessibility mapping, 39 are known to be found in peatland communities or were found in peatland communities during vegetation field investigations. Traditional use plant species and species of importance to Indigenous communities were identified through a review of desktop resources and Indigenous Knowledge provided by the Eabametoong First Nation, Marten Falls First Nation, and Aroland First Nation. Traditional use plant species associated with peatlands are listed in **Table 5-8** (WSP, 2026h).

Table 5-8: Traditional Use Plants Associated with Peatland Vegetation Community Types

Common Name	Oji-Cree name	Scientific Name	Peatland Habitat	Traditional Use Category
Alpine Bilberry / Bog Bilberry	*Nikeminan*	*Vaccinium uliginosum*	Bog, Fen, Swamp	Food
American Sweetflag	Unknown	*Acorus americanus*	Marsh	Medicinal
Balsam Fir	*Zhingobaandag* (Eabametoong First Nation) *Ini'naandag* (Marten Falls First Nation)	*Abies balsamea*	Bog, Fen, Swamp	Home uses
Balsam Poplar	*Maan azaadii*	*Populus balsamifera*	Fen, Swamp	Unknown
Black Crowberry	Unknown	*Empetrum nigrum*	Swamp	Unknown
Black Spruce	*Mina'ig* (Eabametoong First Nation) *Shikobaatik* (Marten Falls First Nation)	*Picea mariana*	Bog, Fen, Marsh, Swamp	Home uses
Blue Flag	Unknown	*Iris versicolor*	Fen, Marsh, Swamp	Medicinal
Bog Goldenrod	Unknown	*Solidago uliginosa*	Bog, Fen, Marsh, Swamp	Medicinal
Broad-leaved Cattail	*Paskakannoog*	*Typha latifolia*	Fen, Marsh, Swamp	Home uses
Bunchberry	*Shashagoominan* (Eabametoong First Nation) *Shashakominaan* (Marten Falls First Nation)	*Cornus canadensis*	Bog, Fen, Swamp	Food
Caribou / Reindeer Lichen	*Wabakamik*	*Cladonia rangiferina*	Bog, Fen, Marsh, Swamp	Unknown
Cloudberry	*Machakotominun*	*Rubus chamaemorus*	Bog, Fen, Marsh, Swamp	Food; Medicinal
Common Bearberry	*Makoominan*	*Arctostaphylos uva-ursi*	Bog, Fen, Swamp	Medicinal
Creeping Snowberry	*Kinabik* (Eabametoong First Nation) *Wabiminaan* (Marten Falls First Nation)	*Gaultheria hispidula*	Bog, Fen, Marsh, Swamp	Food; Medicinal
Dwarf birch	Unknown	*Betula nana*	Bog, Fen, Marsh, Swamp	Unknown

Common Name	Oji-Cree name	Scientific Name	Peatland Habitat	Traditional Use Category
Eastern White Cedar	*Giishkaatig*	*Thuja occidentalis*	Fen, Marsh, Swamp	Medicinal; Spiritual
Fireweed	*Awihkabigwaan*	*Chamaenerion angustifolium*	Bog, Fen, Swamp	Medicinal
Highbush Cranberry	*Zhikwako Minik*	*Viburnum opulus*	Fen, Swamp	Medicinal
Jack Pine	*Okikaandaag*	*Pinus banksiana*	Bog, Fen, Swamp	Food
Labrador Tea	*Kakekaybegoon*	*Rhododendron groenlandicum* or *Ledum groenlandicum*	Bog, Fen, Swamp	Food; Medicinal; Spiritual
Narrow-leaved Cottongrass	Unknown	*Eriophorum angustifolium*	Bog, Fen, Marsh, Swamp	Unknown
Northern Black Currant	*Maanatoominan*	*Ribes hudsonianum*	Swamp	Food
Northern Labrador Tea	Unknown	*Rhododendron tomentosum*	Bog, Fen, Marsh, Swamp	Unknown
Northern Mountain Ash	*Makominagaawanzh*(*iig*) or *Makominatig*	*Sorbus decora*	Swamp	Medicinal
Northern Wild Rice	*Manoomin*	*Zizania palustris*	Marsh	Food
Paper Birch	*Wiigwaasatig* (Eabametoong First Nation) *Wigwaasatik* (Marten Falls First Nation)	*Betula papyrifera*	Fen, Marsh, Swamp	Home uses; Medicinal
Prickly Rose	Unknown	*Rosa acicularis*	Marsh, Swamp	Food
Red-osier Dogwood	*Miskwabiimagaatik* (Eabametoong First Nation) *Wabiminaatik* (Marten Falls First Nation)	*Cornus sericea*	Fen, Marsh, Swamp	Medicinal
Red Raspberry	*Miskominik*	*Rubus idaeus*	Marsh, Swamp	Food
Red Willow – traditional name (also known as Green Alder)	*Wikobatik*	*Alnus alnobetula* ssp. *crispa*	Swamp	Medicinal

Common Name	Oji-Cree name	Scientific Name	Peatland Habitat	Traditional Use Category
Small Cranberry	*Mashkikominan*	*Vaccinium oxycoccos*	Bog, Fen, Marsh, Swamp	Medicinal
Sphagnum moss	*Maashkigo'aaki*	*Sphagnum* sp.	Bog, Fen, Marsh, Swamp	Home uses
Strawberry	*Ode'minan* (Wild Strawberry, Eabametoong First Nation) *Miskomaang* (Strawberry, Marten Falls First Nation)	*Fragaria virginiana*	Fen, Marsh, Swamp	Food; Medicinal
Tamarack	*Mashkiigwaatig* (Eabametoong First Nation) *Maaskigwatik* / *wakinagan* (Marten Falls First Nation)	*Larix larincina*	Bog, Fen, Marsh, Swamp	Medicinal
Trembling Aspen	*Apijih pakoosh*	*Populus tremuloides*	Fen, Swamp	Unknown
Velvet-leaved Blueberry	*Minan*	*Vaccinium myrtilloides*	Bog, Fen, Swamp	Food
White Spruce	*Mihnaihk*	*Picea glauca*	Bog, Swamp	Unknown
Yellow Pond-lily	*Ateebagoon* (Eabametoong First Nation *Okitebaag* (Marten Falls First Nation)	*Nuphar variegata*	Marsh	Medicinal
Willow	*Ashiisigobiminsh*(*iig*) (Eabametoong First Nation) *Wiisihkobihmagoon* (Marten Falls First Nation)	*Salix* spp.	Bog, Fen, Marsh, Swamp	Medicinal

sp. = species; ssp. = subspecies

5.3.5 Carbon Storage and Flux

The *Peatlands Technical Support Document: Carbon Storage and Flux* (AECOM, 2026) identified the following existing conditions within the existing conditions Local Study Area:

5.3.5.1 Carbon Storage

- Calculated total soil organic carbon storage within the existing conditions Local Study Area ranged from at 92,868,963 to 96,303,101 tonnes of carbon; and
- Given their large distribution within the existing conditions Local Study Area, fen and organic swamp communities accounted for the largest stores (>95%) of soil organic carbon in peatland communities.

5.3.5.2 Total Carbon Flux

Carbon Dioxide

- Total daily flux of carbon dioxide for the total peatland area within the existing conditions Local Study Area is -464 ± 1,630 tonnes of carbon dioxide; and
- Total seasonal flux of carbon dioxide for the total peatland area within the existing conditions Local Study Area is -14,186 ± 49,891 tonnes of carbon dioxide. Seasonal flux was evaluated for a growing season of 153 days.

Overall, these results indicate that peatland systems within the existing conditions Local Study Area are carbon dioxide sinks where more carbon dioxide is stored in peatlands than is released back into the atmosphere. On a peatland group scale, both fens and bogs were found to be sinks for carbon dioxide while organic swamp communities were sources of carbon dioxide, where more carbon is being released into the atmosphere daily and seasonally compared to what is being stored.

Methane

- Daily methane flux for the total peatland area within the existing conditions Local Study Area is 19 ± 6 tonnes of methane; and
- Seasonal methane flux for the total peatland area within the existing conditions Local Study Area is 2,970 ± 987 tonnes of methane. Seasonal flux was evaluated for a growing season of 153 days.

Overall, these results indicate that peatlands within the existing conditions Local Study Area are sources of methane. All peatland groups were identified as sources of methane with organic swamps accounting for the largest daily and seasonal releases of methane into the atmosphere.

Additional details of the carbon storage and flux study can be found in **Attachment C**.

6. Selection of the Preferred Route

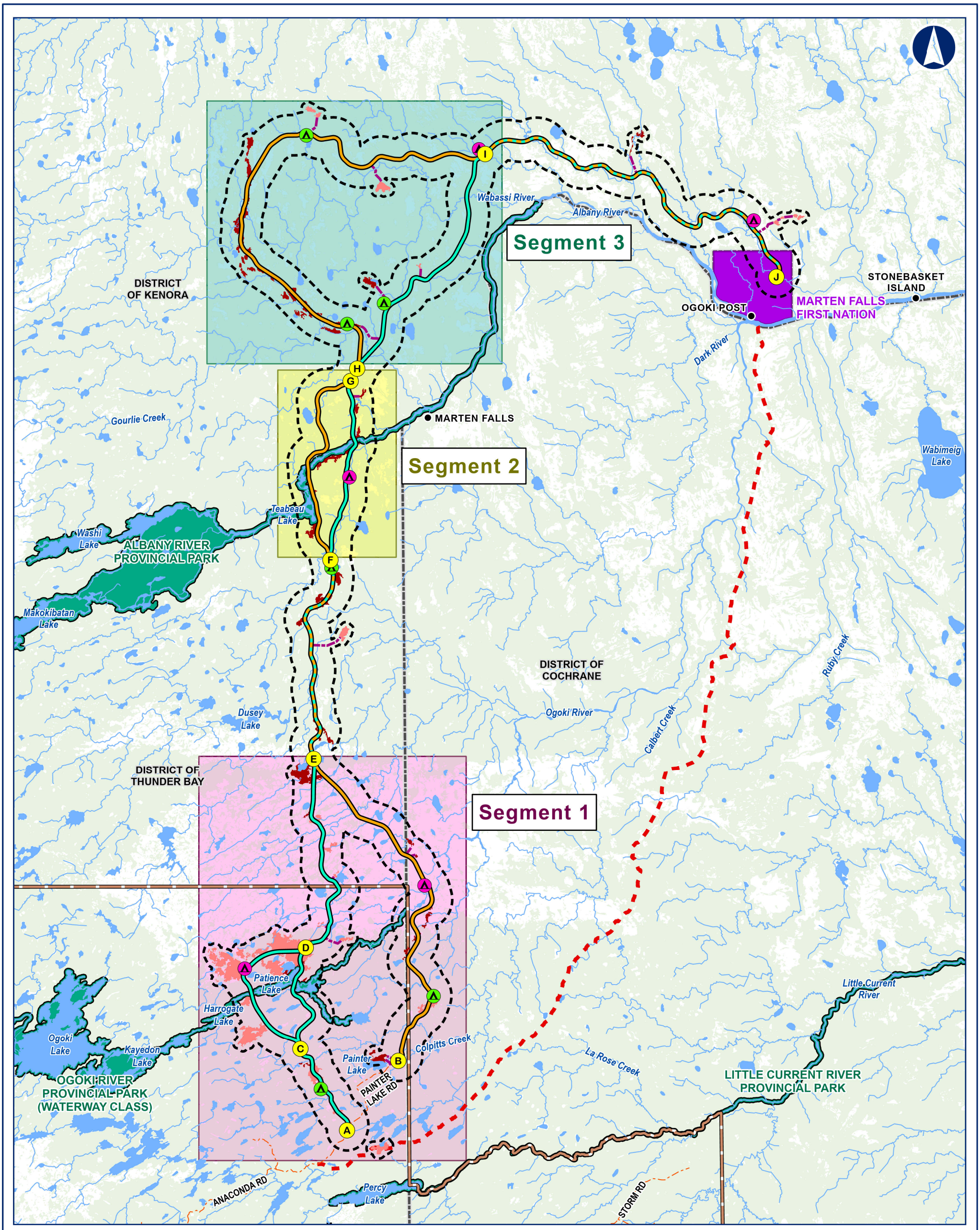
Following the collection of existing condition information on the two alternative route alignments described in **Section 4**, the Project Team undertook an exercise to select a Preferred Route. The methodology and detailed results of this exercise are described in the *Environmental Assessment / Impact Statement Report* and are summarized at a high level below. The Preferred Route includes the footprint of any temporary features such as pits and quarries, temporary access roads, and worker camps associated with the construction of that route. The effects assessment will be completed using the identified Preferred Route.

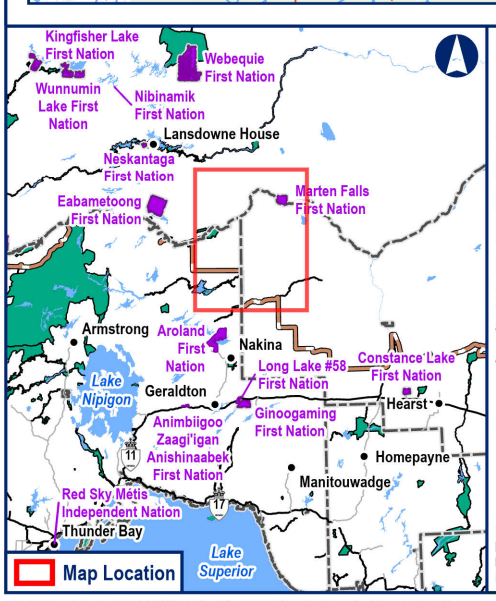
6.1 Alternative Segments and Routes Within Each Segment

To simplify the evaluation of the alternatives, they 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 area, allowing for flexibility to avoid sensitive natural features encountered within the Project disturbance area for each segment instead of requiring decision makers to balance trade-offs of one long route versus the other.

MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Route Alternatives and Segments





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.

0 5 10 20
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 6-1

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Date Saved: 2026-01-21 6:05 AM User Name: paige.crossman

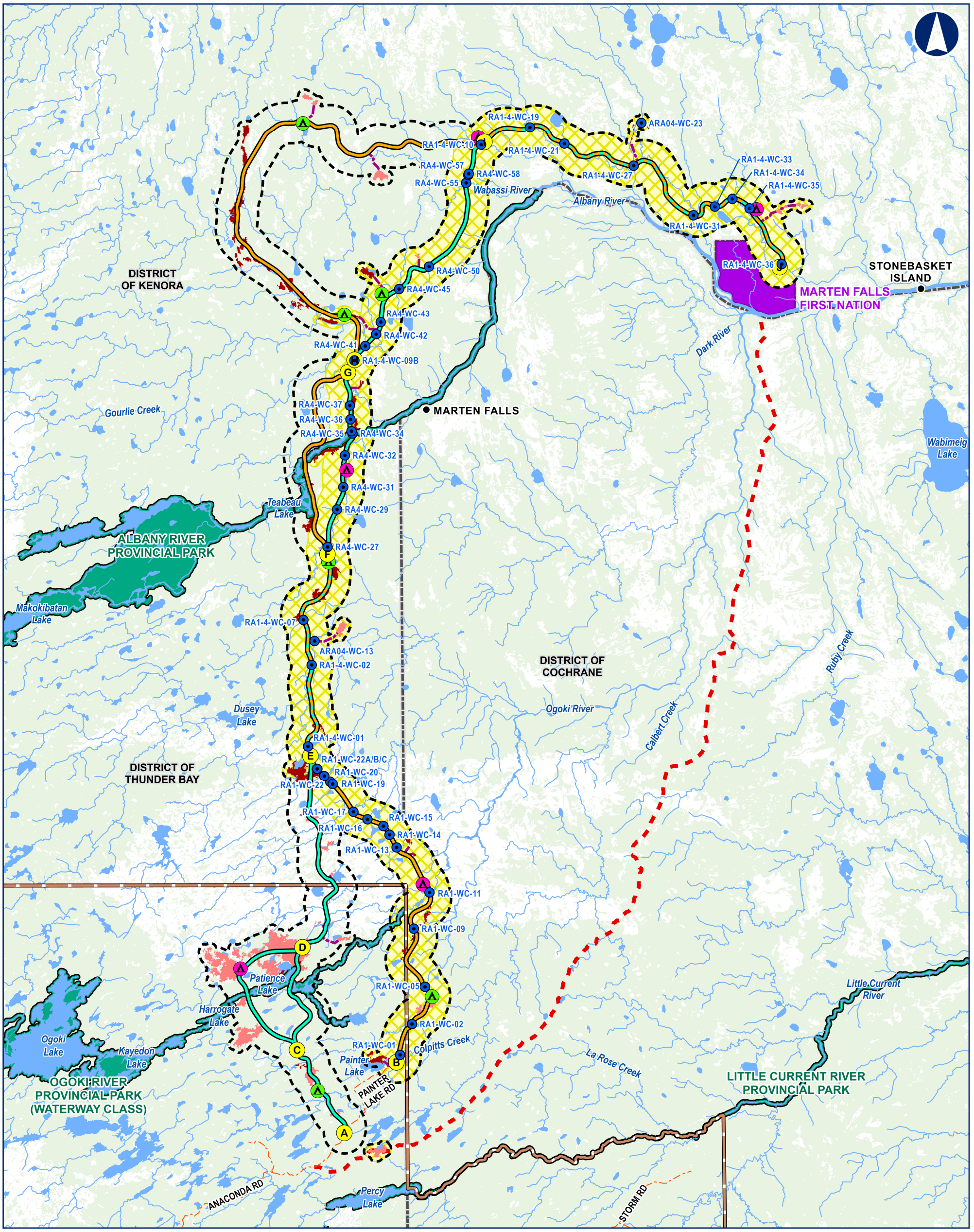
6.2 Preferred Route

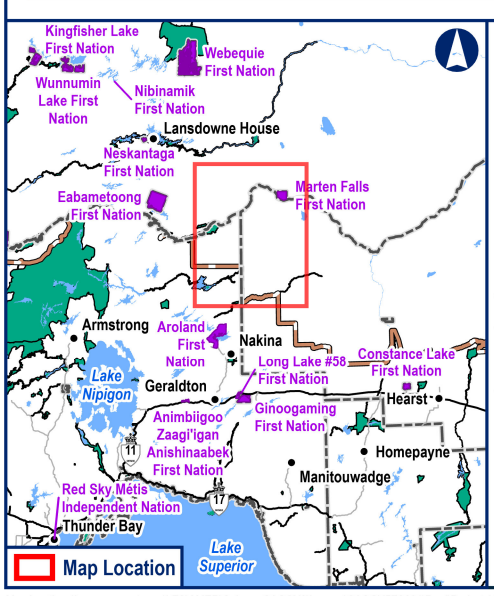
The selection of the Preferred Route within each segment involved a thorough analysis of technical, economic, natural, social, and cultural factors. The route alternative evaluation considered the potential effects and standard or known mitigation approaches to determine the net positive or negative 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 the completion of the steps outlined above, obtaining direction from the communities of Marten Falls First Nation, 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 (**Figure 6-2**).





Legend

- Water Crossing
- Segment Node (A)
- 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:
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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

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Figure 6-2

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7. Residual Effects Assessment

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

7.1 Summary of the Existing Environment Within the Effects Assessment Study Areas

Existing conditions were established for peatland ecosystems within the existing conditions Local Study Area and existing conditions Regional Study Area, as presented in **Section 5**. These data have been used to establish a description of the Existing Environment for the effects assessment Study Areas (i.e., Local and Regional Study Areas established for the Preferred Route). These data are summarized in the following sections and shown in **Figure 7-1** and **Figure 7-2.** The effects assessment Construction Disturbance Area comprises a total area of 4,700.2 ha. The Construction Disturbance Area includes the 100 m Community Access Road right-of-way, temporary construction access roads, work areas, worker camps, pits, quarries, and permanent access roads (**Table 4-3**). The effects assessment Local Study Area comprises a total area of 115,961.2 ha. The effects assessment Regional Study Area comprises a total area of 971,416.9 ha.

The availability, distribution, composition, and function of the peatland ecosystems, as well as peatland carbon storage and flux, and the climate within the general Project area are described in **Section 5.2**. The following sections summarize the same data within the effects assessment Study Areas.

7.1.1 Availability

As summarized in **Table 7-1**, peatland ecosystems represent 66% of the effects assessment Local Study Area (76,814.8 ha) and 64% of the effects assessment Regional Study Area (623,429 ha). Fen and organic swamp communities are the most common wetland communities within the effects assessment Local Study Area, comprising 40% and 24%, respectively. Fen and Swamp communities also have the highest cover of all peatlands in the effects assessment Regional Study Area, but to a lesser degree at 23% and 25%, respectively. Marsh and Bog communities are much less common within the effects assessment Local Study Area, each accounting for <3% of the total area. Bogs are relatively more common in the effects assessment Regional Study Area at 16%; however, this may represent mapping bias in either the Landcover dataset or in the vegetation mapping produced for the Project. **Table 7-1** summarizes the availability of peatland ecosystems within the effects assessment Study Areas. peatland ecosystems in the effects assessment Study Areas are also displayed in **Figure 7-1** and **Figure 7-2.**

Table 7-1: Summary of Peatland Ecosystem Availability in the Effects Assessment Study Areas

Peatland Community	Effects Local Study Area		Effects Regional Study Area[(b)]		Effects Construction Disturbance Area		% of Community Type Affected within the Effects Local Study Area
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Area (ha)	Percentage (%) of the Effects Local Study Area	
Organic Swamp	27,781.5	24%	242,363	25%	1,308.8	1%	5%
Organic Marsh	1,510.9	<2%	3,875.3	<1%	26.4	<1%	2%
Fen	46,083.6	40%	219,950.5	23%	786.2	1%	2%
Bog	1,438.8	<2%	157,240.2	16%	29.2	<1%	2%
Total[(a)]	**76,814.8**	**66%**	**623,429**	**64%**	**2,150.6**	**2%**	**3%**

Notes:

(a) Percentages do not add to 100% since remaining area is composed of upland ecosystems, mineral wetland ecosystems, water, and anthropogenic areas.

(b) Wetland area values within the Regional Study Area represent a combination of area values from delineated peatland communities completed for the Project within the existing conditions Local Study Area, and Ontario Land Cover Compilation Version 2.0 mapping for areas beyond the limits of the existing conditions Local Study Area. The Ontario Land Cover Compilation layer is a is a compilation of Far North Land Cover version 1.4, Southern Ontario Land Resource Information System version 1.2, and Provincial Land Cover 2000 Edition. The Ontario Land Cover mapping does not differentiate between organic and mineral wetland communities.

% = percent; ha = hectare; < = less than.

PATIENCE LAKE
OGOKI RIVER
HARROGATE LAKE
ESSER LAKE
MCCAW LAKE
PAINTER LAKE
DEBAERE LAKE
ORVISS LAKE
PIGMENT LAKE
CRONY LAKE
COLPITTS LAKE
BURY LAKE
RENWICK LAKE
SLY LAKE
ZURBRIGG LAKE
NASS LAKE
BURNABY LAKE
DURER LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
PERCY LAKE
JUNGFRAU LAKE
AIRPORT LAKE
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE
NORRINGTON LAKE
LITTLE CURRENT RIVER
SKID LAKE

Hudson Bay Lowlands
Ontario Shield
Map Location

Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)
- 50 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA
- ANTHROPOGENIC
- RIPARIAN ECOSYSTEMS

WETLAND AND UPLAND ECOSYSTEMS IN THE LSA
- UPLAND ECOSYSTEMS
- WATER
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL

WETLAND AND UPLAND ECOSYSTEMS IN THE RSA
- UPLAND ECOSYSTEMS
- WATER
- WETLAND ECOSYSTEMS

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Wetland and Upland Ecosystems in the Effects Assessment Study Areas

0 3 6
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-1.1

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BALSON LAKE
DUSEY LAKE
DUSEY RIVER
WINSLOW LAKE
BALES LAKE
BRUNDRIT LAKE
SANDS LAKE
BYFORD LAKE
GLAZE LAKE
OGOKI RIVER
PATIENCE LAKE
HARROGATE LAKE
MCCAW LAKE
ESSER LAKE

Hudson Bay Lowlands
Ontario Shield
Map Location

Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)
- 50 PERSONS
- 200 PERSONS
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- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
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- SAND AND GRAVEL

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Wetland and Upland Ecosystems in the Effects Assessment Study Areas

0 3 6
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-1.2

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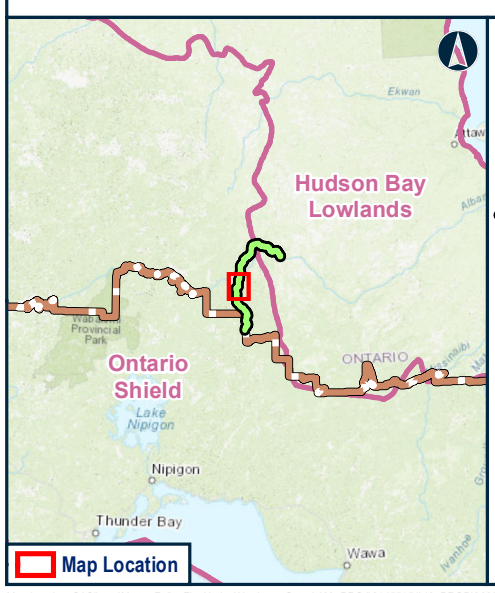
ALBANY RIVER
TRELOAR LAKE
TEABEAU LAKE
TOLFREE LAKE
SUWALA LAKE
DUSEY RIVER
TANASE LAKE
BALSON LAKE
DUSEY LAKE
WINSLOW LAKE



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 CONSTRUCTIONS CAMP
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- REGIONAL STUDY AREA
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WETLAND AND UPLAND ECOSYSTEMS IN THE LSA

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- WETLAND ECOSYSTEMS - MINERAL

WETLAND AND UPLAND ECOSYSTEMS IN THE RSA

- UPLAND ECOSYSTEMS
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- WETLAND ECOSYSTEMS

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Wetland and Upland Ecosystems in the Effects Assessment Study Areas

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Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-1.3

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Date Saved: 2/12/2026 2:44:03 PM User Name: INGU06951

WABASSI RIVER

VENTON LAKE

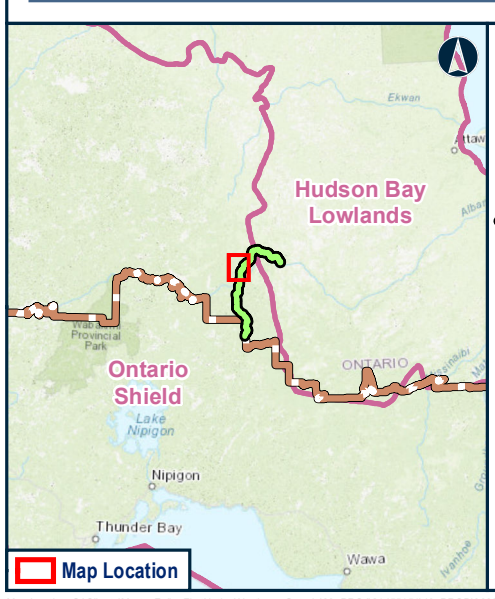
MAXEY LAKE

TREBELL LAKE

SAARIMAKI LAKE

ALBANY RIVER

TRELOAR LAKE



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
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WETLAND AND UPLAND ECOSYSTEMS IN THE RSA

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Notes:
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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Wetland and Upland Ecosystems in the Effects Assessment Study Areas

0 3 6
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-1.4

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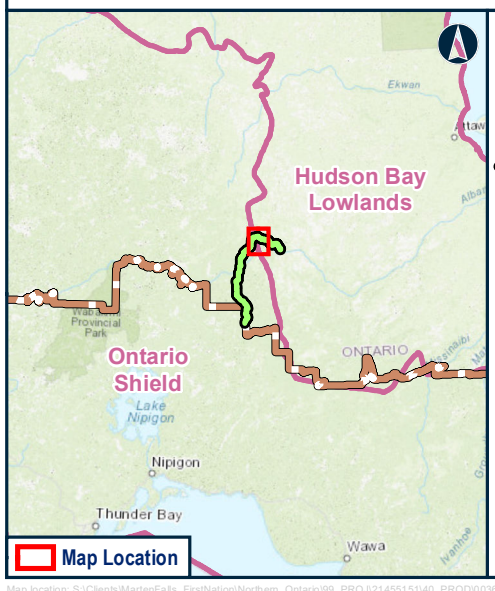
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
GITTINS LAKE
WABASSI RIVER
ALBANY RIVER
TREBELL LAKE



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA
- ANTHROPOGENIC
- RIPARIAN ECOSYSTEMS

WETLAND AND UPLAND ECOSYSTEMS IN THE LSA

- UPLAND ECOSYSTEMS
- WATER
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL

WETLAND AND UPLAND ECOSYSTEMS IN THE RSA

- UPLAND ECOSYSTEMS
- WATER
- WETLAND ECOSYSTEMS

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Wetland and Upland Ecosystems in the Effects Assessment Study Areas

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Kilometres
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Figure 7-1.6

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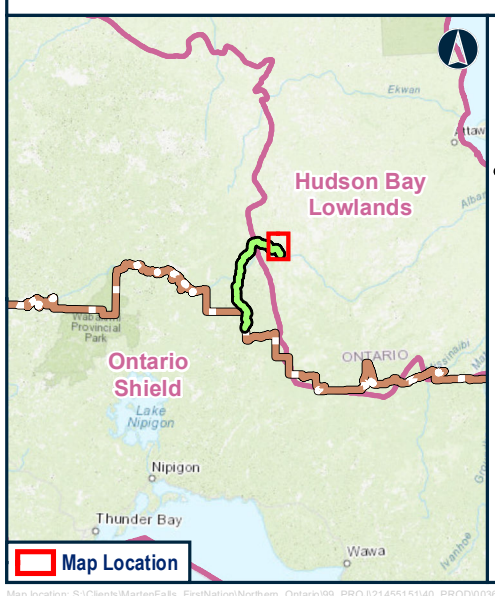
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
TIFFIN LAKE
ALBANY RIVER
DARK RIVER
OGOKI RIVER



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FIRST NATION COMMUNITY
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA
- ANTHROPOGENIC
- RIPARIAN ECOSYSTEMS

WETLAND AND UPLAND ECOSYSTEMS IN THE LSA

- UPLAND ECOSYSTEMS
- WATER
- WETLAND ECOSYSTEMS - ORGANIC (PEATLANDS)
- WETLAND ECOSYSTEMS - MINERAL

WETLAND AND UPLAND ECOSYSTEMS IN THE RSA

- UPLAND ECOSYSTEMS
- WATER
- WETLAND ECOSYSTEMS

Notes:
None

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0 3 6
Kilometres
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Figure 7-1.7

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PATIENCE LAKE
OGOKI RIVER
HARROGATE LAKE
ESSER LAKE
MCCAW LAKE
PAINTER LAKE
DEBAERE LAKE
ORVISS LAKE
COLPITTS LAKE
BURY LAKE
ZURBRIGG LAKE
CRONY LAKE
PIGMENT LAKE
RENWICK LAKE
SLY LAKE
NASS LAKE
BURNABY LAKE
DURER LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
PERCY LAKE
JUNGFRAU LAKE
AIRPORT LAKE
Muriel River
Runway Creek
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE
NORRINGTON LAKE
LITTLE CURRENT RIVER
SKID LAKE

Hudson Bay Lowlands
Ontario Shield
Ekwan
Attawapiskat
Albany
Winisk Provincial Park
ONTARIO
Lake Nipigon
Nipigon
Thunder Bay
Wawa
Map Location

Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Community Types in the Effects Assessment Study Area

0 — 2.75 — 5.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-2.1

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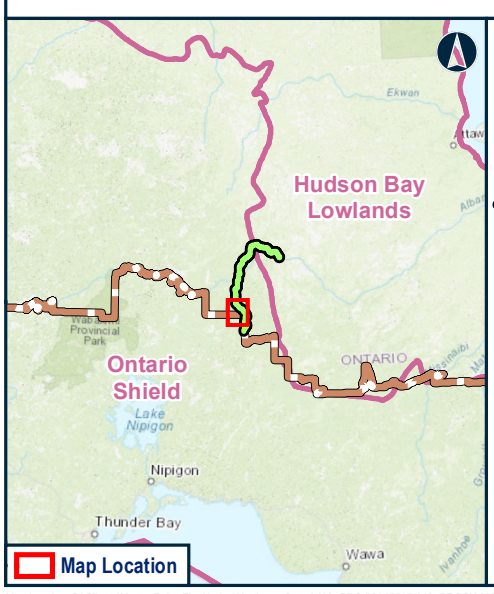
BALSON LAKE
DUSEY LAKE
DUSEY RIVER
WINSLOW LAKE
BALES LAKE
BRUNDRIT LAKE
GLAZE LAKE
SANDS LAKE
BYFORD LAKE
OGOKI RIVER
PATIENCE LAKE
HARROGATE LAKE
MCCAW LAKE
ESSER LAKE



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 CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Community Types in the Effects Assessment Study Area

0 — 2.75 — 5.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-2.2

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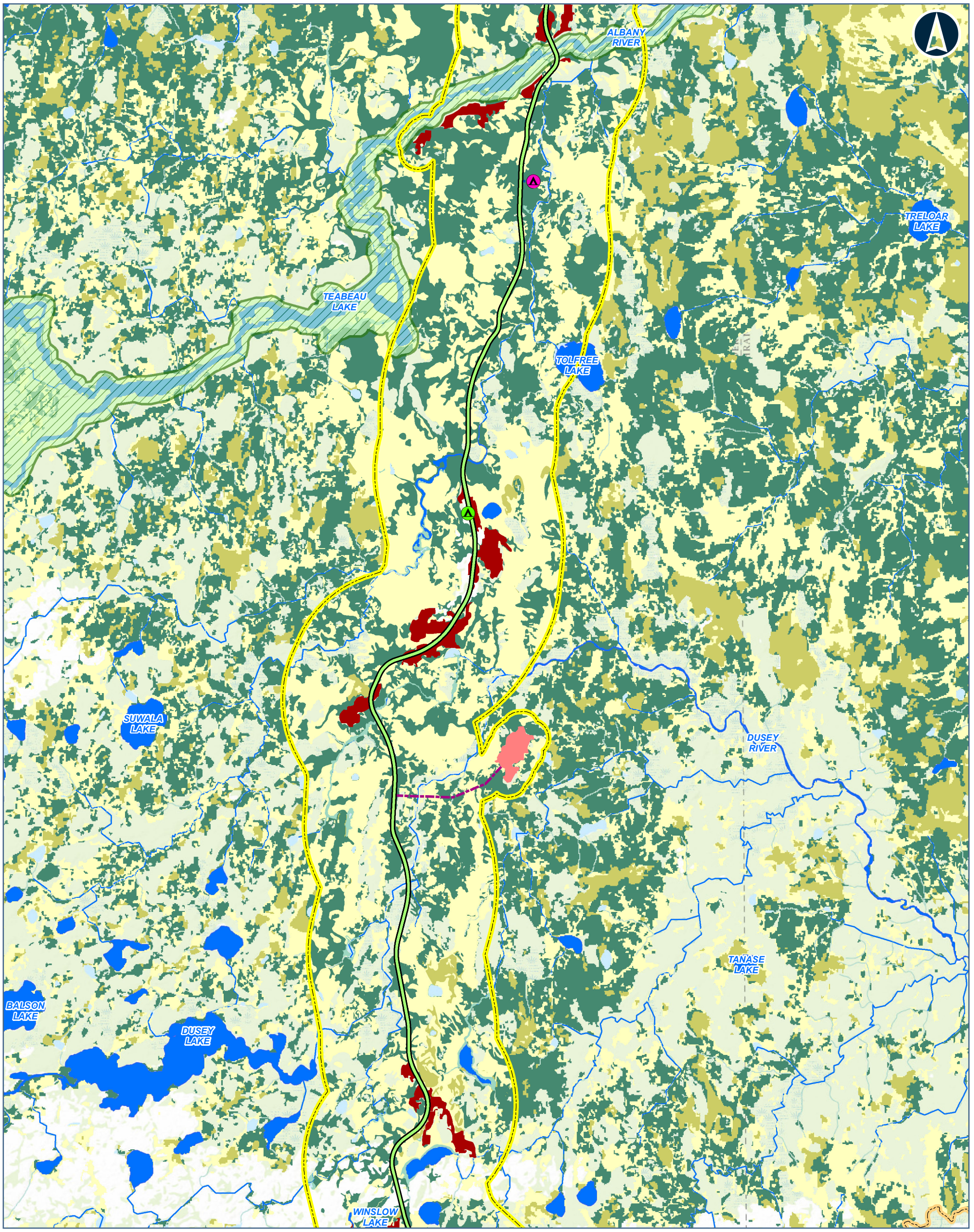

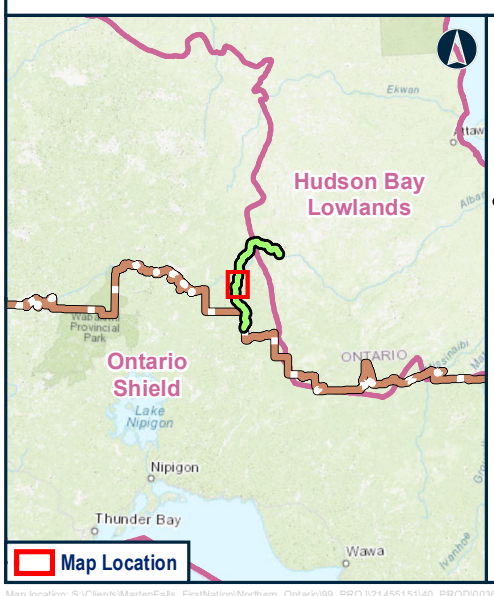

Legend

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 CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Community Types in the Effects Assessment Study Area

0 — 2.75 — 5.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 7-2.3

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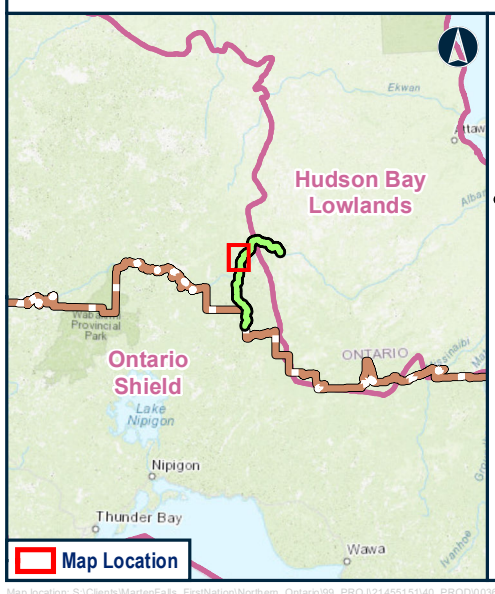
WABASSI RIVER
VENTON LAKE
MAXEY LAKE
TREBELL LAKE
SAARIMAKI LAKE
ALBANY RIVER
TRELOAR LAKE



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 CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- WATERCOURSE
- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Community Types in the Effects Assessment Study Area

0 — 2.75 — 5.5
Kilometres
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Figure 7-2.4

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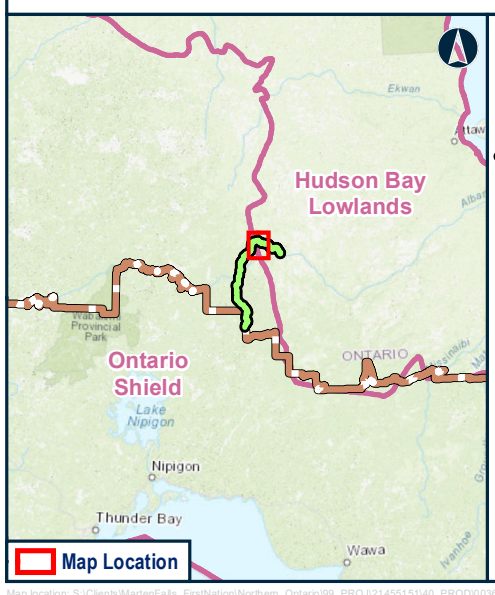
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
GITTINS LAKE
WABASSI RIVER
ALBANY RIVER
TREBELL LAKE



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
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- PROVINCIAL PARK
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Community Types in the Effects Assessment Study Area

0 — 2.75 — 5.5
Kilometres

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Figure 7-2.6

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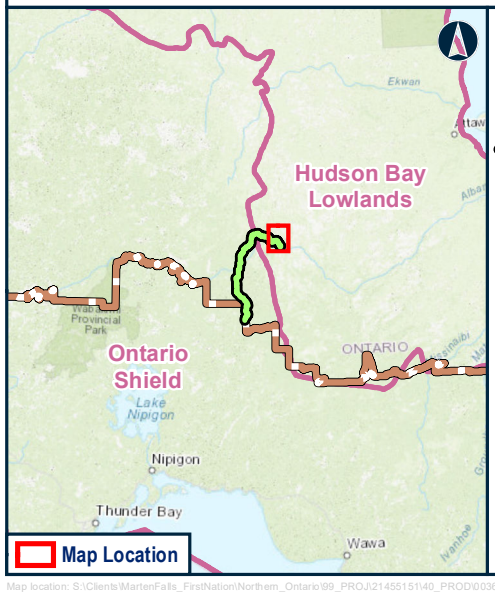
ACTON LAKE
SEBERT LAKE
GURDEN LAKE
TIFFIN LAKE
ALBANY RIVER
DARK RIVER
OGOKI RIVER



Legend

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 200 PERSONS
- PREFERRED ROUTE
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTIONS CAMP
- BEDROCK
- SAND AND GRAVEL
- ROAD
- WINTER ROAD
- WATERCOURSE
- FIRST NATION COMMUNITY
- LOCAL STUDY AREA (3 KM)
- REGIONAL STUDY AREA

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP

Notes:
None

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Community Types in the Effects Assessment Study Area

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

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Figure 7-2.7

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7.1.2 Distribution

The distribution of peatland ecosystems within the effects assessment Local Study Area is illustrated on **Figure 7-1** and **Figure 7-2**. Generally, peatlands are found throughout the effects assessment Local Study Area but are more frequent north of Dusey Lake, as indicated by the dominance of light blue and orange shading in **Figure 7-1, plates 3 through 6**. Likewise, fen and organic swamp communities are most common in the northern portion of the effects assessment Local Study Area (**Figure 7-2, plates 3 through 6**).

7.1.3 Composition

Information about the composition of peatland ecosystems within the effects assessment Local and Regional Study Areas is summarized in **Section 5.3.3**. That information has not been repeated here as the information relates to peatland systems as a whole and does not change within the effects assessment Study Areas.

7.1.4 Function

Information about the function of peatland ecosystems within the effects assessment Local and Regional existing conditions Study Areas is summarized in **Section 5.3.4**. That information has not been repeated here as the information relates to peatland systems as a whole and does not change within the effects assessment Study Areas.

7.1.5 Carbon Storage and Flux

The *Peatlands Technical Support Document: Carbon Storage and Flux* (AECOM, 2026) identified the following within the effects assessment Local Study Area:

7.1.5.1 Carbon Storage

- Total soil organic carbon storage within peatlands within the effects assessment Local Study Area ranged from 58,224,122 to 60,456,711 tonnes of carbon; and
- Given their large distribution within the effects assessment Local Study Area, fen and organic swamp communities accounted for the largest stores (>94%) of organic carbon in peatland communities.

7.1.5.2 Total Carbon Flux

Carbon Dioxide

- Total daily flux of carbon dioxide for the total peatland area within the effects assessment Local Study Area is -294 ± 1,014 tonnes of carbon dioxide; and
- Total seasonal flux of carbon dioxide for the total peatland area within the effects assessment Local Study Area is -9,009 ± 31,041 tonnes of carbon dioxide. Seasonal flux was evaluated for a growing season of 153 days.

Overall, these results indicate that peatland systems within the effects assessment Local Study Area are considered carbon dioxide sinks, where more carbon dioxide is stored in peatlands than is released back into the atmosphere. Among peatland types, both fens and bogs were found to be sinks for carbon dioxide while organic swamp communities were considered sources of carbon dioxide, where more carbon is being released into the atmosphere on a daily and seasonal basis compared to what is being stored.

Methane

- Daily flux of methane for the total peatland area within Local Study Area is 12 ± 4 tonnes of methane; and
- Seasonal flux of methane for the total peatland area within Local Study Area is 1,843 ± 609 tonnes of methane. Seasonal flux was evaluated for a growing season of 153 days.

Overall, these results indicate that peatland systems within the effects assessment Local Study Areas are considered sources of methane. All peatland groups were identified as sources of methane with organic swamps accounting for the largest daily and season release of methane into the atmosphere.

Additional details of the carbon storage and flux study can be found in **Attachment C**.

7.2 Project–Environment Interactions

The analysis of Project–environment interactions for peatland ecosystems that are likely to have a potential effect is provided in **Table 7-2**.

Table 7-2: Project–environment interactions

Project Phase	Project Activities	Valued Component	Indicator	Description of Potential Effects
Construction	■ Mobilization of equipment and supplies ■ Temporary construction staging areas[(a)] ■ Temporary access roads and trails[(a)] ■ Temporary construction camps[(a)] ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries[(a)] ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	■ Peatland Ecosystems	■ Availability ■ Distribution	■ Changes to the availability and distribution of peatland ecosystems as a result of direct peatland loss
			■ Composition and Function	■ Changes to the composition and function of peatland ecosystems as a result of direct peatland loss
				■ Changes to peatland ecosystems as a result of changes to hydrology (i.e., alteration of drainage patterns and increased / decreased drainage flows and surface levels that can cause changes to soils and vegetation health and composition, thereby changing the availability, distribution, composition, and function of retained peatland communities)
				■ Changes to peatland ecosystems as a result of changes to groundwater (i.e., alteration of drainage patterns and increased / decreased drainage flows and groundwater levels that can cause changes to soils and vegetation health and composition, thereby changing the availability, distribution, composition, and function of retained peatland communities)
				■ Changes to peatland ecosystems resulting from the introduction and spread of invasive plant species (e.g., *Phragmites*)
				■ Changes to peatland ecosystems as a result of fragmentation and edge effects (i.e., clearing within an otherwise intact landscape that introduces a range of edge effects on retained peatland communities including sunscald and windthrow)
				■ Changes to peatland ecosystems from the release of sediment during construction
				■ Changes to peatland ecosystems from spills of fuel or other contaminants
				■ Changes to peatland ecosystems as a result of the deposition of air contaminants
				■ Changes to peatland ecosystems as a result of fugitive dust emissions
				■ Changes to peatland ecosystems as a result of increased public access
			■ Carbon Storage and Flux	■ Changes to peatland ecosystem carbon storage and flux
Operation and Maintenance	■ Road usage ■ Maintenance	■ Peatland Ecosystems	■ Availability ■ Distribution	■ Changes to the availability and distribution of peatland ecosystems as a result of additional peatland loss for maintenance activities
			■ Composition and Function	■ Changes to peatland ecosystems resulting from the introduction and spread of invasive plant species
				■ Changes to peatland ecosystems as a result of fragmentation and edge effects (i.e., clearing within an otherwise intact landscape that introduces a range of edge effects on retained peatland communities including sunscald and windthrow)
				■ Changes to peatland ecosystems from spills of fuel or other contaminants
				■ Changes to peatland ecosystems as a result of the deposition of air contaminants
				■ Changes to peatland ecosystems as a result of fugitive dust emissions
				■ Changes to peatland ecosystems as a result of increased public access
			■ Carbon Storage and Flux	■ Changes to peatland ecosystem carbon storage and flux

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

7.3 Assessing Residual Effects

This section presents the potential effects, and appropriate mitigation measures to prevent or reduce effects on peatlands. Net residual effects are brought forward for characterization into **Section 7.3.2** and into the cumulative effects assessment in **Section 8** (where residual effects are greater than "negligible"). A summary of the potential effects, and mitigation measures and residual effects is presented in **Table 7-4**.

7.3.1 Potential Effects, Mitigation Measures, and Predicted Residual Effects

The potential effects of the Project on peatlands are presented below. The effects of direct peatland loss on peatland ecosystems are assessed in **Section 7.3.1.1**, along with appropriate mitigation measures, and predicted residual effects. **Section 7.3.1.2** through **Section 7.3.1.12** present effects that are common to peatland ecosystems. Mitigation measures are presented for each potential effect, along with predicted residual effects. A summary of the potential effects, mitigation measures, and residual effects is provided in **Section 7.3.4** (**Table 7-4**).

7.3.1.1 Changes to the Availability and Distribution of Peatland Ecosystems as a Result of Direct Peatland Loss

7.3.1.1.1 Potential Effects

Construction

Clearing of, and / or building on top of, peatlands during construction will result in the direct loss of peatland ecosystems (bog, fen, marsh, and swamp), thereby reducing the availability of these communities within the effects assessment Local and Regional Study Areas as well as changing their distribution within the Project landscape. It is conservatively assumed that the entire effects assessment Construction Disturbance Area will be cleared, resulting in the following direct loss of peatland ecosystems:

- **2,150.6 ha of peatland ecosystems**, which equates to **3%** of the peatland ecosystems within the effects assessment Local Study Area and **<1%** of peatlands within the effects assessment Regional Study Area. This is composed of the following peatland types:
  - 1,308.8 ha of organic swamp (i.e., 1% of the organic swamp within the effects assessment Local Study Area and <1% within the effects assessment Regional Study Area).
  - 26.4 ha of organic marsh (i.e., <1% of the marsh within the effects assessment Local Study Area and <1% within the effects assessment Regional Study Area).

- 786.2 ha of Fen (i.e., <1% of the Fen within the effects assessment Local Study Area and <1% within the effects assessment Regional Study Area).
- 29.2 ha of Bog (i.e., <1% of the Bog within the effects assessment Local Study Area and <1% within the effects assessment Regional Study Area).

Most of these direct losses are expected to be permanent (and are assumed to be permanent in the direct loss calculation) because the Operation and Maintenance Phase is expected to be indefinite. However, the effects assessment Construction Disturbance Area footprint includes temporary features (e.g., temporary access roads, storage and temporary laydown areas, temporary construction camps, and temporary pits and quarries) some of which may be decommissioned and restored or vegetation will be established, as outlined on the required Rehabilitation Plan to align with the 'Aggregate Resources of Ontario: Site Plan (2020) Standards'. These areas are anticipated to eventually provide some of the functions that cleared peatland communities currently provide, but the re-establishment of certain peatland community types (especially fens and bogs) is particularly challenging without some form of human intervention. It has been demonstrated that peat moss does not re-establish well on its own in areas where peat has been removed or harvested and the existing peat moss species have been stripped (Ferland and Rochefort, 1997). Instead, sites tend to be colonized by vascular plant species that do not provide or establish the same ecological functions (Ferland and Rochefort, 1997). Some active restoration of temporary disturbances is anticipated to be carried out. Restoration approaches will be developed as part of the Vegetation Restoration Plan to be prepared during detailed design.

Operation and Maintenance

Operation and maintenance activities, such as culvert or bridge replacements, may result in disturbance to peatland communities. However, given the conservative assumptions regarding the footprint area for construction, it is assumed that these potential future disturbances are already captured in the calculation of permanent loss in the Construction Phase and would not represent additional direct loss of peatlands.

7.3.1.1.2 Mitigation Measures

Construction

Mitigation measures that will be implemented during the Construction Phase to minimize direct loss of peatland ecosystems wherever and whenever possible are outlined below.

- Limit vegetation clearing to within the 100 m right-of-way and to less than this width to the extent possible;
  - Minimize clearing widths in peatland ecosystems to the extent feasible, given the difficulty of effective restoration of these ecosystems.

  - Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction.
  - Limit clearing of riparian vegetation (i.e., within 30 m of waterbodies) to the extent possible and to the requirements of the access road and alignment clearing width only.
  - Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles in less sensitive ecosystems (e.g., upland ecosystems), where feasible. Avoid peatland communities for temporary features wherever feasible.

- Upon completion of construction, sand and gravel pits, including temporary access roads leading to the pits will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resource Act*, which will include backfilling, levelling, recompacting, and redistributing organic materials to encourage natural revegetation. Temporary access roads leading to temporary quarry areas will also be decommissioned. Temporary quarries not required for maintenance activities will be vegetated in accordance with the Rehabilitation Plan. Quarries maintained for operations will be blocked to discourage public use but facilitate access for ongoing road maintenance. The number of quarries required for maintenance are will be determined during the detailed design phase;
- Perform clearing and construction activities in winter months where feasible, to minimize compaction of peat. A review of the project construction schedule will be completed during detailed design to coordinate work based on environmental timing windows and timing restrictions;
- Develop and implement a Project-specific Environmental Protection Plan;
- Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan; and
- Prepare and Implement a Vegetation Restoration Plan that includes measures specific to peatland ecosystems and peatland restoration, including peat stockpile management. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols;

Given the difficulty of restoring peatland environments and the overall size of the Construction Disturbance Area, if it's determined that restoration of all temporarily impacted peatland communities is not feasible, additional examination of the Construction Disturbance Area may be required to determine where peatland restoration efforts are required. Restoration techniques for peatland communities should follow established

practices that have previously been shown to be successful in the establishment of appropriate ecological conditions including plant assemblages (e.g., the re-establishment of peat moss layers) and hydrology. Consideration should also be given to the type of community being restored. For example, the Moss Layer Transfer Technique is one method generally used for the re-establishment of bog and poor fen systems (Quinty et al., 2019). However, new methods or adjustments to existing techniques may be required for other peatland community types given the differences in species presence and hydrological conditions (e.g., best practices for bog restoration may not be applicable to fen community types) (Quinty et al., 2019). See **Section 9** and **Section 10** for commitments and recommendations for the development of future Vegetation Restoration Plan and Preliminary Biodiversity Offset Plan.

Operation and Maintenance

The following mitigation measures are recommended during Operation and Maintenance:

- Avoid re-entry and disturbance of restored temporary access areas post-construction.

7.3.1.1.3 Predicted Residual Effects

Construction

Measures to minimize direct effects on peatland ecosystems will be implemented, but direct losses cannot be avoided. Therefore, changes as a result of direct vegetation loss during Construction are predicted to result in residual effects on the availability and distribution of peatlands and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

Operation and Maintenance

With the implementation of mitigation measures, and the conservative assumptions applied for the Construction Phase, no additional clearing or disturbance of peatland ecosystems is expected during Operation and Maintenance. Therefore, this interaction was not carried forward to the residual effects characterization.

7.3.1.2 Changes to the Composition and Function of Peatland Ecosystems as a Result of Direct Peatland Loss

7.3.1.2.1 Potential Effects

Construction

Clearing of peatlands during construction and the placement of a permanent “floating road” over these areas will result in the direct loss of peatland ecosystems, thereby altering the composition and functions of these ecosystems in the effects assessment Local and Regional Study Areas.

Removal of peatland vegetation will reduce habitat availability (i.e., through direct loss of habitat) and can alter habitat suitability (e.g., by disrupting habitat and / or hydrological connectivity) for wildlife and vegetation species. This can result in a decline in biodiversity. More detailed discussions of potential effects on wildlife habitat are in the *Wildlife Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026g), *Birds Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026a) and *Ungulates Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026f). Indigenous communities including Fort Albany First Nation also highlighted concerns related to potential impacts on and loss of peatland habitats. In particular, how the loss of air filtering capacity due to peatland loss might result in changes to the diet of wildlife species, particularly for small mammals and rodents (Fort Albany First Nation, 2024).

In addition to the above, removal of peatlands in riparian systems can reduce the stabilizing forces provided by plant roots, reduce physical obstructions provided by plant material that moderate surface water run-off velocity, and expose vulnerable banks or slopes resulting in increased erosion and sedimentation. Disturbance of soils can contribute to sedimentation by increasing the quantity of loose material present. Soil disturbance during vegetation removal can also facilitate the spread of invasive species (discussed in **Section 7.3.1.5**). Loss of riparian vegetation cover may increase the water temperature due to a reduction in shading, which can reduce aquatic species richness and alter habitat suitability for fish. A more detailed discussion of potential effects on fish and fish habitat are discussed in the *Fish & Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026b).

Direct loss of peatlands will also result in the direct loss of functional peatland area and might reduce the ability of remaining areas to carry out important ecosystem functions. For example, construction on areas that were previously swamp or fen might reduce surface water flows into unaffected areas, causing the water table to drop and conditions to become unsuitable for species adapted to saturated soils. This, in turn, could result in an increased abundance of upland species, a reduction in biodiversity, a decline in peat production and an accompanying reduction in carbon sequestration capacity (Borkenhagen et al., 2023). Fort Albany First Nation has also highlighted concerns specific to how potential changes in the composition of peatland ecosystems, such as the reduction of low-growing mosses and wetland plants and replacement with larger shrubs and vegetation which thrive in drier conditions (Fort Albany First Nation, 2024). Peatland loss also reduces the capacity of ecosystems to conduct biogeochemical functions such as photosynthesis and the uptake and processing of nutrients.

Potential effects on the composition and function of peatland ecosystems due to other Project activities are discussed in the following sections, including changes to surface water (**Section 7.3.1.3**), groundwater (**Section 7.3.1.4**), the introduction and spread of invasive species (**Section 7.3.1.5**), fragmentation and edge effects (**Section 7.3.1.6**), the release of sediment (**Section 7.3.1.7**), spills (**Section 7.3.1.8**), deposition of air contaminants (**Section 7.3.1.9**) and fugitive dust (**Section 7.3.1.10**), increased public access (**Section 7.3.1.11**), and changes in carbon storage and flux (**Section 7.3.1.12**).

Operation and Maintenance

Operation and maintenance activities, such as culvert or bridge replacements, may result in disturbance to peatland communities. However, given the conservative assumptions regarding the footprint area for construction, it is assumed that these potential future disturbances are already captured in the calculation of permanent loss in the Construction Phase and would not represent additional direct loss of peatlands.

7.3.1.2.2 Mitigation Measures

Construction

Mitigation measures that will be implemented during the Construction Phase to minimize direct loss of peatlands wherever and whenever possible are outlined in **Section 7.3.1.1.2.**

Operation and Maintenance

Mitigation measures that will be implemented during the Operation and Maintenance Phase to minimize direct loss of peatlands wherever and whenever possible are outlined in **Section 7.3.1.1.2.**

7.3.1.2.3 Predicted Residual Effects

Construction

Measures to minimize direct effects on peatland ecosystems will be implemented, but direct losses cannot be avoided. Therefore, direct peatland loss during Construction is predicted to result in a residual effect on the composition and function of peatland ecosystems are and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

Operation and Maintenance

With the implementation of mitigation measures, and the conservative assumptions applied for the Construction Phase, no additional clearing or disturbance of peatland ecosystems is expected during Operation and Maintenance. Therefore, this interaction was not carried forward to the residual effects characterization.

7.3.1.3 Changes to Peatland Ecosystems as a Result of Changes to Hydrology

7.3.1.3.1 Potential Effects

Construction

Project activities such as road construction through peatlands, watercourse crossings, vegetation clearing, short-term water-taking and discharge of water during the Construction Phase can cause alterations of drainage patterns, impacts on surface water quality, and increased / decreased drainage flows and surface water levels. This can, in turn, cause changes to soils and vegetation health / composition, thereby altering the availability, distribution, composition and function of retained peatland ecosystems. Although peatland ecosystems experience water level fluctuations as part of natural variability, changes in the amplitude, frequency, and timing of flood or drought compared to historical levels can cause adverse effects. Permanent changes to local hydrology can influence whether a peatland continues to act as a carbon sink with drier conditions allowing for increased decomposition rates while increased water levels can lead to an increase in the release of methane (Zhang et al., 2022). Permanent changes to hydrology can also exacerbate anticipated impacts on peatlands expected on a broader scale from climate change, including increased levels of local evapotranspiration from drier overall conditions (Price et al., 2023).

Changes to surface water drainage can lead to increased levels of surface water runoff into adjacent peatland communities, which can have an impact on the species composition of a community and the overall community classification. For example, flooding can cause a turnover of vegetation, leading to the die-off of woody vegetation, creating more open peatland habitats such as open bogs, open fens and marsh habitat that replace treed peatland habitats (Asada et al., 2005). Additionally, linear disturbances obstructing surface flow between an upgradient and downgradient side of the Community Access Road can lead to increased water levels and pooling on the upgradient side, causing aerobic conditions and the accelerated decomposition of peat on the downgradient end, further influencing the composition and function of these peatland communities (Vu, 2019). Similarly, studies have found that in some instances, a drawdown of water tables (**Section 7.3.1.4**) can create a disconnect between previously connected peatland systems and can, in-turn, impact water availability for downstream systems (Balliston et al., 2023).

Studies have also demonstrated that impacts on local hydrology from access roads in combination with impacts on the surrounding vegetation from road construction can lead to localized increases in carbon and methane emissions as well as increased enzyme activities, which might lead to higher decomposition rates of organic matter (Saraswati and Strack, 2019; Saraswati et al., 2019; Saraswati et al., 2023).

If changes to hydrology are notable enough to change the composition of a peatland community, the availability, distribution, composition, and function of that altered peatland community type will also eventually be affected within the effects assessment Local Study Area.

Fort Albany First Nation has noted concerns related to peatlands drying (and increased potential for fire hazards) and impacts on peatland hydrology and landscape stability (Fort Albany First Nation, 2020). Kashechewan First Nation has similar noted concerns related to the drying of peatlands due to lower water levels in rivers within their traditional territory resulting from historical damming and diversion activities upriver of their community (Kashechewan First Nation, 2024). Fort Albany First Nation also has concerns about potential impacts and interactions relating to peatland disturbance and permafrost degradation (Fort Albany First Nation, 2020).

Properly functioning peatland systems are capable of mitigating impacts of wildfires through their elevated water levels and permanently saturated conditions (Price et al., 2023). However, a peatland can lose its ability to mitigate against wildfire activity when the water table has decreased and the upper layer of peat dries (Natural Resources Canada, 2024). Wildfires within boreal peatlands can release substantial amounts of carbon, methane and other greenhouse gases to the atmosphere including elements such as mercury, which can have health impacts for surrounding communities (Lin et al., 2021; Natural Resources Canada, 2024).

The surface water quality within peatlands may also be affected by the construction of the Community Access Road. During construction, surface water may become contaminated if chemicals or substances (e.g., petroleum products, sediments, and garbage) from Project equipment, vehicles, road surfaces, or blasting sites are transported into surface water during precipitation events (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]). This includes contamination of surface water from accidental spills and leaks of chemicals and hazardous materials (**Section 7.3.1.8**).

Additionally, there may be changes to surface water quality from increases in concentrations of suspended solids in waterbodies as a result of increased rates of erosion–sedimentation processes during water-taking and discharge activities. This might also occur following the removal of the diversion works and / or installation or removal of temporary waterbody crossing structures due to the disturbance of the bed and banks of a waterbody (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]).

Furthermore, air emissions from Project activities during Construction could result in changes to surface water quality (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]).

Areas in the Construction Disturbance Area are at highest risk of surface water contamination from the Project (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]).

Short-term residual changes to surface water quantity are predicted during the Construction Phase because of short-term water discharges and water-taking and water diversions at waterbody crossings (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]). These residual effects have been assessed as likely to cause minimal changes to stream flows and / or water levels at receiving waterbodies and be limited to, at most, the spatial extent of the Local Study Area during Construction (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]). This finding has been extrapolated to indicate that the resulting residual effects on peatland ecosystems is likewise expected to be minimal and limited to the Local Study Area during Construction.

Operation and Maintenance

Long-term residual changes to surface water quantity are predicted during the Operation and Maintenance Phase as a result of changes in channel hydraulics at waterbody crossings and changes in land cover (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]). These residual effects have been assessed as likely to cause minimal changes to stream flows and / or water levels at receiving waterbodies and be limited to, at most, the spatial extent of the Local Study Area (*Surface Water Technical Support Document: Existing Conditions and Effects Assessment Report* [WSP, 2026e]). This finding has been extrapolated to indicate that the resulting residual effects on peatland ecosystems is likewise expected to be minimal and limited to the Local Study Area during Operation and Maintenance.

7.3.1.3.2 Mitigation Measures

Construction

A list of mitigation measures to limit changes to surface water quantity and quality during Construction is provided in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e).

Additional mitigation measures that will be implemented during the Construction Phase, specific to peatlands include:

- During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of surface water;
- Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented

appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan;

- Design and implement a pre-, during- and post-construction monitoring program that assesses surface water movement and helps to ensure that pre-construction conditions are maintained to the extent feasible (**Section 9**); and
- Implement adaptive management measures if drainage patterns are determined to be significantly altered. Adaptive management measures will be determined through the development of the Environmental Protection Plan.

Once further hydrological monitoring and water budget studies are undertaken at detailed design, specific mitigation measures to maintain peatland hydrology may be required and will be included with detailed design documentation as the Project schedule allows. See **Sections 9** and **10** for further details regarding monitoring commitments and recommendations.

Operation and Maintenance

A list of mitigation measures to limit changes to surface water quantity and quality during Operation and Maintenance is provided in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e). The effectiveness of mitigation measures will be evaluated during Operation and Maintenance Phase, and mitigation measures will be modified or enhanced as necessary through adaptive management.

7.3.1.3.3 Predicted Residual Effects

Construction, Operation and Maintenance

With the implementation of the recommended mitigation measures, changes to hydrology will be minimized and impacts to retained peatland ecosystems should be minimal. However, this assumes that the mitigation measures will be sufficient to maintain pre-construction drainage patterns. It is expected that a robust monitoring program will be undertaken, and adaptive management measures implemented, as required. Changes to peatland ecosystems as a result of changes to hydrology is predicted to result in a residual effect and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.4 Change to Peatland Ecosystems as a Result of Changes to Groundwater

7.3.1.4.1 Potential Effects

Construction

As discussed in the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c), during the Project Construction Phase, short-term water-takings from groundwater sources may be required for the installation of below ground structures, such as footings or culverts, or for water supply to temporary construction camps or temporary concrete batch plants. These water takings may cause a lowering of the local groundwater levels. If aggregates are extracted from below the water table at pits or quarries, the local groundwater levels will be lowered either by active dewatering or dredging. Additionally, clearing of the effects assessment Construction Disturbance Area will remove much of the vegetative cover, and this will be replaced with gravelled surfaces. These gravelled surfaces are expected to have different infiltration rates from precipitation than the existing conditions.

Changes to groundwater recharge rates and local groundwater levels could reduce the groundwater quantity available for natural receptors such as vegetation and groundwater-fed waterbodies. Similarly, the construction of roads across peatland areas has the potential to interrupt groundwater flows through the peatland, which could cause changes to the availability of groundwater to peatlands upgradient and downgradient of the Community Access Road.

Groundwater quality may be affected through changing groundwater levels which could have an impact on various peatland processes, a change in the groundwater chemistry in areas adjacent to the road, or through spills during Construction. For example, as discussed in **Section 5.3.4**, the drying of peat, where the groundwater regime has been altered by construction and operation of the road, or impacted via climate change, could lead to an increase in production of methylmercury and inorganic mercury concentrations in peatland communities.

Additionally, the incorporation of potentially acid generating soil and rock into the construction of the road could lead to increased level of methylmercury, as discussed in **Section 5.3.4.3**, by increasing the sulphur content in peatlands. However, the risk of occurrence is expected to be low based on the results presented in the *Geochemical Characterization Technical Support Document* prepared as part of the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c). All potentially acid generating soil or rock was found outside of the Project Development Area Boundary. Samples within the boundary showed low metal leaching potential.

Other potential sources of groundwater contaminants may include the application of chemicals for dust-control and de-icing during both the construction and operation stages, which could enter peatland ecosystems through surface water runoff. A further discussion of impacts on peatlands from spills is presented below in **Section 7.3.1.8**.

If changes to groundwater regimes are notable enough to change the composition of a peatland community, the availability, distribution, composition, and function of that altered peatland community type could eventually be affected within the effects assessment Local Study Area.

Operation and Maintenance

During the Operation and Maintenance Phase, short-term water takings from groundwater sources may be required for the repair of below ground structures such as footings or culverts. Additionally, as in the Project's Construction Phase, aggregate extraction below the water table at pits or quarries may lower local groundwater levels. Periodic extraction from pits and quarries is expected to continue at some sources to provide material for road maintenance during the Operation and Maintenance Phase of the Project.

Clearing of the effects assessment Construction Disturbance Area and resulting changes to vegetation cover may change groundwater infiltration rates from precipitation relative to the existing conditions. Areas that were cleared during the Construction Phase but not maintained for use are expected to gradually return to similar existing conditions through active or passive restoration processes. In remaining areas, these changes to groundcover will persist for lifetimes of the road right-of-way and any access roads, laydown areas, or pits and quarries that are maintained or re-activated for use during the Operation and Maintenance Phase.

Equipment and vehicles used during the Operation and Maintenance Phase of the Project will have the potential for malfunctions or accidents to cause leaks of fuels, oils, lubricants, coolants, and other potential contaminants. Storage and transfer of fuels and other chemicals in the effects assessment Construction Disturbance Area during the Operation and Maintenance Phase and maintenance also pose a risk of accidental spills. These accidental spills and leaks may contact the ground and migrate to the water table causing contamination of the groundwater.

7.3.1.4.2 Mitigation Measures

Construction

A list of mitigation measures to limit changes to groundwater quantity and quality during construction is provided in the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c). The effectiveness of mitigation measures will be evaluated during construction and mitigation measures will be modified or enhanced as necessary through adaptive management.

Additional mitigation measures that will be implemented during the Construction Phase, specific to peatlands include:

- Construct the Community Access Road through peatland communities using a "floating road" construction methodology to allow for groundwater movement below and through the road embankment. This approach will involve:
  - Completion of a detailed ground survey, further characterizing the peat and local hydrology at a later stage of the project during the pre-construction period / detailed design.
  - Site-specific identification of appropriate values for peat strength.
  - Use of a geogrid base to act as a separator and strengthener between the road subgrade fill materials and the peat.
  - Use of additional geogrid and geotextile materials in layers combined with road aggregate material above the embankment fill to form a mechanically stabilized layer. This layer will provide the required strength and stiffness for the road to perform during all seasons, including spring thaw.
  - Design the Floating Road Plan, profile and cross-section for each road section based on context-sensitive design standards, geometry and loading.
  - Provide transitions between "floating road" sections, excavated and fill sections.
  - Schedule construction to allow for primary settlement of the peat without risk of shear failure.
  - Monitor the work through construction, measuring and recording lateral movement and settlements. Be prepared to adjust the design based on observation and monitoring.
- During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of groundwater. This can help to minimize the impacts on local carbon and methane emissions and the increased enzyme activity noted above (Saraswati and Strack, 2019; Saraswati et al., 2019; Saraswati et al., 2023);
- Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan;
- Design and implement a pre-, during- and post-construction monitoring program that assesses surface and groundwater movement and allows for the maintenance of pre-construction conditions to the extent feasible (**Section 9**).

This includes the creation of a monitoring program that involves geochemical testing on exposed bedrock and soils to assess the potential for acid rock drainage and / or metal leaching as it relates to methylmercury production in peatland communities present within the Construction Disturbance Area. The program will also monitor potential increases in methylmercury production related to changes in groundwater levels as a result of the construction of the Community Access Road; and

- Implement adaptive management measures if groundwater flow patterns are determined to be significantly altered. Adaptive management measures will be determined through the development of the Environmental Protection Plan.

Operation and Maintenance

A list of mitigation measures to limit changes to groundwater quantity and quality during Operation and Maintenance is provided in the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c).

7.3.1.4.3 Predicted Residual Effects

Construction, Operation and Maintenance

With the implementation of the recommended mitigation measures, changes to groundwater quantity and quality will be minimized and impacts on retained peatland ecosystems should be minimal. However, this assumes that the mitigation measures will be sufficient to maintain pre-construction drainage patterns and groundwater regimes.

A three-year hydrological monitoring study completed by Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) in 2016, 2017, and 2018 on behalf of Manitoba Infrastructure for the East Side Road project. This study was completed to examine the impacts of the “floating road” construction methodology on peatland environments (KGS, 2019c). The East Side Road is a network of all-season roads that were built on the east side of Lake Winnipeg to provide year-round access for remote and isolated communities. The project spanned sections of peatland in which a similar “floating road” method to that outlined in **Section 7.3.1.3.2** was implemented. The hydrological study was a requirement of the project to identify project impacts on the overlapping wetland systems. The monitoring study found no hydrological changes between upstream and downstream peatland communities with monitoring stations, including those found on either side of the constructed road and control sites, exhibiting similar responses to individual precipitation events and seasonal variability in precipitation. Additionally, observed shifts in groundwater quality between sites were found to be subtle and within the expectations of fluctuations within a natural system. It is expected that a robust monitoring program will be undertaken for this Project, and adaptive management measures will be implemented, as required if similar results to the East Side Community Access Road are not observed.

Changes to groundwater quantity and quality are predicted to result in a residual effect on peatlands and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.5 Changes to Peatland Ecosystems as a Result of the Introduction and Spread of Invasive Plant Species

7.3.1.5.1 Potential Effects

Construction

During the Construction Phase, the regular movement of vehicles, equipment and personnel in-and-out of the Construction Disturbance Area could introduce and transport invasive plant seeds or plant parts into new areas, including peatlands, inside and adjacent to the Construction Disturbance Area. Most non-native invasive plant species are introduced through various forms of human transport (Mack et al., 2000; Reichard and White, 2001). As noted in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h), there were no invasive plant species documented in the study areas.

The introduction and spread of invasive plant species can affect plant community composition and function over the long term. This is a particular concern for the Project given its remote nature and current absence of invasive plant species from the Project area. Indigenous communities, including Aroland First Nation, have concerns related to the potential spread of invasive species (Dillon, 2024b). Fort Albany First Nation has suggested that changes to peatlands resulting in native species to decline could allow invasive species to encroach (Fort Albany First Nation, 2020).

The resulting changes to peatland communities might, in turn, affect their ecological functioning and their ability to support certain wildlife species. Specifically, the introduction of invasive plant species into new areas can reduce the quality of bird habitats by altering species diversity and plant community structure if they outcompete native species, and by changing soil conditions (e.g., nutrients and moisture) (Mack et al., 2000; Carlson and Shephard, 2007; Truscott et al., 2008). Invasive plant species thrive in areas with recently disturbed soils and a high ratio of edge habitat as this improves their ability to establish and spread (Honnay et al., 2002). Invasive plant species often establish in fragmented landscapes along edge habitats, such as cleared areas adjacent to roads (Lafortezza et al., 2010: Dubé et al., 2011).

Site hydrology and nutrient availability in peatlands can play a role in maintaining native plant assemblages and limiting the presence of unwanted flora. Factors such as permanently saturated environments, limited nutrients, or low pH levels can all act as deterrents for the establishment of certain non-native and invasive species (Dubé et al., 2011). For example, certain non-native or invasive species shown to have large

impacts on mineral wetlands may not be as adapted to the acidic conditions of a bog. However, changes to a site's hydrology and the drying out of a site could lead to more favourable conditions for these species to establish (Irish Peatland Conservation Council, 2009). Furthermore, their introduction could create a negative feedback loop where, once a species gains a foothold within a community type, it facilitates further modification of a site so it becomes more suitable for the proliferation of that and other non-native. For example, European Reed (*Phragmites australis* subsp*. australis*) is known to alter the availability of water in a site by transpiring water faster than the surrounding native vegetation (Nichols, 2020). This could create drier, less acidic conditions that would allow for further establishment of this species along roadside edges.

Vehicles and equipment can serve as dispersal mechanisms for plant seeds and vegetative parts that can get lodged in tires, the undercarriage, or mud on the surface of the vehicle (Parendes and Jones, 2000; Trombulak and Frissell, 2000). Many non-native invasive plant species are able to spread more easily in landscapes that have been fragmented, and often become established along edge habitats, such as those alongside transportation corridors (Lafortezza et al., 2010).

Operation and Maintenance

During the Operation and Maintenance Phase, regular vehicle traffic on the Community Access Road could transport invasive plant seeds or plant parts into the effects assessment Local Study Area. The indirect effects on peatlands resulting from the introduction and spread of invasive species described above, are also relevant to the Operation and Maintenance Phase.

7.3.1.5.2 Mitigation Measures

Construction

It is generally more efficient and cost effective to prevent the introduction and spread of invasive plant species in a new area than to try to remove those plants once established (Clark, 2003; Polster, 2003; Carlson and Shepard, 2007). Therefore, the following mitigation measures are recommended:

- An Environmental Protection Plan will be developed during detailed design, and will be implemented during construction to prevent, detect, control (i.e., remove), and monitor areas with invasive species. The plan should also include the following measures:
  - Thoroughly inspect and clean construction equipment and vehicles prior to bringing them to the work area and when moving between work areas within the Project. Cleaning shall be completed in accordance with the most up to date version of the Clean Equipment Protocol for Industry (Halloran et al., 2013). Documentation of the results of each inspection will be a requirement of the Environmental Protection Plan. Additional recommendations for the cleaning of

equipment (e.g., the use of specific cleaning stations and their location) will be determined through the development of the Environmental Protection Plan.

- Use reduced disturbance techniques to prevent topsoil removal and preserve adequate substrate to promote natural revegetation (e.g., use a low impact method to leave the surface vegetation root mat intact).
- Contour disturbed areas to minimize soil and water erosion and encourage growth of native vegetation.
- Limit off-road vehicle use by contractors during Construction. Inspections and maintenance activities will include cleaning of off-road vehicles before and after each use to prevent the spread of invasive species. Recommendations related to the use of off-road vehicles will be determined at detailed design and / or through the development of the Environmental Protection Plan.
- Use seed mixes with appropriate native species for all seeding and restoration works. Seed mixes must be tested / certified to be free of invasive species. Native seed should be sourced from local populations whenever possible.
- Require that the road operator follow Ministry of Transportation Ontario *Provincial Standard Specification 803* to avoid spreading invasive plant species.

Operation and Maintenance

The following mitigation measures are recommended during Operation and Maintenance:

- Include the following measures as part of the Environmental Protection Plan to prevent, detect, control (i.e., remove), and monitor areas with invasive species:
  - Limit off-road vehicle use by contractors during Operation and Maintenance. Inspections and maintenance activities will include cleaning of off-road vehicles before and after each use to prevent the spread of invasive species.
  - Require that the road operator follows Ministry of Transportation Ontario Provincial Standard Specification 803 to avoid spreading invasive plant species.
  - Herbicides 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.
  - Design and implement a post-construction invasive species monitoring program to detect invasive species presence and control (i.e., remove) new introductions. Details of the post-construction invasive species monitoring program will be included in the Environmental Protection Plan.

7.3.1.5.3 Predicted Residual Effects

Construction

With the implementation of the recommended mitigation measures and continued monitoring and control of invasive species, impacts on the retained peatland communities should be minimal. However, this assumes that mitigation measures are effectively implemented, and all observations of invasive species are reported and addressed immediately. The introduction and spread of invasive plant species during Construction because of are predicted to result in a residual effect on peatland ecosystems and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

Operations and Maintenance

With the implementation of the recommended mitigation measures and continued monitoring and control of invasive species, impacts on the retained peatland communities should be minimal. However, this assumes that mitigation measures are effectively implemented. Additionally, introduction of invasive plant species may be higher during Operation and Maintenance due to public use of the Community Access Road. The introduction and spread of invasive plant species during Operation and Maintenance are predicted to result in a residual effect on peatland ecosystems and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.6 Changes to Peatland Ecosystems as a Result of Fragmentation and Edge Effects

7.3.1.6.1 Potential Effects

Construction

Clearing within an otherwise intact landscape introduces new fragmentation and a range of edge effects on retained peatland ecosystems, which could be particularly evident in forested swamp communities. Edge effects include the introduction and spread of invasive species (discussed in **Section 7.3.1.5**), as well as sunscald, desiccation and windthrow, which alter the microclimate of the retained communities. These effects influence the composition and function of the retained peatland ecosystems resulting in secondary effects (e.g., altering habitat use by certain wildlife species). These secondary or indirect edge effects generally extend further into a forest than forest structural changes (Franklin et al., 2021). In Ontario, sunscald, desiccation, and windthrow effects are typically experienced to a greater degree (or penetrate further into the retained treed community) on south and west-facing edges due to more solar exposure and prevailing westerly winds (Hylander, 2005; Honnay et al., 2002; Murcia, 1995).

However, boreal forests have been shown to be less influenced by edge effects than tropical and temperate forests (Franklin et al., 2021) because they are adapted to large-scale natural disturbances (e.g., fire, windthrow, and insect outbreaks), typically have a short canopy height and more widely spaced trees (relative to temperate and tropical forests and especially in open fens and bogs), and have natural vegetation community heterogeneity (Harper et al., 2015). Nevertheless, some edge effects on peatland ecosystems are anticipated to occur in the Project area and are expected to be more pronounced on the south and west-facing edges of forested swamps. Edge effects on open bog, fen and organic marsh peatland communities are likely to be more related to hydrological or hydrogeological changes introduced by the new road or construction "edge" where the pooling of water or drying of peat may occur depending on the peatlands and the location of the road relative to the flow of surface water or groundwater (**Sections 7.3.1.3** and **7.3.1.4**).

As discussed in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h), while the landscape in the Project area is largely intact, there are anthropogenic and natural disturbances that have influenced the landscape. Notably, natural disturbances (primarily fire) have occurred over 20,741.7 ha (18%) of the effects assessment Local Study Area, while anthropogenic disturbances cover 364.2 ha (<1%) of the effects assessment Local Study Area. In the effects assessment Regional Study Area, natural disturbances (primarily fire) have occurred over 170,289.3 ha (27%) and anthropogenic disturbances cover a total of 4,109.2 ha (<1%). These disturbances have caused minor fragmentation and edge effects on the existing landscape. The Project will create new anthropogenic disturbances layered over the existing disturbance regime. The total Construction Disturbance Area footprint is 4,700.2 ha. Additional analysis on disturbance within the effects assessment Local and Regional Study Areas is provided in the *Vegetation Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026h).

Operation and Maintenance

It is not expected that the Operation and Maintenance Phase will introduce new fragmentation or edge effects on the retained peatland communities.

7.3.1.6.2 Mitigation Measures

Construction

Mitigation measures that will be implemented during the Construction Phase are as follows:

- Adjust the alignment or clear off-centre within the right-of-way to minimize peatland fragmentation and the creation of new wooded peatland edges, where feasible. These details will be refined during detailed design;

- Construct temporary laydown areas and temporary construction camps on existing disturbed areas, wherever possible. The availability of existing disturbed areas for the construction of temporary laydown areas and temporary construction camps will be determined at detailed design;
- Avoid grubbing along newly created forested swamp edges to promote natural regeneration, which will quickly "seal" the new forested swamp edge;
- Use reduced disturbance techniques during construction to prevent topsoil removal, preserve adequate substrate to promote natural revegetation (e.g., use a low impact method to leave the surface vegetation root mat intact). Recommendations for reduced disturbance techniques will be described in detailed design; and
- Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed. Progressive restoration techniques will be provided in the Environmental Protection Plan.

Operation and Maintenance

No additional mitigation measures are recommended during the Operation and Maintenance Phase.

7.3.1.6.3 Predicted Residual Effects

Construction, Operation and Maintenance

Changes to the retained peatland ecosystems resulting from fragmentation and edge effects during Construction are predicted to result in a residual effect and this interaction is carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.7 Changes to Peatland Ecosystems from the Release of Sediment

7.3.1.7.1 Potential Effects

Construction

The Project has the potential to result in the release of sediment from vegetation clearing, earth-moving, pit and quarry development and other construction activities. Sediment release into adjacent retained peatland ecosystems can have an effect on the composition and function of those communities. It is expected that the effects on peatlands would be very localized but could include vegetation smothering and changes to drainage patterns and infiltration in the area of sediment deposits.

Operation and Maintenance

There is potential that activities during the Operation and Maintenance Phase may cause the release of sediment to adjacent retained peatland ecosystems. Large precipitation events may lead to run-off from the road and sedimentation in low lying areas including

peatland ecosystems. Similar to Construction, the effects would be localized, intermittent and variable throughout the year.

7.3.1.7.2 Mitigation Measures

Construction

Mitigation measures that will be further developed during detailed design, and implemented during the Construction Phase include:

- Develop and implement a Project-specific Environmental Protection Plan;
- Develop and implement a Project-specific Erosion and Sediment Control Plan. Erosion and sediment control measures will be developed and implemented in accordance with Ontario Provincial Standard Specifications (Ontario Provincial Standard Specifications *OPSS.PROV.804* and *OPSS.MUNI.805*). Environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction. Installed erosion and sediment control measures are not expected to affect the water movement to peatlands;
- Regularly inspect and maintain Erosion and Sediment Control structures (e.g., sediment fences, rip rap or other sediment control structures) in accordance with Ontario Provincial Standard Specifications *OPSS.PROV 804* during all phases of the Project and modify measures as necessary. If control measures are not functioning properly, no further work will occur until the problem is resolved;
- Stabilize disturbed areas through revegetation with native plant species or other appropriate means (e.g., erosion control blankets) following completion of the works;
- Reschedule work or reduce traffic in areas where soils are considered to be excessively wet or where there is a heavy rainfall risk. Areas where a reduction in traffic will be determined during the detailed design phase;
- Earthworks should be avoided during periods of heavy rainfall, particularly in areas adjacent to watercourses and wetlands; and
- Adhere to all mitigation measures outlined in the *Fish & Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026b) and the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e).

Operation and Maintenance

The mitigation measures established and refined using adaptive management during Project Construction should be maintained during the Operation and Maintenance Phase.

7.3.1.7.3 Predicted Residual Effects

Construction Operation and Maintenance

With the implementation of the mitigation measures, specifically implementation of a Project-specific Erosion and Sediment Control Plan, residual effects on retained peatland communities due to the release of sediment are not predicted. Should sediment be released into an adjacent peatland community, the effect is expected to be localized such that a measurable effect on the availability, distribution, composition, and function of peatlands is not predicted to occur. Therefore, this interaction is not carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.8 Changes to Peatland Ecosystems from Spills of Fuel or Other Contaminants

7.3.1.8.1 Potential Effects

Construction

During Project construction chemical or hazardous material spills (e.g., petroleum products) can have detrimental effects on ecosystems in the affected area. Spills that occur in high enough concentrations can contaminate peat and affect peatland organisms and vegetation health and survival, thereby affecting the composition and function of the affected peatland communities and dependant wildlife. Marten Falls First Nation has noted concerns related to pollution from potential collision and / or spills that might occur. The community notes that muskeg (peatland) is particularly susceptible to pollutants and that remediation options related to spills are limited (Marten Falls First Nation, 2023). Aroland First Nation noted similar concerns specific to contamination due to surface level spills / pollution (e.g., oil or chemical spill contamination in muskeg due to interconnectedness with nearby surface water) (Fort Albany First Nation, 2024).

Peatlands and peat differ from mineral soils in the way they transport and retain contaminants. Spills in peatlands tend to spread over a larger horizontal gradient in the upper layer of peat due to the higher levels of impermeability of the lower, more decomposed peat and the higher porosity in the surface layer (Gharedaghloo and Price, 2018). This can create a larger impact area via the surface area; however, while the overall impacts on a system depend on the contaminant, the higher biogeochemical interactions in the top layers of peat mean that the transformation or sequestration of contaminants can be quick with many soluble contaminants being efficiently removed from a peatland system through natural process (Price et al., 2023). Therefore, there is a potential that the Project could cause spills of fuel or other contaminants that could negatively affect the composition and function of peatland ecosystems.

Operation and Maintenance

There is the potential for accidental spills of fuels and other materials resulting from vehicle collisions during Operation and from malfunctions of equipment or spills during equipment or vehicle refuelling for Maintenance activities. The indirect effects on peatlands resulting from spills of fuel or other contaminants during Operation and Maintenance are the same as discussed in the Construction section, above.

7.3.1.8.2 Mitigation Measures

Construction

Mitigation measures described in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c), *Physiography, Terrain, and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d), and *Vegetation Existing Conditions & Effects Assessment Report* (WSP, 2026h) will be implemented to minimize effects from spills of fuel and other contaminants on peatland ecosystems.

Operation and Maintenance

During Operation and Maintenance mitigation measures will include posting and enforcement of a speed limit on the highway, which should reduce potential for chemical or hazardous material spills by reducing vehicle collision risk.

Detailed lists of mitigation measures to limit the risk and effects from spills of fuel and other contaminants during Operation and Maintenance are provided in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c), *Physiography, Terrain, and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d).

7.3.1.8.3 Predicted Residual Effects

Construction, Operation and Maintenance

As discussed in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c), *Physiography, Terrain, and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d), and *Vegetation Existing Conditions & Effects Assessment Report* (WSP, 2026h), there are predicted to be no residual effects from chemical or hazardous material spills on surface water quality, groundwater, soil, or vegetation quality during Construction or Operation and Maintenance.

The implementation of mitigation measures is expected to effectively avoid and minimize the frequency, spatial extent, and severity of spills of chemicals and / or hazardous materials on site. Spills are expected to occur infrequently and are not expected to result in a measurable change to the availability, distribution, composition, and function of peatlands relative to existing conditions. As a result, there are expected to be no residual effects on peatland ecosystems resulting from spills of fuel or other contaminants and this interaction was not carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.9 Changes to Peatland Ecosystems from the Deposition of Air Contaminants

7.3.1.9.1 Potential Effects

Construction

Construction of the Project is expected to generate air particulate emissions, including carbon monoxide, sulphur oxides (including sulphur dioxide), and nitrogen oxides. Construction activities are expected to produce air emissions from the use of construction vehicles, motorized equipment and machinery, power generators (to be used at temporary construction camps and temporary pits and quarries), the use of explosives (blasting), and the burning of non-hazardous waste materials (e.g., food garbage at temporary construction camps).

The deposition of criteria air contaminant emissions can result in changes to soil and surface water quality, which has the potential to alter plant community structure, composition, and diversity by modifying the pH, nutrient content, and abundance and diversity of living organisms in the soil. Soil acidification can result from the deposition of sulphate and nitrogen oxides and uptake of these contaminants by plants can cause varying levels of effects on vegetation in peatland ecosystems depending on the concentrations and durations of deposition.

Air quality modelling was used to predict maximum ground-level concentrations of criteria air contaminant emissions during the Construction and Operation and Maintenance Phases. The methods and results for air quality modelling are presented in detail in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). During the Construction Phase, most air criteria contaminants were predicted to be below *Canadian Ambient Air Quality Standards* and / or *Ontario Ambient Air Quality Criteria* thresholds. However, threshold exceedances for the Project were noted for nitrogen dioxide (NO_2) and sulphur dioxide (SO_2), carbon monoxide (CO), acrolein, and benzo(a)pyrene emissions. Most threshold exceedances were limited to less than 760 m from the emission source. The exceptions to this distance threshold are NO_2, SO_2, and CO emissions during quarry blasting. During quarry blasting, NO_2 and SO_2 emissions thresholds may be exceeded by up to 12.3 km, while CO emissions may exceed the *Ontario Ambient Air Quality Criteria* threshold out to 1.5 km.

It should be noted that the air quality modelling incorporated conservative assumptions (i.e., using worst-case scenarios) so effects would not be underestimated.

Operation and Maintenance

During the Operation and Maintenance Phase of the Project, emissions will be generated mainly from the use of fossil fuels associated with vehicle use of the Project and road maintenance (general, seasonal, and special maintenance).

As discussed in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026), air criteria contaminants are predicted to be below *Canadian Ambient Air Quality Standards* and / or *Ontario Ambient Air Quality Criteria* thresholds during the Operation and Maintenance Phase.

It should be noted that the air quality modelling incorporated conservative assumptions (i.e., using worst-case scenarios) so effects would not be underestimated.

7.3.1.9.2 Mitigation Measures

Construction

A list of mitigation measures that will be implemented to limit air particulate emissions during construction is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). The effectiveness of mitigation measures will be evaluated during construction, and mitigation measures will be modified or enhanced as necessary through adaptive management.

Environmental approval conditions, permits, or authorizations issued for Project Construction, including those issued from Environment and Climate Change Canada, the Ontario Ministry of the Environment, Conservation and Parks and the Ontario Ministry of Natural Resources, will be followed during Construction.

Operation and Maintenance

A list of mitigation measures that will be implemented to limit air particulate emissions during Operation and Maintenance is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). The effectiveness of mitigation measures will be evaluated during Operation and Maintenance, and mitigation measures will be modified or enhanced as necessary through adaptive management.

7.3.1.9.3 Predicted Residual Effects

Construction, Operation and Maintenance

During the Construction and Operation and Maintenance Phases emissions of criteria air contaminants may have negative effects on water, soils, vegetation, and associated peatland ecosystem composition and function. Effects are expected to be larger during the Construction Phase than during the Operation and Maintenance Phase.

An Environmental Protection Plan and Environmental Monitoring Plan developed for the Project, which will include adaptive management, are expected to limit the emissions of criteria air contaminants.

Even with mitigation, the Project is expected to have net residual effects on peatland ecosystems as a result of emissions of criteria air contaminants. As such, residual effects from air contaminants to peatland ecosystems were carried forward into the residual effects characterization (**Section 7.3.2**).

7.3.1.10 Changes to Peatland Ecosystems from Fugitive Dust Emissions

7.3.1.10.1 Potential Effects

Construction

Fugitive dust emissions are expected to be produced by the Project during construction activities such as land clearing, blasting, and infrastructure implementation (Dillon, 2026). Accumulation of airborne dust produced from the Project may result in local and direct changes to peatland ecosystems; for example, deposition of airborne dust onto vegetation in peatland ecosystems can smother plant tissues, hinder gas exchange, and reduce photosynthesis by physically blocking sunlight. Dust particles often contain metals or pollutants, which can leach into the soil and lead to toxicity or nutrient imbalances in plants (Hirano et al., 1995; Prajapati, 2012). Consequently, the deposition of dust can affect plant health, and alter plant species composition, structure, and biomass in affected areas. Indigenous communities including Weenusk First Nation have noted concerns specific to impacts related to air quality as a result of fugitive dust from movement and operations of construction equipment and vehicles (MNP LLP, 2024b).

Air quality modelling was used to predict maximum ground-level concentrations of criteria air contaminant emissions during Construction and Operation and Maintenance (Dillon, 2026). During Construction, threshold exceedances for the Project are predicted for total suspended particulate, particulate matter emissions less than 2.5 micrometres ($PM_{2.5}$) and particulate matter less than ten micrometres (PM_{10}). Threshold exceedances for dust emissions are predicted to be reached at less than 300 m from the emission source. Refer to the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026) for further details about emission sources and modelling.

It should be noted that the air quality modelling incorporated conservative assumptions (i.e., using worst-case scenarios) so effects were not underestimated.

Operation and Maintenance

Fugitive dust emissions are expected to be produced by traffic on the Community Access Road during Operation and Maintenance. Accumulation of airborne dust produced from the Project may result in local and direct changes to peatland ecosystems as described in the Construction section above.

During Operation and Maintenance, threshold exceedances for the Project are predicted for $PM_{2.5}$, PM_{10} and total suspended particulates. The $PM_{2.5}$ levels are predicted to reach the 24-hour and annual criteria thresholds at 115 and 134 m from the road, respectively. Levels of PM_{10} are predicted to reach the 24-hour threshold at 1,986 m from the road. Emissions of total suspended particulates are predicted to reach the 24-hour and annual thresholds at 3,004 and 899 m from the road, respectively (*Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* [Dillon, 2026a]).

It should be noted that the air quality modelling incorporated conservative assumptions (i.e., using worst-case scenarios) so effects were not underestimated.

7.3.1.10.2 Mitigation Measures

Construction

A list of mitigation measures that will be implemented to limit dust deposition during Construction is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). These measures will be implemented to minimize effects from dust emissions and deposition on peatland ecosystems. The effectiveness of mitigation measures will be evaluated during construction, and mitigation measures will be modified or enhanced as necessary through adaptive management.

Environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction.

Operation and Maintenance

A list of mitigation measures that will be implemented to limit dust deposition during Operation and Maintenance is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). The effectiveness of mitigation measures will be evaluated during Operation and Maintenance, and mitigation measures will be modified or enhanced as necessary through adaptive management.

7.3.1.10.3 Predicted Residual Effects

Construction, Operation and Maintenance

Although mitigations will be implemented to reduce dust emissions, dust deposition during Construction, Operation and Maintenance are predicted to degrade vegetation within peatland communities immediately adjacent to the Project (within 100 m). There are currently no plans to decommission the Project and dust deposition is expected over the life of the Project.

Even with mitigation, residual effects from dust emissions on peatland ecosystems are expected to occur and are therefore carried forward into the residual effects characterization (**Section 7.3.2**).

7.3.1.11 Changes to Peatland Ecosystems as a Result of Increased Public Access

7.3.1.11.1 Potential Effects

Construction, Operation and Maintenance

The construction of the Community Access Road and associated infrastructure (e.g., pits and quarries, temporary access roads, and worker camps) could cause changes to peatland ecosystems as a result of increased public access. Marten Falls First Nation has noted concerns about illegal dumping of waste in muskegs (i.e., peatlands), including potential leaching of contaminants into the water table. The community noted that illegal dumping of waste is already a problem with the Winter Access Road (such as people leaving behind drums, vehicles, and other materials). One community member noted the importance of the muskeg (i.e., peatlands), highlighting that "*the muskeg is just like our bodies, if we get sick, and then the whole body gets sick*", referring to the interconnections between the muskeg (i.e., peatlands) and other components of the environment (Marten Falls First Nation, 2023). Additionally, Weenusk First Nation noted concerns related to impacts on harvestable species within the community's traditional territory as a result of increased access (MNP LPP, 2024b).

Increased public access is anticipated to be limited during the Construction Phase. However, members of the public may illegally use constructed portions of the Construction Disturbance Area to access areas that were previously inaccessible or more difficult to access for hunting, fishing, plant or timber harvesting. The Community Access Road will also expand access to remote peatland ecosystems during the Operation and Maintenance Phase. However, the region will remain relatively remote with the nearest urban centre (i.e., Thunder Bay with a population of approximately 111,000) being over 430 km from Marten Falls First Nation. Therefore, a large influx of individuals or groups into the area is not expected. Traffic levels for the Project have been estimated at 700 vehicles per day for the north-south section and 100 vehicles a day for the east-west section of the Community Access Road. These volumes are reflective of the anticipated peak traffic in 2046.

Regardless, increased public access may result in secondary effects such as the introduction and spread of invasive plant species. Non-native and invasive plant species may compete with local native flora. This potential effect is discussed in **Section 7.3.1.5**. Another secondary effect of increased public access is the spills of fuel or other contaminants during Operation and Maintenance. This potential effect is discussed in **Section 7.3.1.8**.

Finally, increased public access may also introduce an additional risk of human-ignited wildfire (Morisson, 2007). According to one study based in the United States, it was determined that 88% of all wildfires in the United States are caused by humans and of those wildfires, 90% occurred within one mile of a road (Morisson, 2007). While the boreal landscape is adapted to a natural wildfire disturbance regime, these natural regimes are changing as a result of climate change. The total area and the number of large fires has increased across Canada since 1959, when wildfire monitoring began (Natural Resources Canada, 2024). The *Climate Adaptation and Resiliency Technical Support Document: Existing Conditions and Effects Assessment Report* (AECOM, 2026) also predicts that the warmer weather and less snow in winter that is expected to result from climate change will increase the likelihood of wildfires in the Project area and that the wildfires will burn hotter and faster and consume a greater area than they did historically. This increased wildfire frequency and extent may ultimately influence the availability and distribution, composition, and function of peatlands. This effect cannot be quantified at this time but should be considered in future planning phases and in the development of the monitoring programs (**Section 9**).

7.3.1.11.2 Mitigation Measures

Construction

The following mitigation measures will be implemented during the Construction Phase:

- Limit the Project footprint, vegetation clearing and access road requirements to the extent feasible (e.g., share / coordinate access, concentrate temporary activities spatially, leave habitat outside the scoped Construction Disturbance Area, selective clearing, and use existing access roads when available). Reducing cleared areas and the number of access roads through coordination, can reduce the number of cleared areas and access roads that will be present during and following construction that may provide access to previously inaccessible lands;
- Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed and prevent ongoing use of inactive areas through combined use of physical control measures (rollback, removal of creek crossings, recontouring to surrounding topography, revegetation / reforesting and / or barriers at junctions with active access);

- Develop a policy for Project personnel while on shift or at temporary construction camps regarding any plant or timber harvesting activities; and
- Develop a wildfire prevention plan for the construction works that outlines protocols for hot works or any other activity with the potential to trigger a fire, required fire suppression equipment, and a response plan if a fire is triggered.

Operation and Maintenance

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

- Install access controls (e.g., gates and boulders) to control public vehicle travel on some temporary access routes and trails; and
- Install signage at regular intervals stating that any dumping is prohibited.

Marten Falls First Nation continues to engage in discussions with the Province regarding the ownership and future operations and maintenance of the Community Access Road. Access and ownership including gating security/ID system will require further dialogue between the communities and the Province.

7.3.1.11.3 Predicted Residual Effects

Construction, Operation and Maintenance

Public access is difficult to monitor and control, however the effects on peatlands (aside from the secondary effects including increased risk of spills of contaminants and spread of invasive species, which are addressed separately) from increased public access would be negligible. Increased public access is not predicted to result in a measurable negative effect on peatlands, therefore, this interaction is not carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.12 Changes to Peatland Carbon Storage Flux

7.3.1.12.1 Predicted Effects

Construction

Construction of the proposed Community Access Road could have a negative impact on soil organic carbon storage and carbon dioxide and methane fluxes currently occurring within the Construction Disturbance Area. Changes to peatland carbon storage flux has been noted as a concern by Indigenous communities who have provided feedback on the Project including Fort Albany First Nation and Weenusk First Nation (Firelight Research Inc., 2024; Fort Albany First Nation, 2020; Weenusk, 2024b). **Table 7-3** presents the calculated rates of storage and fluxes for the Construction Disturbance Area compared to the effects assessment Local Study Area.

Table 7-3: Summary of Carbon Storage and Carbon and Methane Flux within the Construction Disturbance Area

Type of Storage and Flux	Total for the Effects Assessment Local Study Area	Total for the Construction Disturbance Area	% of Value Calculated for the Effects Local Study Area
Soil Organic Carbon Storage (tonnes of carbon)	58,224,122 to 96,303,101	1,378,912 to 1,382,779	2%
Daily Carbon Dioxide Flux (tonnes CO_2/day)	-294 ± 1,014	0.06 ± 17	0%
Seasonal Carbon Dioxide Flux (tonnes CO_2/Growing Season)	-9,009 ± 31,041	1.88 ± 531	0%
Daily Methane Flux (tonnes CH_4/day)	12 ± 4	0.32 ± 0.14	3%
Seasonal Methane Flux (tonnes CH_4/Growing Season)	1,843 ± 609	49 ± 22	3%

% = percent; - = negative; ± = plus or minus; CO_2 = carbon dioxide; CH_4 = methane.

Based on the summary presented in **Table 7-3** and the results outlined in **Attachment C**, overall soil organic carbon storage within the Construction Disturbance Area represents 2% of the total soil organic carbon storage present in the effects assessment Local Study Area. The Construction Disturbance Area also represents 3% of the total daily and seasonal methane flux within the effects assessment Local Study Area.

For carbon dioxide flux, the Construction Disturbance Area differed from the effects assessment Local Study Area in that peatlands in the Construction Disturbance Area are considered an overall source of carbon dioxide rather than a sink. This was also confirmed through an analysis completed as part of the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions and Effects Assessment Volume 2* (Dillon, 2025) on the potential effects from Land Use Changes within the Construction Disturbance Area. This finding is largely due to a higher percentage of organic swamp peatlands in the Construction Disturbance Area (61% compared to 36% in the effects assessment Local Study Area). These peatlands are considered a source of carbon dioxide, not a carbon dioxide sink like bogs and fens. In other words, the Construction Disturbance Area will remove more peatlands that are considered a carbon source than those that are considered a carbon sink.

7.3.1.12.2 Mitigation Measures

Construction

As described in **Section 7.3.1.4**, to limit the disturbance and excavation of peat, a "floating road" construction methodology will be utilized where the proposed Community Access Road will be constructed on top of the peat. In addition, the following mitigation measures should be implemented during the Construction Phase of the Project.

- Limit vegetation clearing to within the 100 m right-of-way and reduce clearing to less than this width whenever and wherever possible;
- Minimize clearing widths in peatland ecosystems given the difficulty of restoring these systems.
  - Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction.
  - Limit clearing of riparian vegetation (i.e., within 30 m of waterbodies) to the extent possible and to the requirement of the access road and alignment clearing width only.
  - Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles in less sensitive ecosystems (e.g., upland ecosystems), where possible. Avoid peatland communities for temporary features wherever possible.
- Decommission and rehabilitate temporary access roads, staging areas, camps, and debris and / or timber stockpiles following construction. Details related to peatland rehabilitation will be determined at detailed design and/or when the Vegetation Restoration Plan is developed;
- Prepare and Implement a Vegetation Restoration Plan that includes measures specific to peatland communities and peatland restoration, including peat stockpile management. These measures will be determined at detailed design and/or when the Vegetation Restoration Plan is developed. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.; and
- Prepare and implement a Biodiversity Offset Plan.

7.3.1.12.3 Predicted Residual Effects

Construction, Operation and Maintenance

With the implementation of a "floating road" construction methodology in peatland communities, minimal change to the overall carbon storage capacity of the peat within the Construction Disturbance Area is anticipated.

Any changes in storage capacity will be limited to areas where peat excavation may be required for specific Project components (i.e., construction of footings for a crossing structure) and the loss of living and dead organic matter that may be removed to support the proposed construction (e.g., in thicket or treed peatland communities). The proposed Community Access Road is also expected to create a permanent barrier between the underlying peat and atmosphere. As such, both the carbon and methane flux within the Construction Disturbance Area will permanently cease to the extent indicated in **Table 7-3** for the Construction Disturbance Area and effects assessment Local Study Area. The effects assessment Local Study Area daily and seasonal methane flux will be reduced by approximately 3%, which would be considered a minor net benefit. Additionally, peatlands within the Construction Disturbance Area are minor carbon source rather than carbon sinks. Therefore, the effect of the proposed Community Access Road on carbon storage and carbon and methane flux within the effects assessment Local Study Area is expected to be negligible and this interaction is not carried forward to the residual effects characterization (**Section 7.3.2**).

7.3.1.13 Summary of Potential Effects, Mitigation Measures, and Identification of Residual Effects

Table 7-4 provides a summary of the potential effects due to Project–environment interactions during Construction and, Operation and Maintenance of the Project, mitigation measures, and the residual effects identified in previous sections.

Table 7-4: Summary of Potential Effects, Mitigation Measures and Predicted Residual Effects on Peatland Ecosystems

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	Construction	Changes to peatland ecosystem **availability**, **distribution composition** and **function** as a result of direct peatland loss	Mitigation measures that will be implemented during the Construction Phase to minimize direct loss to peatland ecosystems wherever and whenever possible are outlined below. ■ Limit vegetation clearing to within the 100 m right-of-way and reduce to less than this width whenever and wherever possible. Specifically, ○ Minimize clearing widths in peatland ecosystems to the extent feasible, given the difficulty of effective restoration of these ecosystems. ○ Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction. ○ Limit clearing of riparian vegetation (i.e., within 30 m of waterbodies) to the extent possible and to the requirement of the access road and alignment clearing width only. ○ Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles in less sensitive ecosystems (e.g., upland ecosystems), where feasible. Avoid peatland communities for temporary features wherever feasible. ■ Upon completion of construction, sand and gravel pits, including temporary access roads leading to the pits will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the Aggregate Resource Act, which will include backfilling, levelling, recompacting, and redistributing organic materials to encourage natural revegetation. Temporary access roads leading to temporary quarry areas will also be decommissioned. Temporary quarries not required for maintenance activities will be vegetated in accordance with the Rehabilitation Plan. Quarries maintained for operations will be blocked to discourage public use but facilitate access for ongoing road maintenance. The number of quarries required for maintenance will be determined during the detailed design phase . ■ Perform clearing and construction activities in winter months where feasible, to minimize compaction of peat. A review of the project construction schedule will be completed during detailed design to coordinate work based on environmental timing windows and timing restrictions. ■ Develop and implement a Project-specific Environmental Protection Plan. ■ Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan. ■ Design and implement a program to monitor for peatland condition in the vicinity of project activities. The program will include science-based thresholds or indicators of peatland condition based on research and established standards, like those presented in Minasny et. al, 2023, as well as mitigation and adaptive response plan to prevent long term damage or carbon release. Details regarding the thresholds and indicators as well as the number of monitoring locations and the length of the monitoring period will be determined in subsequent Project phases. ■ Prepare and Implement a Vegetation Restoration Plan that includes measures specific to peatland ecosystems and peatland restoration, including peat stockpile management. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.: ○ Given the difficulty of restoring peatland environments and the overall size of the Construction Disturbance Area, if it's determined that restoration of all temporarily impacted peatland communities is not feasible, additional examination of the Construction Disturbance Area may be required to determine where peatland restoration efforts are required. Restoration techniques for peatland communities should follow established	Residual effects on the availability and distribution of peatlands

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
				practices that have previously been shown to be successful in the establishment of appropriate ecological conditions including plant assemblages (i.e., the re-establishment of peat moss layers) and hydrology. Consideration should also be given to the type of community being restored. For example, the Moss Layer Transfer Technique is one method generally used for the re-establishment of bog and poor fen systems (Quinty et al., 2019). However, new methods or adjustments to existing techniques may be required for other peatland community types given the differences in species presence and hydrological conditions (i.e., best practices for bog restoration may not be applicable to fen community types) (Quinty et al., 2019). See **Sections 9 and 10** for commitments and recommendations for the development of future Vegetation Restoration Plan and Preliminary Biodiversity Offset Plan.	
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ Avoid re-entry and disturbance of restored temporary access areas post-construction. ■ Design and implement a program to monitor for peatland condition in the vicinity of project activities. The program will include science-based thresholds or indicators of peatland condition based on research and established standards, like those presented in Minasny et. al, 2023, as well as mitigation and adaptive response plan to prevent long term damage or carbon release. Details regarding the thresholds and indicators as well as the number of monitoring locations and the length of the monitoring period will be determined in subsequent Project phases.	No predicted residual effect
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	Construction	Changes to peatland ecosystems as a result of changes to hydrology	■ A list of mitigation measures to limit changes to surface water quantity and quality during Construction, Operation and Maintenance is provided in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e). Additional mitigation measures that will be implemented during the Construction Phase, specific to peatlands include: ■ During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of surface water; ■ Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan; ■ Design and implement a pre-, during- and post-construction monitoring program that assesses surface water movement and helps to ensure that pre-construction conditions are maintained to the extent feasible (**Section 9**); and ■ Implement adaptive management measures if drainage patterns are determined to be significantly altered. Adaptive management measures will be determined through the development of the Environmental Protection Plan.	Residual effects on the composition and function of retained peatlands
	■ Road Usage ■ Maintenance	Operation and Maintenance			
	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a)	Construction	Changes to peatland ecosystems as a result	■ A list of mitigation measures to limit changes to groundwater quantity and quality during Construction is provided in the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c).	Residual effects on the composition and function of retained peatlands

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
	■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas		of changes to groundwater	Additional mitigation measures that will be implemented during the Construction Phase, specific to peatlands include: ■ Construct the Community Access Road through peatland communities using a “floating road” construction methodology to allow for groundwater movement below and through the road embankment. This approach will involve: ○ Completion of a detailed ground survey, characterizing the peat and local hydrology at a later stage of the project / detailed design. ○ Site-specific identification of appropriate values for peat strength. ○ Use of a geogrid base to act as a separator and strengthener between the road subgrade fill materials and the peat. ○ Use of additional geogrid and geotextile materials in layers combined with road aggregate material above the embankment fill to form a mechanically stabilized layer. This layer will provide the required strength and stiffness for the road to perform during all seasons, including spring thaw. ○ Design the Floating Road Plan, profile and cross-section for each road section based on context-sensitive design standards, geometry and loading. ○ Provide transitions between “floating road” sections, excavated, and fill sections. ○ Schedule construction to allow for primary settlement of the peat without risk of shear failure. ○ Monitor the work through construction, measuring and recording lateral movement and settlements. Be prepared to adjust the design based on observation and monitoring. ■ During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of groundwater. This can help to minimize the impacts on local carbon and methane emissions and increased enzyme activity noted above (Saraswati and Strack, 2019; Saraswati et al., 2019; Saraswati et al., 2023). ■ Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan. ■ Design and implement a pre-, during- and post-construction monitoring program that assesses surface and groundwater movement and allows for the maintenance of pre-construction conditions to the extent feasible (**Section 9**). This includes the creation of a monitoring program that involves geochemical testing on exposed bedrock and soils to assess the potential for acid rock drainage and / or metal leaching as it relates to methylmercury production in peatland communities present within the Construction Disturbance Area. The program will also monitor potential increases in methylmercury production related to changes in groundwater levels as a result of the construction of the Community Access Road. ■ Implement adaptive management measures if groundwater flow patterns are determined to be significantly altered. Adaptive management measures will be determined through the development of the Environmental Protection Plan.	
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ A list of mitigation measures to limit changes to groundwater quantity and quality during Operation and Maintenance is provided in the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c).	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a)	Construction	Changes to peatland ecosystems from the introduction and spread of invasive plant species	■ An Environmental Protection Plan will be developed, and will be implemented during construction to prevent, detect, control (i.e., remove), and monitor areas with invasive species. The plan will also include the following measures:	Residual effects on the composition and function of retained peatlands

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
	■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas			○ Thoroughly inspect and clean construction equipment and vehicles prior to bringing them to the work area and when moving between work areas within the Project. Cleaning shall be completed in accordance with the most up to date version of the Clean Equipment Protocol for Industry (Halloran et al., 2013). Documentation of the results of each inspection will be a requirement of the Environmental Protection Plan. Additional recommendations for the cleaning of equipment (e.g., the use of specific cleaning stations and their location) will be determined through the development of the Environmental Protection Plan. ○ Use reduced disturbance techniques to prevent topsoil removal and preserve adequate substrate to promote natural revegetation (e.g., use a low impact method to leave the surface vegetation root mat intact). ○ Contour disturbed areas to minimize soil and water erosion and encourage growth of native vegetation. ○ Limit off-road vehicle use by contractors during Construction. Inspections and maintenance activities will include cleaning of off-road vehicles before and after each use to prevent the spread of invasive species. Recommendations related to the use of off-road vehicles will be determined at detailed design and / or through the development of the Environmental Protection Plan. ○ Use seed mixes with appropriate native species for all seeding and restoration works. Seed mixes must be tested / certified to be free of invasive species. Native seed should be sourced from local populations whenever possible. ■ Require that the road operator follow Ministry of Transportation Ontario *Provincial Standard Specification 803* to avoid spreading invasive plant species. ○ Remove and manage invasive species using manual and mechanical means. Herbicides will not be used.	
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ Include the following measures as part of the Environmental Protection Plan to prevent, detect, control (i.e., remove), and monitor areas with invasive species: ○ Limit off-road vehicle use by contractors during Operation and Maintenance. Inspections and maintenance activities will include cleaning of off-road vehicles before and after each use to prevent the spread of invasive species. ○ Require that the road operator follows Ministry of Transportation Ontario *Provincial Standard Specification 803* to avoid spreading invasive plant species ○ Herbicides 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. ○ Design and implement a post-construction invasive species monitoring program to detect invasive species presence and control (i.e., remove) new introductions. Details of the post-construction invasive species monitoring program will be included in the Environmental Protection Plan.	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production	Construction	Changes to peatland ecosystems as a result of fragmentation and edge effects	Mitigation measures that will be implemented during the Construction Phase are as follows: ■ Adjust the alignment or clear off centre within the right-of-way to minimize peatland fragmentation and the creation of new forested swamp edges, where feasible. These details will be refined during detailed design. ■ Construct temporary laydown areas and temporary construction camps on existing disturbed areas, wherever possible. The availability of existing disturbed areas for the construction of temporary laydown areas and temporary construction camps will be determined at detailed design.	Residual effects on the composition and function of retained peatlands

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
	■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas			■ Avoid grubbing along newly created forested swamp edges to promote natural regeneration which will quickly "seal" the new forested swamp edge. ■ Use reduced disturbance techniques during construction to prevent topsoil removal, preserve adequate substrate to promote natural revegetation (e.g., use a low impact method to leave the surface vegetation root mat intact). Recommendations for reduced disturbance techniques will be described in detailed design.; and ■ Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed. Progressive restoration techniques will be provided in the Environmental Protection Plan.	
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ No additional mitigation measures are recommended during the Operation and Maintenance Phase.	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	Construction	Changes to peatland ecosystems from the release of sediment	■ Develop and implement a Project-specific Environmental Protection Plan. ■ Develop and implement a Project-specific Erosion and Sediment Control Plan. Erosion and sediment control measures will be developed and implemented in accordance with Ontario Provincial Standard Specifications (Ontario Provincial Standard Specifications *OPSS.PROV.804* and *OPSS.MUNI.805*). Environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction. Installed erosion and sediment control measures are not expected to affect the water movement to peatlands. ■ Regularly inspect and maintain Erosion and Sediment Control structures (e.g., sediment fences, rip rap, or other sediment control structures) in accordance with Ontario Provincial Standard Specifications *OPSS.PROV 804* during all phases of the Project and modify measures as necessary. If control measures are not functioning properly, no further work will occur until the problem is resolved. ■ Stabilize disturbed areas through revegetation with native plant species or other appropriate means (e.g., erosion control blankets) following completion of the works. ■ Reschedule work or reduce traffic in areas where soils are considered to be excessively wet or where there is a heavy rainfall risk. ■ Earthworks should be avoided during periods of heavy rainfall, particularly in areas adjacent to watercourses and wetlands. Areas where a reduction in traffic are required will be determined during the detailed design phase. ■ Adhere to all mitigation measures outlined in the *Fish & Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment* Report (WSP, 2026b) and the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e).	No predicted residual effect
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal	Construction	Changes to peatland ecosystems from spills of fuel or other contaminants	■ Mitigation measures described in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2025c), *Physiography, Terrain, and Soils Technical Support Document: Existing Conditions & Effects Assessment* (WSP, 2026d), and *Vegetation Existing Conditions & Effects Assessment Report* (WSP, 2026h) will be implemented to minimize effects from spills of fuel and other contaminants to peatland ecosystems.	No predicted residual effect

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
	■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas				
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ During operations, mitigation measures will include a posting and enforcement of a speed limit on the highway, which should reduce potential for chemical or hazardous material spills by reducing vehicle collision risk. ■ A detailed list of mitigation measures to limit the risk and effects from spills of fuel and other contaminants during Operation and Maintenance is provided in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c), *Physiography, Terrain, and Soils Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026d).	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	Construction	Changes to peatland ecosystems as a result of the deposition of air contaminants	■ A list of mitigation measures that will be implemented to limit air particulate emissions during construction is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). The effectiveness of mitigation measures will be evaluated during construction, and mitigation measures will be modified or enhanced as necessary through adaptive management. ■ Environmental approval conditions, permits, or authorizations issued for the Project Construction, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction.	Residual effects on the composition and function of retained peatlands

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ A list of mitigation measures that will be implemented to limit air particulate emissions during Operation and Maintenance is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). The effectiveness of mitigation measures will be evaluated during Operation and Maintenance, and mitigation measures will be modified or enhanced as necessary through adaptive management.	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	Construction	Changes to peatland ecosystems as a result of fugitive dust emissions	■ A list of mitigation measures that will be implemented to limit dust deposition during Construction is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). These measures will be implemented to minimize effects from dust emissions and deposition on peatland ecosystems. The effectiveness of mitigation measures will be evaluated during construction, and mitigation measures will be modified or enhanced as necessary through adaptive management. ■ Environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction.	Residual effects on the composition and function of retained peatlands
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ A list of mitigation measures that will be implemented to limit dust deposition during Operation and Maintenance is provided in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). The effectiveness of mitigation measures will be evaluated during Operation and Maintenance, and mitigation measures will be modified or enhanced as necessary through adaptive management.	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures,	Construction	Changes to peatland ecosystems as a result of increased public access	■ Limit the Project footprint, vegetation clearing and access road requirements to the extent feasible (e.g., share / coordinate access, concentrate temporary activities spatially, leave habitat outside the scoped Construction Disturbance Area, selective clearing, and use existing access roads when available). Reducing cleared areas and the number of access roads through coordination, can reduce the number of cleared areas and access roads that will be present during and following construction that may provide access to previously inaccessible lands; ■ Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed and prevent ongoing use of inactive areas through combined use of physical control measures (rollback, removal of creek crossings, recontouring to surrounding topography, revegetation / reforesting and / or barriers at junctions with active access);Develop a policy for Project personnel while on shift or at temporary construction camps regarding any plant or timber harvesting activities; and	No predicted residual effect.

Valued Component(s)	Project Activities	Project Phase	Description of Potential Effect	Mitigation Measures	Predicted Residual Effect
	superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas			■ Develop a wildfire prevention plan for the construction works that outlines protocols for hot works or any other activity with the potential to trigger a fire, required fire suppression equipment, and a response plan if a fire is triggered.	
	■ Road Usage ■ Maintenance	Operation and Maintenance		■ Install access controls (e.g., gates and boulders) to control public vehicle travel on some temporary access routes and trails. ■ Install signage at regular intervals stating that any dumping is prohibited.	
Peatland Ecosystems	■ Mobilization of equipment and supplies ■ Temporary construction staging areas(a) ■ Temporary access roads and trails(a) ■ Temporary construction camps(a) ■ Right-of-way clearing and grubbing ■ Brush and timber disposal ■ Pits and quarries(a) ■ Drilling / blasting / aggregate production ■ Road construction (stripping, subgrade excavation, embankment fill placement, grading, ditching) ■ Bridge and culvert installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls) ■ Construction site restoration ■ Pits and quarries will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resources Act* ■ Decommissioning of temporary camps, roads / trails and staging areas	Construction	Changes to peatland ecosystem carbon storage and flux	■ As described in **Section 7.3.1.4**, to limit the disturbance and excavation of peat, a “floating road” construction methodology will be utilized where the proposed Community Access Road will be constructed on top of the peat. ■ Limit vegetation clearing to within the 100 m right-of-way and reduce to less than this width whenever and wherever possible. ○ Minimize clearing widths in peatland ecosystems given the difficulty of restoration efforts in these systems. ○ Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction. ○ Limit clearing of riparian vegetation (i.e., within 30 m of waterbodies) to the extent possible and to the requirement of the access road and alignment clearing width only. ○ Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles in less sensitive ecosystems (e.g., upland ecosystems), where possible. Avoid peatland communities for temporary features wherever possible. ■ Decommission and rehabilitate temporary access roads, staging areas, camps, and debris and / or timber stockpiles following construction. Details related to peatland rehabilitation will be determined at detailed design and/or when the Vegetation Restoration Plan is developed. ■ Prepare and Implement a Vegetation Restoration Plan that includes measures specific to peatland communities and peatland restoration, including peat stockpile management. These measures will be determined at detailed design and/or when the Vegetation Restoration Plan is developed. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.	No predicted residual effect

Notes:
(a) Includes general maintenance (e.g., grading, erosion control, quarrying, and borrow pits), seasonal maintenance (e.g., snow clearing and bridge and culvert maintenance), and special maintenance (e.g., slope failures and road settlement / break-up).
m = metre.

7.3.2 Characterization of Predicted Residual Effects

Even assuming effective implementation of all the mitigation measures presented in **Table 7-4**, the Project is predicted to have residual effects on peatland ecosystems. These are characterized in terms of context, direction, magnitude, geographic extent, duration; frequency, reversibility, likelihood and uncertainty (**Section 4.4.2**). A description of the predicted residual effects of the Project on peatland ecosystems, is presented below and summarized in **Table 7-5**.

7.3.2.1 Residual Effects on the Availability and Distribution of Peatland Ecosystems as a Result of Direct Peatland Loss

The construction of the Community Access Road will result in the direct loss of area from peatland communities, representing <1% of the extent of these ecosystems within the effects assessment Regional Study Area. This is a conservative estimate as it assumes the full 100 m width of the right-of-way and the full footprint area of all other components of the Construction Disturbance Area (e.g., staging areas, temporary access roads, and camps) will be permanently affected (i.e., cleared, grubbed, and not restored). However, with the implementation of the recommended mitigation measures outlined in **Section 7.3.1** and **Table 7-4**, the actual area of direct peatland loss is expected to be less than this. Anticipated restoration and implementation of a Biodiversity Offset Plan (**Section 9**) will also serve to reduce the long-term residual effects on peatland ecosystems as a result of direct peatland loss.

After implementation of the mitigation measures, the effects of direct peatland ecosystem loss on the availability and distribution of peatland ecosystems will be **permanent** (irreversible) and **long term** in duration. The effects are **certain** to occur, and the changes are **negative**; however, because the loss will be relatively small in extent, the magnitude is considered **low**. As a result, the residual effects of direct peatland loss on the availability and distribution of peatland ecosystems are determined to be **not significant**.

7.3.2.2 Residual Effects on the Composition and Function of Peatland Ecosystems as a Result of Direct Peatland Loss

As noted above, construction of the Community Access Road will result in the direct loss of peatland communities, representing <1% of these ecosystems within the effects assessment Regional Study Area. The composition and function of peatland ecosystems within the effects assessment Local and Regional Study Areas will also be affected by this direct peatland loss through loss of associated wildlife habitat availability, biodiversity, and capacity of the affected peatlands to conduct important hydrological, biogeochemical and local climate regulating functions.

After implementation of the mitigation measures, the effects of direct peatland ecosystem loss on the composition and function of peatland ecosystems will be **permanent** (irreversible), and therefore **long term**. The effects are **certain** to occur, and the changes are **negative**; however as noted above, the magnitude is considered **low** as the area lost will be small relative to that which is existing. Accordingly, the residual effects of direct peatland loss on the composition and function of peatland ecosystems are determined to be **not significant**.

7.3.2.3 Residual Effects on Peatland Ecosystems as a Result of Changes to Hydrology

The construction of the Community Access Road may cause alterations to drainage patterns and increased / decreased drainage flows and surface water levels, thereby affecting associated peatland communities. However, with the effective implementation of the mitigation measures (detailed in **Section 7.3.1** and **Table 7-4**) and the use of best management practices, it is anticipated that residual changes to peatland ecosystems from changes to hydrology will be reduced or moderated, as well as regulated through permitting.

Changes to peatland ecosystems resulting from changes in hydrology that may alter drainage patterns and increase or decrease drainage flows and surface water levels are expected to be **negative** in direction, **negligible** in magnitude, **local** in geographic extent, **long-term**, **infrequent**, **irreversible**, and **possible**. As a result, the residual effects as a result of changes to hydrology on peatland ecosystems are determined to be **not significant**.

7.3.2.4 Residual Effects on Peatland Ecosystems as a Result of Changes to Groundwater

The construction of the Community Access Road may cause alterations to drainage patterns and increased / decreased groundwater levels, thereby affecting associated peatland communities. However, with the effective implementation of the mitigation measures (detailed in **Section 7.3.1** and **Table 7-4**) and the use of best management practices, it is anticipated that residual changes to peatland ecosystems from changes to groundwater will be reduced or moderated, as well as regulated through permitting (e.g. provincial Permit to Take Water). Although pit and quarry dewatering have the potential to alter groundwater levels near excavations, the total number and area of pit and quarry sites is small compared to the size of the effects assessment Regional Study Area. Potential effects on peatland communities would therefore not be expected to result in a net residual effect on ecosystem or population availability, distribution, composition or function.

Construction of the Community Access Road through peatlands also has the potential to alter groundwater quality, quantity and flow, altering the availability of peatlands and peatland processes. Mitigation measures, namely construction of the road using the "floating road" construction methodology and implementation of a monitoring program, are expected to limit residual changes. However, there is uncertainty about the effectiveness of this mitigation and measurable changes to groundwater levels and groundwater quality near the road are possible.

Changes to peatland ecosystems resulting from changes in groundwater that may alter drainage patterns, impair groundwater quality, and increase or decrease groundwater levels are expected to be **negative** in direction, **medium** in magnitude, **local** in geographic extent, **long term**, **continuous**, **irreversible**, and **probable**. However, there is high uncertainty in the magnitude of predicted effects of the "floating road" on the maintenance of peatland function. Concerns were expressed by multiple Indigenous communities that reviewed the draft Environmental Assessment / Impact Statement due to high uncertainty with the effects that the "floating road" construction will have in peatland ecosystems through this pathway. As a result, the residual effects as a result of changes to groundwater on peatland ecosystems are determined to be **significant**.

7.3.2.5 Residual Effects on Peatland Ecosystems as a Result of the Introduction and Spread of Invasive Plant Species

During Construction, Operation and Maintenance, invasive plant species may occasionally be introduced within the effects assessment Construction Disturbance Area. Best management practices and mitigation measures for controlling the spread of invasive species are well understood and the methods have been demonstrated to be effective, particularly if newly detected species are removed quickly.

After implementation of mitigation, effects from the introduction of invasive plants are predicted to be **possible**, **reversible** in the short term, **infrequent**, and confined to the Construction Disturbance Area. Effects from the introduction of invasive plants on peatlands in the effects assessment Local Study Area are anticipated to be **negative** but **negligible** in magnitude. As a result, the residual effects on peatlands due to the introduction and spread of invasive plant species are determined to be **not significant**.

7.3.2.6 Residual Effects on Peatland Ecosystems as a Result of Fragmentation and Edge Effects

Secondary effects on retained peatland communities, particularly coniferous treed organic swamp communities, may occur following the clearing of the right-of-way during construction of the Project. These include changes to community composition and function as a result of sunscald, desiccation, and windthrow.

After implementation of mitigation, edge effects are predicted to be **probable**, **reversible** in the medium-term, **frequent**, and limited to the effects assessment Local Study Area. These edge effects are anticipated to be **negative**, but **negligible** in magnitude, particularly given that boreal forests are generally adapted to large-scale natural disturbances (Harper et al., 2015) and are less influenced by fragmentation and edge effects than temperate and tropical forests (Franklin et al., 2021). As a result, residual effects as a result of edge effects on peatland ecosystems are determined to be **not significant**.

7.3.2.7 Residual Effects on Peatland Ecosystems from the Deposition of Air Contaminants

Soil contamination from emissions of criteria air contaminants during Construction, Operations and Maintenance of the Project may have negative effects on soils and peatland communities.

After implementation of mitigation, soil contamination from the emissions of criteria air contaminants is predicted to be **possible, permanent** (irreversible), **continuous**, and confined to the effects assessment Local Study Area. These effects will be **negative** but **negligible** in magnitude. As a result, the residual effects as a result of soil contamination from deposition of air contaminants on peatland ecosystems are determined to be **not significant**.

7.3.2.8 Residual Effects on Peatland Ecosystems from Fugitive Dust Emissions

Project Construction, Operation and Maintenance are expected to increase dust emissions. Although mitigations will be implemented to reduce dust emissions, dust deposition during Project construction and operations is predicted to degrade vegetation immediately adjacent to the Project.

Effects from dust emissions are predicted to be **certain**, **permanent** (irreversible), **continuous**, and confined to the effects assessment Local Study Area. Effects from dust emissions on peatland ecosystems in the effects assessment Local Study Area are anticipated to be **negative**, but **negligible** in magnitude. As a result, the residual effects as a result of fugitive dust emissions on peatland ecosystems are determined to be **not significant** because the effects from dust are not expected to affect the ability of peatland ecosystems to be self-sustaining and ecologically effective at the Regional Study Area level.

7.3.3 Assessment of Significance

The assessment of the overall significance of residual effects of the Project is informed by the interaction between above assessment ratings for each residual effect, with magnitude and geographic extent being the most important. Consideration is also given to context, which includes ecological context (i.e., the sensitivity and resilience of the Valued Components, i.e., peatland ecosystems), and social context (i.e., the concerns of

Indigenous communities, interested agencies, groups and individuals that were raised during consultation and engagement and in review comments on the Environmental Assessment reports). Implementation of industry standard mitigation measures is expected to aid in the avoidance or reduction of the magnitude, geographic extent, and / or duration of residual effects on peatland ecosystems. See **Section 4.4.2.6** for further explanation about the approach to the assessment of significance.

The magnitude of the predicted residual effects described above is either negligible, low or medium and the extent ranges from being confined to the Construction Disturbance Area to local (i.e., the effects assessment Local Study Area). Based on these and other ratings, most residual effects are considered **not significant** because they are not expected to compromise the long-term viability of peatland ecosystems. A high uncertainty rating has been assigned to two of the residual effects (i.e., residual changes to peatland ecosystems due to changes in groundwater that may alter drainage patterns, groundwater regimes, or groundwater quality and residual changes to peatland ecosystems due to changes in hydrology that may alter drainage patterns and increase or decrease drainage flows and surface water levels). The uncertainty related to these effects is in regards to the lack of a full understanding of peatland hydrology and hydrogeology in the effects assessment Local and Regional Study Areas, as well as uncertainty regarding the preliminary design details and effectiveness of the primary design-related mitigation measure (i.e., the “floating road”). Given the high uncertainty and probable likelihood of occurrence (versus the possible likelihood of occurrence for the residual effects to hydrology), a precautionary approach has been taken and the residual effects associated with groundwater (quantity and quality) are determined to be **significant** at this time. There are commitments to address gaps in knowledge during future stages of the project (See **Section 9** and **Section 10**), thereby reducing the high uncertainty that has been conservatively assigned in this assessment. With an improved understanding of peatland hydrology and hydrogeology in the study areas and associated refined road design within peatlands that will be developed during future stages of the project, it is expected that the uncertainty associated with the two residual effects will be lessened and peatland ecosystems will continue to be self-sustaining and ecologically effective.

Based on the weight of evidence from the analysis, uncertainty in effects predictions, specifically those associated with the “floating road” approach to construction and operation, and application of the precautionary approach, Project-related changes in the availability, distribution, composition, and function of peatland ecosystems could occur. Specifically, those changes to peatland ecosystems associated with groundwater quantity and quality were assessed as significant. As a result, the combined residual effects from the Project on peatland ecosystems are predicted to be **significant**.

A summary of the predicted residual effects of the Project on peatlands is provided in **Section 7.3.1.4**, including the assessment of significance for each predicted residual effect.

7.3.3.1 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 peatland assessment include:

- Availability and accuracy of existing conditions data (e.g., accuracy of vegetation and peatland mapping);
- Level of understanding of existing peatland conditions, range of natural variation, and the resilience of peatlands 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 peatland ecosystems); and
- Level of certainty associated with the effectiveness of proposed mitigations, where applicable.

Uncertainty was managed by:

- Rolling-up the peatland mapping from ecosites to peatland community groupings (i.e., bog, fen, organic marsh, and organic swamp) and completing the effects assessment on these groupings This reduces uncertainty because the confidence that an area is classified correctly as a fen is greater than the certainty that a more granular classification is correct (e.g., Open Moderately Rich Fen);
- Completing quality assurance and quality control of existing conditions data;
- Applying conservative assumptions regarding the footprint area and related Project activities that may cause disturbance or direct peatland loss to increase confidence that the effects were not underestimated; and
- Comparing assessment results to relevant published scientific literature.

Overall, there is a **low** to **high** degree of confidence in the predictions regarding Project residual effects on peatland ecosystems. Mitigation measures and best management practices will be implemented to reduce effects on peatland ecosystems and there is a high level of confidence in most of these as they are routinely and effectively implemented across Canada. One notable exception to this is the “floating road” design mitigation proposed for the development of this Project within peatland ecosystems. This type of road design is relatively novel with only one known recent example in northern Manitoba. While the project in northern Manitoba indicates promising results approximately ten years post-construction, long term effectiveness of this design is unknown. This has resulted in low confidence in the predictions made about its ability to maintain groundwater flow and in turn groundwater quality on either side of the road within peatland ecosystems.

This is coupled with the lack of available data specific to peatland hydrogeology and water balance also have resulted in low confidence in the predictions within this residual effect pathway at this time.

Overall, confidence levels are **moderate** because there were existing conditions data for the effects assessment Local Study Area, the Project-related effects are mostly understood, and the level of certainty associated with the effectiveness of proposed mitigations is high.

7.3.4 Summary

Table 7-5 provides a summary of the characterization of predicted residual effects and the determination of significance for peatland ecosystems.

Table 7-5: Characterization of Predicted Residual Effects and Determination of Significance for Peatlands

Valued Component	Predicted Residual Effect	Phase	Context	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance	Uncertainty	Direct / Indirect
Peatland Ecosystems	Residual changes to peatland ecosystem availability and distribution as a result of **direct peatland loss**	Construction	Peatland ecosystems represent approximately 66% of the effects assessment Local Study Area and 64% of the effects assessment Regional Study Area.	Negative	**Low** 2,150.6 ha or <1% of the peatland ecosystems within the effects assessment Regional Study Area will be directly affected	Construction Disturbance Area	**Long term** and **irreversible** (for permanent impacts) **Long term** and **reversible** (for temporary impacts where peatland ecosystems can and will be restored)	Continuous	Certain	Not Significant	Moderate	Direct
	Residual changes to peatland ecosystem composition and function as a result of **direct peatland loss**	Construction	Peatland ecosystems represent approximately 66% of the effects assessment Local Study Area and 64% of the effects assessment Regional Study Area.	Negative	**Low** 2,150.6 ha or <1% of the peatland ecosystems within the effects assessment Regional Study Area that provide ecosystems services such as habitat and hydrological, biogeochemical and climate regulating functions will be directly affected	Construction Disturbance Area	**Long term** and **irreversible** (for permanent impacts) **Long term** and **reversible** (for temporary impacts where peatland ecosystems can and will be restored)	Continuous	Certain	Not Significant	Moderate	Direct
	Residual changes to peatland ecosystems due to **changes to hydrology** that may alter drainage patterns and increase or decrease drainage flows and surface water levels	Construction	Mitigations to limit changes to hydrology are well understood and the methods have been demonstrated to be effective.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas	Local	Long term	Infrequent	Possible	Not Significant	High	Indirect
	Residual changes to peatland ecosystems due to **changes to groundwater** that may alter drainage patterns, groundwater regimes, or groundwater quality.	Construction	Mitigations to limit changes to groundwater are well understood and the methods have been demonstrated to be effective for the majority of effect pathways. However, there is uncertainty about the effectiveness of the “floating road” methodology.	Negative	**Medium** Measurable changes to groundwater quantity and quality possible that result in changes to ecosystem and population availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas	Local	Long term	Continuous	Probable	Significant	High	Indirect
	Residual changes to peatland ecosystems due to **changes to groundwater** that may alter drainage patterns,	Operation and Maintenance	Mitigations to limit changes to groundwater are well understood and the methods have been demonstrated to be effective for the majority of	Negative	**Medium** Measurable changes to groundwater quantity and quality possible that result in	Local	Long term	Continuous	Probable	Significant	High	Indirect

Valued Component	Predicted Residual Effect	Phase	Context	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance	Uncertainty	Direct / Indirect
	groundwater regimes, or groundwater quality.		effect pathways. However, there is uncertainty about the effectiveness of the "floating road" method.		changes to ecosystem and population availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas							
	Residual changes to peatland ecosystems as a result of the **introduction and spread of invasive plant species**	Construction	Limited existing human disturbance has resulted in limited potential for invasive species to be present in the Construction Disturbance Area. No invasive plant species were documented during field surveys. Mitigations to limit the introduction and spread of invasive plants are well understood and the methods have been demonstrated to be effective.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas, relative to existing conditions	Construction Disturbance Area	Long term	Infrequent	Possible	Not Significant	Low	Indirect
	Residual changes to peatland ecosystems as a result of the **introduction and spread of invasive plant species**	Operations and Maintenance	Limited existing human disturbance has resulted in limited potential for invasive species to be present in the Construction Disturbance Area. No invasive plant species were documented during field surveys. Mitigations to limit the introduction and spread of invasive plants are well understood and the methods have been demonstrated to be effective.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas, relative to existing conditions	Construction Disturbance Area	Long term	Infrequent	Possible	Not Significant	Low	Indirect
	Residual changes to peatland ecosystems as a result of **fragmentation and edge effects**	Construction	The Project is located in a landscape that is largely intact, however there are natural disturbances (e.g., fire) that have influenced the landscape as well as some small areas of anthropogenic disturbances. The Project will introduce new anthropogenic disturbances that will cause fragmentation and edge effects.	Negative	**Negligible** in magnitude, given that boreal forests are generally adapted to large-scale natural disturbances and are less influenced by fragmentation and edge effects than temperate and tropical forests	Local	Medium term	Frequent	Probable	Not Significant	Moderate	Indirect

Valued Component	Predicted Residual Effect	Phase	Context	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance	Uncertainty	Direct / Indirect
	Residual changes to peatland ecosystems as a result of the **deposition of air contaminants**	Construction	Construction of the Project is expected to generate air particulate emissions, including carbon monoxide, sulphur oxides (including sulphur dioxide), nitrogen oxides, and particulate matter.	Negative	**Negligible** changes to peatland ecosystems availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas	Local	Long term	Continuous	Possible	Not Significant	Low	Indirect
	Residual changes to peatland ecosystems as a result of the **deposition of air contaminants**	Operations and Maintenance	Operation and Maintenance of the Project are expected to generate air particulate emissions, including carbon monoxide, sulphur oxides (including sulphur dioxide), nitrogen oxides, and particulate matter.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas	Local	Long term	Continuous	Possible	Not Significant	Low	Indirect
	Residual changes to peatland ecosystems as a result of the **fugitive dust emissions**	Construction	Construction of the Project is expected to produce fugitive dust emissions.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas	Local	Long term	Continuous	Certain	Not Significant	Low	Indirect
	Residual changes to peatland ecosystems as a result of the **fugitive dust emissions**	Operation and Maintenance	Operation and Maintenance of the Project are expected to produce fugitive dust emissions.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Local and Regional Study Areas	Local	Long term	Continuous	Certain	Not Significant	Low	Indirect

% = percent; ha = hectare; < = less than.

8. Cumulative Effects Assessment

The *Canadian Environmental Assessment Act, 2012* (Government of Canada, 2019) requires that each Environmental Assessment of a project take into account 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.

This section presents the assessment of potential cumulative effects completed as part of the Project. The effects of past and present activities on the effects assessment Regional Study Area and Valued Components identified for the Project were assessed and results are described in the following sections.

8.1 Cumulative Effects Scoping

8.1.1 Valued Components with Residual Effects

The cumulative effects assessment builds on the results of the residual 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. A cumulative effects assessment was not completed in the following cases:

- Where no residual effects were identified in **Section 7**;
- The magnitude of the residual effect was rated as negligible, and the probability of occurrence was unlikely or possible; and
- The residual effect was positive in direction.

Residual effects that have been carried forward for cumulative effects assessment are described in **Table 8-1**.

Table 8-1: Valued Components and Residual Effects

Valued Component	Residual Effect
Peatland Ecosystems	■ **Direct Peatland Loss**–Direct removal of 4,532.5 ha of peatland ecosystems, representing <1% of the peatland ecosystems within the effects assessment Regional Study Area. Loss of this area affects the availability, distribution, composition, and function of peatland ecosystems within the landscape.
	■ **Changes to Groundwater**–Project activities may cause alterations of groundwater quality, drainage patterns, levels and discharge rates, which can change the composition and function of retained peatland communities.
	■ **Fragmentation and Edge Effects–**The Project will introduce new anthropogenic disturbances that will cause fragmentation and edge effects (i.e., introduction and spread of invasive species, sunscald, desiccation, and windthrow). These effects influence the composition and function of the retained peatland communities, particularly coniferous treed organic swamp communities, resulting in secondary effects (e.g., changes to community composition or function). Edge effects on open bog, fen and organic marsh peatland communities are likely to be more related to hydrological or hydrogeological changes (e.g., water pooling and drying of peat).
	■ **Fugitive Dust Emissions–**Accumulation of airborne dust produced from the Project can affect plant health, and alter plant species composition, structure, and biomass in affected areas.

ha = hectare; < = less than; % = percent.

8.1.2 Spatial and Temporal Boundaries

Temporal boundaries for the cumulative effects assessment correspond to the predicted duration of the likely residual adverse effects of the Project. 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.

The spatial boundary for the cumulative effects assessment corresponds to the geographic extent of the likely residual adverse effects of the Project that are predicted to occur. The study area used in the cumulative effects assessment is the same as the peatlands effects assessment Regional Study Area used for the residual effects assessment (**Section 4.2.3.2**).

Table 8-2: Spatial and Temporal Boundaries

Valued Component	Spatial Boundary	Temporal Boundary
Peatland Ecosystems	Quaternary watersheds that overlap with the peatlands existing conditions Local Study Area	■ Construction ■ Operation and Maintenance

8.1.3 Physical Activities Inclusion List

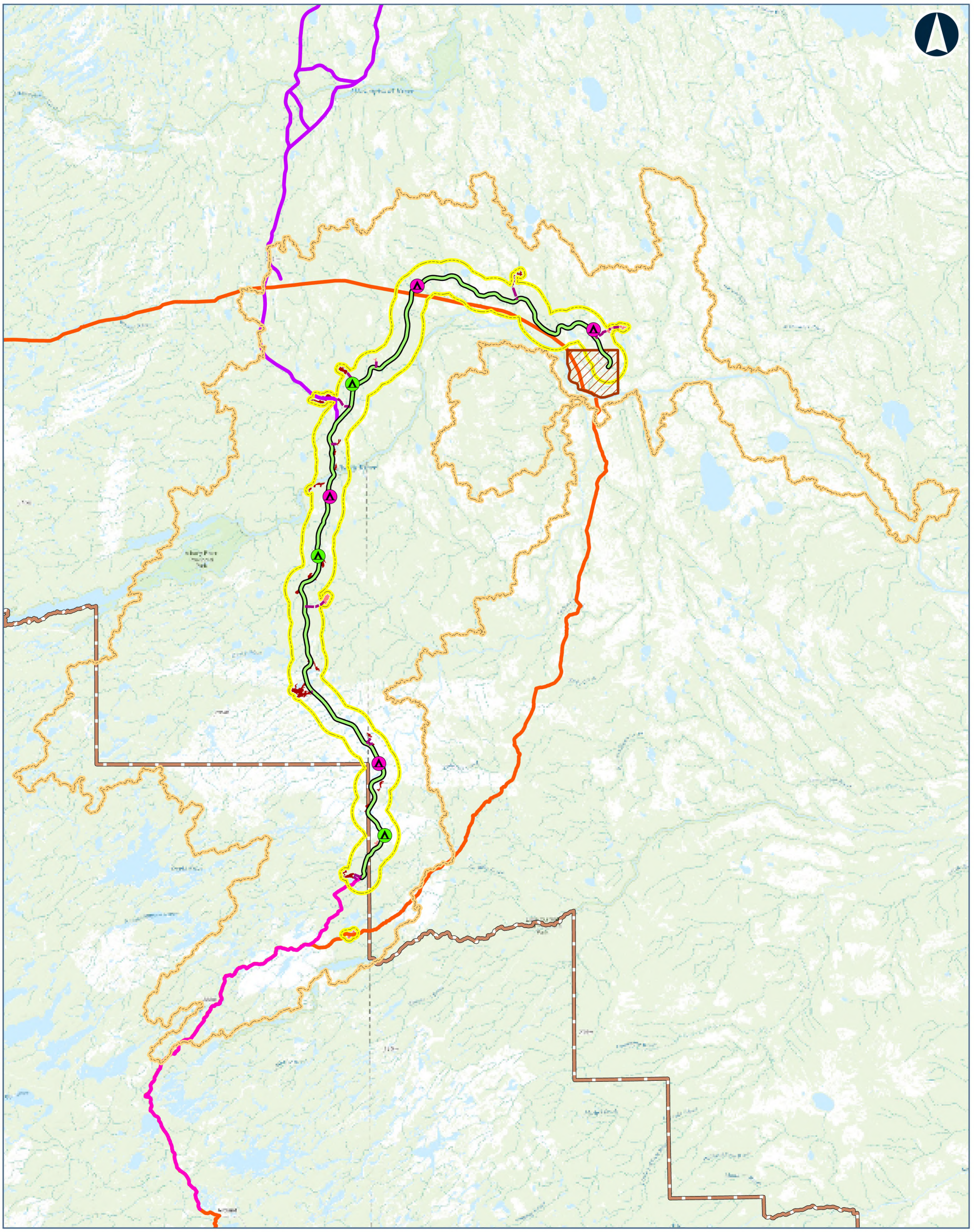
To determine the spatial boundaries of potential cumulative effects, four related projects within the peatlands effects assessment Regional Study Area were considered for the cumulative effects assessment (**Table 8-3; Figure 8-1**). One project, the Ogoki Forest Management Plans was not displayed on the cumulative effects assessment mapping as the Forest Management Unit is not an accurate representation of the forestry impacts at any one point in time. As such, a qualitative assessment of forestry impacts in conjunction with the project impacts within the portion of the study area was completed instead.

Table 8-3: Project and Physical Activity Inclusion List for Peatlands

Project	Identified in *Tailored Impact Statement Guidelines* (Y / N)	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	Peatland Valued Components Temporal Overlap with Project (Y / N)	Peatland Valued Components Spatial Overlap with Project (Y / N)	Included in Cumulative Effects Assessment (Y / N)
Northern Road Link	Y	Between Marten Falls First Nation Community Access Road and Webequie Supply Road, northwestern Ontario	Impact Assessment ongoing	0 (adjacent or overlapping)	Webequie First Nation Marten Falls First Nation	Impact Assessment initiated in August 2023 Construction start date unknown	Unknown	Unknown	Y – 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 an all-season 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. ■ *Terms of Reference* for the preparation of an Environmental Assessment were approved March 3, 2023.	Y	Local Study Area – Y Regional Study Area – Y	Y
Anaconda and Painter Lake Road Upgrades	Y	James Bay Lowlands	Unknown	0 (adjacent or overlapping)	In discussions: Ministry of Transportation, Ontario and Arland First Nation	Not Started	2-5 years	Unknown	Y – 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 operations. ■ Currently discussions on proponency and scope of work are underway. ■ Potential scope of work is expected to include roadway widening, culvert and bridge replacements / rehabilitations to accommodate higher weight vehicles, and road base improvements. ■ 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.	Y	Local Study Area – Y Regional Study Area – Y	Y
Rapid Lynx Broadband	Y	Matawa First Nation communities	Phase 1: 70% complete, with remaining sections targeted for September 2024 completion; section near the Project is complete Phase 2: targeted completion September	Phase 1 – 0 (adjacent or overlapping) Phase 2 – 57.69	Rapid Lynx	February 2020	Unknown	Unknown	Y – construction of Phase 2 and operations of Phase 1 and 2 expected to overlap with Community Access Road construction and operations	■ Approximately 810 km of fibre optic cables, providing reliable high-speed internet service to 5 Matawa First Nation communities: Eabametoong, Marten Falls, Neskantage, Nibinamik and Webequie with an interconnection at Aroland.	Y	Local Study Area – Y Regional Study Area – Y	Y

Project	Identified in *Tailored Impact Statement Guidelines* (Y / N)	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	Peatland Valued Components Temporal Overlap with Project (Y / N)	Peatland Valued Components Spatial Overlap with Project (Y / N)	Included in Cumulative Effects Assessment (Y / N)
Ogoki Forest Management Plans	Y	Ogoki Forest, Ontario	Operating	Forest Management Plans: Varies Ogoki Primary Roads: 6.24	GreenForest Management Inc. and Geraldton Area Natural Resources Advisory Committee	2020	10 years	2030	Y – Operations overlap with Community Access Road Construction and Operation	■ Forest Management Plans for the Ogoki Forest. ■ Includes Ogoki-Armstrong Primary Roads as these roads are being used for forest management. ■ Includes plans for future harvest. ■ Ogoki Forest is approximately 10,900 km^2 in size, and includes approximately 9,798 km^2 of forested area. ■ Majority of the forest is traditional territory and is subject to forest management planning and forest management operations.	Y	Local Study Area – Y Regional Study Area - Y	Y

km = *kilometre; km^2 = square kilometre; % = percent; 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
- LOCAL STUDY AREA
- REGIONAL STUDY AREA
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY

PHYSICAL ACTIVITIY PROJECT INCLUSION

- ANACONDA AND PAINTER LAKE ROAD UPGRADES
- NORTHERN ROAD LINK
- RAPID LYNX BROADBAND PROJECT

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Physical Activities Inclusions in the Peatlands Local and Regional Study Areas

0 4 8 16 24 32
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 8-1

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8.1.4 Summary of Outcome

The predicted residual effects identified in **Table 8-1**are all applicable to the peatland ecosystems Valued Component. The four projects identified within **Table 8-3** have the potential for residual effects to overlap with the spatial and temporal boundaries of the peatland ecosystems Valued Component (**Table 8-2**); therefore, all four projects and one Valued Component have been considered for the cumulative effects assessment (**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	Peatland ecosystems	Both the Marten Falls First Nation Community Access Road project and Northern Road Link project have the potential for residual effects on the availability, distribution, composition and function of the peatland ecosystem Valued Component through direct peatland loss, changes to groundwater, fragmentation and edge effects, and fugitive dust emissions. The residual effects from both projects may overlap temporally during the Construction and the Operation and Maintenance Phases. Spatially, residual effects from the Northern Road link project may overlap with the residual effects from the Marten Falls Community Access Road Project within the Local and Regional Study Areas.
Anaconda and Painter Lake Road Upgrades	Peatland ecosystems	Both the Marten Falls First Nation Community Access Road Project and Anaconda and Painter Lake Road Upgrades project have the potential for residual effects on the availability, distribution, composition and function, of the peatland ecosystem Valued Component through direct peatland loss, changes to groundwater, fragmentation and edge effects and fugitive dust emissions. The residual effects from both projects may overlap temporally during the Construction and the Operation and Maintenance Phases. Spatially, residual effects from the Anaconda and Painter Lake Road Upgrades project 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	Peatland ecosystems	Both the Marten Falls First Nation Community Access Road Project and Rapid Lynx Broadband project have the potential for residual effects on the availability distribution, composition and function of the peatland ecosystems Valued Component through direct peatland loss, changes to groundwater, fragmentation and edge effects, and fugitive dust emissions. The residual effects from both projects may overlap temporally during the Construction and the 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	Peatland ecosystems	Both the Marten Falls First Nation Community Access Road Project and Ogoki Forest Management Plans project have the potential for residual effects on the availability, distribution, composition and function of the peatland ecosystems through direct peatland loss. The residual effects from both projects may overlap temporally during the Construction and the Operation and Maintenance Phases. Spatially, residual effects from the Ogoki Forest Management Plans may overlap with the residual effects from the Marten Falls First Nation Community Access Road Project within the effects assessment Local and Regional Study Areas. Peatland loss or changes to the distribution and composition of ecosystems associated with forestry activities is considered in a qualitative discussion within the effects assessment Regional Study Area.

8.2 Cumulative Effects Assessment

8.2.1 Direct Peatland Loss

8.2.1.1 Potential Cumulative Effects

Past, present, and reasonably foreseeable activities that overlap with the peatlands effects assessment Regional Study Area and will result in changes to the availability, distribution, composition and function of peatland ecosystems are presented in **Table 8-3** and **Table 8-4**.

Estimates of additional peatland loss presented in the subsections below are conservative estimates as disturbance footprints for these past, present, and reasonably foreseeable activities are not available. As such, for all past, present, and reasonably foreseeable activities in the peatlands effects assessment Regional Study Area, all land within the location of the footprint and a buffer based on disturbance type were assumed to be disturbed in the cumulative effects assessment.

Past, present, and reasonably foreseeable activities including a 100 m buffer are predicted to remove a combined 4,532.5 ha of peatland (in the peatlands effects assessment Regional Study Area (**Table 8-5, Figure 8-2**). This is expected to increase the percentage of peatland loss in the peatlands effects assessment Regional Study Area from **0.3%** (for the Project only) to **0.7%.**

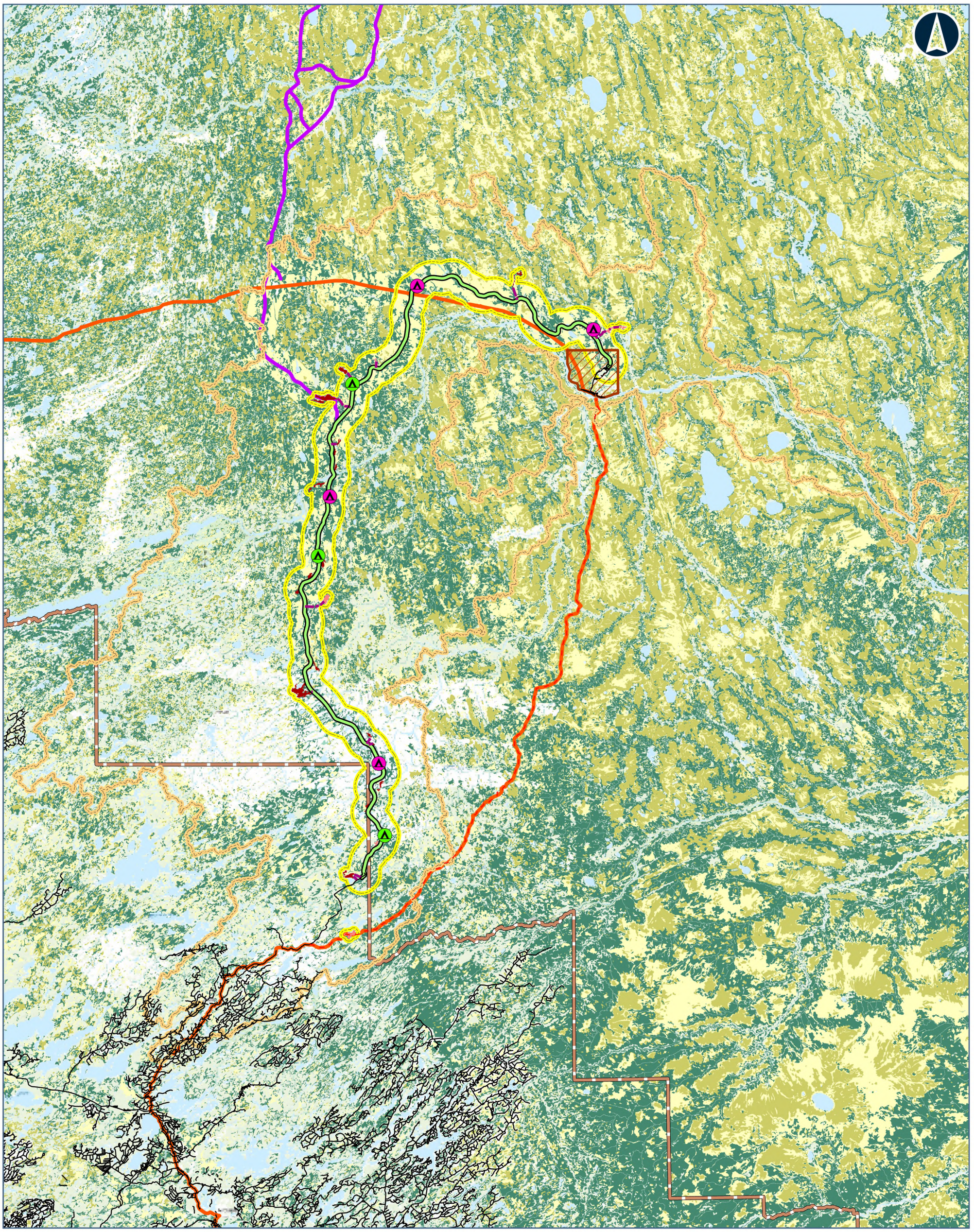
Table 8-5: Peatland Loss in the Peatlands Effects Assessment Regional Study Area

Peatland Type	Peatlands Effects Assessment Regional Study Area[(a)]		
	Existing Conditions Area (ha)	Area of Peatland Loss (ha)	Percent Change (%)
Bog	157,240.2	338.7	0.2%
Fen	219,950.5	1,886.9	0.9%
Organic Swamp	242,363	2,261.2	0.9%
Organic Marsh	3,875.3	45.7	1.2%
Total	**623,429**	**4,532.5**	**0.7%**

Notes:

(a) Wetland area values within the Regional Study Area represent a combination of area values from delineated peatland communities completed for the Project within the existing conditions Local Study Area, and *Ontario Land Cover Compilation Version 2.0* mapping for areas beyond the limits of the existing conditions Local Study Area. The *Ontario Land Cover Compilation* layer is a is a compilation of *Far North Land Cover version 1.4, Southern Ontario Land Resource Information System version 1.2,* and *Provincial Land Cover 2000 Edition*. The Ontario Land Cover mapping does not differentiate between organic and mineral wetland communities. Therefore, the wetland area values may be an overestimation.

ha = hectare; % = percent.



LEGEND

CONSTRUCTION DISTURBANCE AREA

POTENTIAL CAMP SITE (SIZE)

- 50 PERSONS
- 200 PERSONS
- APPROXIMATE ACCESS ROAD TO POTENTIAL CONSTRUCTION CAMP
- APPROXIMATE ACCESS ROAD TO POTENTIAL AGGREGATE SITE
- PREFERRED ROUTE

POTENTIAL AGGREGATE SOURCE

- BEDROCK
- SAND AND GRAVEL
- FIRST NATION COMMUNITY
- ROAD
- WINTER ROAD
- LOCAL STUDY AREA
- REGIONAL STUDY AREA
- FAR NORTH BOUNDARY

PEATLAND COMMUNITY TYPE IN THE LSA

- BOG
- FEN
- ORGANIC SWAMP
- ORGANIC MARSH

PEATLAND COMMUNITY TYPE IN THE RSA

- BOG
- FEN
- SWAMP
- MARSH

PHYSICAL ACTIVITIY PROJECT INCLUSION

- NORTHERN ROAD LINK
- RAPID LYNX BROADBAND PROJECT

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Cumulative Effects in the Peatlands Effects Assessment Regional Study Area

0 4 8 16 24 32
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 8-2

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The predicted loss of peatland communities in the effects assessment Regional Study Area from the Project and other reasonably foreseeable developments would result in localized changes in the extent of peatland communities.

As discussed in **Section 7.3.1.2**, removal of peatland ecosystems results in the direct loss of functional area, which may reduce the ability of retained peatland communities to carry out ecosystem functions. Peatland removal also reduces habitat availability and alters habitat suitability for wildlife, fish and vegetation species, which can result in a decline in biodiversity.

The proportion of direct vegetation loss attributed to the Northern Road Link project is expected to be greater because it will be a new disturbance on the landscape and involve extensive clearing. However, it is possible that the Anaconda and Painter Lake Road upgrades may also require realignment of a portion of the road which would also represent a new disturbance and involve more extensive impacts on peatlands than if works were limited to upgrades along the existing footprint.

The direct losses of peatland ecosystems from the Northern Road Link project and the Anaconda and Painter Lake Road upgrades are considered permanent because the Operation and Maintenance Phase of each of those projects is predicted to be indefinite. Temporary features associated with those projects that are decommissioned and restored or vegetated in accordance with the Rehabilitation Plan after Construction is complete are anticipated to eventually provide some of the functions that the cleared peatland communities currently provide. However, the re-establishment of certain peatland community types (e.g., fen and bog) is particularly challenging without some form of human intervention and can instead be colonized by vascular plant species that do not provide the same ecological functions. Therefore, promptly restoring temporary work areas may reduce, but not eliminate, the cumulative residual effects on peatland communities caused during the Operation and Maintenance Phases of the reasonably foreseeable activities.

Direct peatland loss from the Rapid Lynx Broadband project may be reversible over the long term as the cable will be primarily buried with some aerial sections; however, given the uncertainty about the project (e.g., start and end dates and details of a maintenance plan or decommissioning activities) and to be conservative in the assessment, all peatland loss is considered permanent in the Construction Phase and through the Operation and Maintenance Phase of the Project for the purposes of the Cumulative Effects Assessment.

Overall, peatland ecosystems are predicted to remain abundant (a <1% change from existing conditions) and connected in the effects assessment Regional Study Area after addition of the Project and other reasonably foreseeable developments. Therefore, changes to availability, distribution and composition are predicted to have little effect on the net ecological function of peatland ecosystems in the effects assessment Regional Study Area.

Forest Management Plans

Future forestry activities may change the availability, distribution and composition of peatland communities in the effects assessment Regional Study Area. Fen and organic swamp communities dominate the effects assessment Regional Study Area, at 23% and 25%, respectively. While bog, fen and marsh wetland types are not a target for forest harvesting, swamp wetland types, which may include organic swamp communities, are. The Ogoki Forest Management Plan outlines that potential impacts on wetlands not protected through Conservation Reserve or Park status will be managed through practices such as winter harvesting, and proper road and water crossing construction techniques will be used to minimize site damage and the disruption of water flows in these areas (Ministry of Natural Resources and Forestry, 2021).

Climate Change

Climate change has the potential to alter peatland ecosystem availability, distribution, composition and function in the effects assessment Regional Study Area in various ways, including reducing the extent and connectivity of peatland ecosystems, biological diversity and habitat available to peatland-specific species.

Current and past climate conditions in northern Ontario have created ideal conditions for the establishment of peatland systems. Here, higher levels of precipitation and cooler temperatures allow for peatland inputs to equal or exceed outputs in the form of evapotranspiration, helping to maintain the waterlogged conditions required for the formation of peat (Holden, 2006; Price et al., 2023). While precipitation in the form of rain is expected to increase through climate change, increased temperatures, increased duration of heat events, and the decreased likelihood of some winter conditions (snow depth, freeze-thaw cycles) may lead to drier conditions overall due to increased rates of evapotranspiration in boreal peatland systems (Price et al., 2023). Warming of boreal peatlands and the increased thawing of permafrost can also lead to changes in groundwater flow patterns, which can translate into the rapid drainage of some peatland communities, further exacerbating the drying of peat and the increase in peat decomposition and carbon release. This could potentially contribute to localized subsidence in the landscape (Price et al., 2023). In some instances, a drawdown of water tables can create disconnect between previously connected peatland systems, which can, in-turn, impact water availability for downstream systems (Balliston et al., 2023).

Vegetation and phenology are also expected to change as a result of increasing temperatures with vascular plant species predicted to increase in abundance compared to existing species. With growing degree days increasing in the boreal landscape, plants are expected to leaf out earlier and die-off later, increasing productivity of those plants and the litter quality in peatlands, which can then increase the amount of microbial activity for decomposition and carbon release (Antala et al., 2022).

Fort Albany First Nation has noted concerns related to peatlands drying (and increased potential for wildfire hazards) and impacts on peatland hydrology and landscape stability (Fort Albany First Nation, 2020). Fort Albany First Nation also have concerns about potential impacts and interactions relating to peatland disturbance and permafrost degradation (Fort Albany First Nation, 2020).

Another component of climate change as it relates to peatlands is the increased susceptibility of peatlands to wildfires. While the boreal landscape is adapted to a natural wildfire disturbance regime, these natural regimes are changing as a result of climate change. As discussed in **Section 7.3.1.11**, warmer weather and less snow in winter are expected to increase the likelihood and intensity of wildfires in the effects assessment Regional Study Area. Properly functioning peatlands systems are capable of mitigating the impacts of wildfires through their elevated water levels and permanently saturated conditions (Price et al., 2023). However, a peatland can lose its ability to mitigate against wildfire activity when the water table has decreased and the upper layer of peat dries (Natural Resources Canada, 2024). Increased wildfire frequency and extent combined with drier conditions may ultimately influence the availability and distribution, composition, and function of peatlands, and result in these ecosystems becoming net carbon sources if the fire return interval decreases so the fire emissions are not outweighed by carbon uptake between fires (Wilkinson et al., 2023; Ingram et al., 2019).

The magnitude of climate change effects on peatland ecosystems is difficult to predict. However, climate change is expected to negatively influence the availability, distribution, composition and function of peatland ecosystems within and beyond the effects assessment Regional Study Area.

8.2.1.2 Mitigation Measures

It is anticipated that mitigation measures that will be implemented to minimize effects from direct peatland loss on peatland availability, distribution, composition and function during the construction, operation, and maintenance of the Northern Road Link project, upgraded Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will be similar to those implemented for the Project. No additional mitigation measures are proposed to further mitigate cumulative effects.

It is expected that the effectiveness of mitigation measures for these activities will be evaluated throughout construction, operations and maintenance, and will be modified or enhanced as necessary through adaptive management.

8.2.1.3 Predicted Cumulative Effects

Measures to minimize the residual effects of direct peatland loss on peatland ecosystems by the Project and by the other reasonably foreseeable development, will be implemented by each project, but direct loss of peatland ecosystems cannot be avoided.

The implementation of mitigation measures for residual effects is expected to limit negative effects from reasonably foreseeable developments; however, it is unlikely that mitigation measures will be able to minimize all effects on peatland ecosystem availability, distribution, composition and function. As a result, cumulative residual effects on peatland ecosystems from human developments and climate change are predicted.

8.2.1.4 Characterization of Cumulative Effects

The Project and other reasonably foreseeable developments will result in the removal of **4,532.5 ha** of peatland communities, representing **<1%** of the peatland ecosystems available within the effects assessment Regional Study Area.

Although some temporary work areas may be restored or will revegetate naturally, the changes from the Project, the Northern Road Link, the Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will be mostly permanent as the all-season roads and the right-of-way for the Rapid Lynx Broadband project (i.e., for access and maintenance purposes) will remain disturbed in perpetuity. However, the calculation of loss is a conservative estimate as it assumes the effects in the full footprint area of the Project, and the footprint plus a buffer area for each of the other reasonably foreseeable developments, will be concurrently and permanently affected (i.e., cleared, grubbed, and not restored). However, the true footprint area of each reasonably foreseeable development is unknown.

As the Project's Preliminary Biodiversity Offset Plan is further developed, it is anticipated that restoration and offsetting measures will contribute to minimizing the long-term residual effects of direct peatland loss on peatland ecosystems. It is assumed that the Northern Road Link project will implement a Biodiversity Offset Plan similar to the one that will be developed for the Project, as offsetting is a requirement of the Tailored Impact Statement Guidelines for the Northern Road Link project, and that other reasonably foreseeable developments will implement mitigation measures that will limit effects on peatland communities.

The effect of direct peatland loss resulting from the Project and from other reasonably foreseeable developments on peatland ecosystems is considered **negative**, and **permanent** (irreversible) for the majority of the area within the anticipated footprints; however, it is expected that some temporary work areas will be restored or will revegetate naturally. Where the effects are permanent, the effect of direct peatland loss is **long term**. Where reclamation and restoration of temporary work areas occurs in peatland communities, the effect is still **long term**, given the length of time it takes for peatlands to recover. Effects from reasonably foreseeable developments are likely less than certain (i.e., probable or possible) due to the uncertainty around if and when the construction and operation of these projects will occur.

However, to avoid underestimating the potential significance of effects (i.e., using a precautionary approach), changes in peatland community availability, distribution, composition and function from other reasonably foreseeable developments are classified as **certain**. Predicted effects are assessed as **low** in magnitude, **continuous** and confined to the effects assessment Regional Study Area.

Climate change and related effects are uncertain but **probable**, and may have **continuous**, **permanent** effects on the availability, distribution, composition and function of peatland ecosystems that occur beyond the regional scale. Effects from changes to the availability of peatland ecosystems from loss due to wildfire and other natural disasters (e.g., storms) in the effects assessment Regional Study Area are expected to be **frequent** and **reversible** in the long-term.

8.2.2 Changes in Groundwater

8.2.2.1 Potential Cumulative Effects

The Project, the Northern Road Link project and the Anaconda and Painter Lake Road upgrades may cause alterations to groundwater quality, drainage patterns, recharge rates and increased or decreased groundwater levels due to activities such as road construction through peatlands, changes to topography, short-term water-taking, pit / quarry dewatering and discharge of water.

It is expected that the Northern Road Link and Anaconda and Painter Lake road upgrades would also require development of aggregate pits and quarries to complete their construction. However, no additional pits or quarries are expected to be required where the projects overlap. Therefore, no additional cumulative changes to groundwater quantity due to pit or quarry dewatering in the areas of spatial or temporal overlap between the Project and the Northern Road Link and Anaconda and Painter Lake road upgrades are expected.

It is expected that the road crossings in peatlands used for the Project, the Northern Road Link, and the Anaconda and Painter Lake road upgrades would have similar potential to result in residual effects. The road projects are linear projects therefore would not be expected to cross the same groundwater catchment area in more than one location, with the possible exception of the junction between the Project and the Northern Road Link. Therefore, no additional cumulative changes to groundwater quantity due to road construction in peatland areas in the areas of spatial or temporal overlap between the Project and the Northern Road Link and Anaconda and Painter Lake road upgrades are expected.

Because the Rapid Lynx Broadband project is anticipated to be buried approximately 1 m underground and underneath waterbodies, only temporary and minimal changes in groundwater are expected during construction.

Any groundwater effects would be expected to be local and short-term and would not be expected to overlap temporally with Project construction. A further discussion on cumulative effects on groundwater quality and quantity is provided in the *Groundwater & Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c).

As discussed in **Section 7.3.1.4**, changes to groundwater can cause changes to soils and vegetation health / composition thereby changing the composition and function of retained peatland communities. If changes to groundwater regimes are sufficient to change the composition of a peatland community, then the availability, distribution, composition, and function of that altered peatland community type will also eventually be affected within the effects assessment Regional Study Area. These indirect effects are difficult to quantify as they largely depend on the effectiveness of the mitigation measures that are implemented.

A groundwater monitoring and water budget study will be developed and implemented during detailed design to determine groundwater flow and influence on peatland ecosystems. The additional information obtained from these studies will further inform the assessment of the potential Project impacts on peatland ecosystems and the associated mitigation recommendations that will be confirmed and refined at detailed design. The effectiveness of mitigation measures will also be evaluated during construction and operations and will be modified or enhanced as necessary through adaptive management.

8.2.2.2 Mitigation Measures

It is anticipated that the mitigation measures that will be implemented to minimize changes to groundwater during the construction of the Northern Road Link, the upgraded Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will be similar to those implemented for the Project. No additional mitigation measures are proposed to further mitigate cumulative effects.

As a best practice, it is suggested that the monitoring programs of the Project and any reasonably foreseeable developments share relevant monitoring data for areas where predicted effects may overlap.

8.2.2.3 Predicted Cumulative Effects

Due to the predicted similar aggregate requirements and residual effects of the Project and the Northern Road Link and Anaconda and Painter Lake road upgrades it is not expected that there would be any additional pit or quarry development and dewatering in the areas where the projects overlap.

Due to the limited spatial and temporal overlaps of the Project and reasonably foreseeable developments, it is not generally expected that there would be any additional cumulative effects due to road construction in peatland areas.

There may be potential for additional cumulative effects beyond the predicted residual effects levels in the area where the Project and the Northern Road Link would meet if they both cross the same peatland area.

8.2.2.4 Characterization of Cumulative Effects

The Project and other reasonably foreseeable developments may cause alterations to groundwater quality, drainage patterns and increase or decrease groundwater levels, thereby affecting associated peatland communities. However, with the effective implementation of the mitigation measures and the use of best management practices, it is anticipated that cumulative residual effects on peatland ecosystems from changes to groundwater will be minimized and will be regulated through permitting.

Changes to peatland ecosystems resulting from changes in groundwater that may alter groundwater quality, drainage patterns and increase or decrease groundwater levels from the Project and from other reasonably foreseeable developments are expected to be **negative** in direction, **medium** in magnitude, **regional** in geographic extent, **long term**, **continuous**, **irreversible**, and **probable** to occur.

8.2.3 Fragmentation and Edge Effects

8.2.3.1 Potential Cumulative Effects

The Project and the Northern Road Link project, Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will result in additional permanent peatland loss (**Section 8.2.1**). All of these projects will create new linear corridors for at least some portion of their alignments and therefore introduce new fragmentation and edge effects on the landscape. As described in **Section 7.3.1.6**, edge effects influence the composition and function of the retained peatland ecosystems resulting in secondary effects (e.g., altering habitat use by certain wildlife species).

Introduction of additional fragmentation and edge effects due to the Northern Road Link project, Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will be primarily in the south and some northern portions of the effects assessment Regional Study Area. These are represented in the cumulative effects assessment as an additional 3,559.7 ha layered on the existing disturbance regime within the effects assessment Regional Study Area (i.e., 170,289.3 ha of natural disturbance and 4,109.2 ha of anthropogenic disturbances) and the Project effects assessment Construction Disturbance Area footprint (i.e., 4,700.2 ha). The proportion of new fragmentation attributed to the Northern Road Link project is expected to be greater because it will be a new disturbance on the landscape. However, it is possible that the Anaconda and Painter Lake Road upgrades may also require realignment of a portion of the road which would also represent a new disturbance that is more extensive than if works were limited to upgrades along the existing footprint.

It should also be noted that the majority of the Rapid Lynx Broadband project footprint follows an existing winter road, which is an existing linear disturbance on the landscape. Furthermore, that project involves a buried fibre-optic cable; therefore, ongoing surface-level disturbances will be limited (relative to a maintained road surface), which is expected to cause less disruption to functional landscape connectivity.

As discussed in **Section 7.3.1.6**, edge effects in the boreal landscape are less pronounced than those in tropical and temperate forests because boreal forests typically have a short canopy height, more widely spaced trees (especially in open fens and bogs), natural vegetation community heterogeneity and are adapted to large-scale natural disturbances. Nevertheless, some edge effects on peatland ecosystems are anticipated to occur in the Project area and are expected to be more pronounced on south and west-facing edges of forested swamps. Details regarding effects on wildlife habitat function are found in the *Birds Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026a), *Ungulates Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026f), and *Wildlife Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026g).

8.2.3.2 Mitigation Measures

It is anticipated that mitigation measures that will be implemented to minimize effects from fragmentation and edge effects associated with linear disturbances on retained peatland ecosystems during the construction of the Northern Road Link, upgraded Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will be similar to those implemented for the Project. No additional mitigation measures are proposed to further mitigate cumulative effects.

It is expected that the effectiveness of mitigation measures for these activities will be evaluated throughout construction, and operations, and will be modified or enhanced as necessary through adaptive management.

8.2.3.3 Predicted Cumulative Effects

Measures to minimize the effects of fragmentation and edge effects on peatland ecosystems will be implemented, but these effects cannot be fully avoided by the construction of the Project and other reasonably foreseeable developments. Therefore, there are predicted to be cumulative residual effects on the availability, distribution, composition and function of peatland ecosystems. These effects are carried forward in the assessment of predicted cumulative effects on peatland ecosystems**.**

Climate change may have additional negative effects on the availability, distribution, composition and function of peatland ecosystems, although these effects are expected to occur even in the absence of further fragmentation and edge effects.

8.2.3.4 Characterization of Cumulative Effects

Secondary effects on retained peatland communities, particularly coniferous treed organic swamp communities, may be felt during construction of the Project and other reasonably foreseeable developments. These include changes to community composition and function as a result of sunscald, desiccation, and windthrow. After implementation of mitigation, edge effects are predicted to be **probable**, **reversible** in the medium term, **frequent**, and limited to the effects assessment Regional Study Area. These edge effects are anticipated to be **negative**, but **negligible** in magnitude, particularly given that boreal forests are generally adapted to large-scale natural disturbances (Harper et al., 2015) and are less influenced by fragmentation and edge effects than temperate and tropical forests (Franklin et al., 2021).

8.2.4 Fugitive Dust Emissions

8.2.4.1 Potential Cumulative Effects

The Project and the Northern Road Link project, Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project are predicted to result in fugitive dust emissions. Fugitive dust emissions from construction of these activities, such as land clearing, blasting, and infrastructure implementation, and traffic on the all-season and access roads (e.g., Community Access Road, Northern Road Link, and the Anaconda and Painter Lake Road upgrades) are anticipated. Effects from fugitive dust emissions from other reasonably foreseeable developments will begin during Construction of the Project and continue through the Operation and Maintenance Phase of the Project.

As described in **Section 7.3.1.10**, dust accumulation may locally and directly impact peatland vegetation by smothering plant tissues, hindering gas exchange, and reducing photosynthesis by blocking sunlight (Hirano et al., 1995; Prajapati, 2012). Dust often contains metals or pollutants, which can leach into the soil, causing toxicity or nutrient imbalances in plants. This can also degrade plant health and alter plant species composition, structure, and biomass in affected areas.

Air quality modelling as described in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026), predicted that the Project will result in threshold exceedances for emissions of total suspended particulates, particulate matter less than 2.5 micrometres (µm) and particulate matter less than 10 µm, in the absence of mitigation. During construction, these threshold exceedances are predicted to be reached at less than 300 m from the emission source. During operations and maintenance, threshold exceedances are predicted to be reached between 115 m and up to 3,004 m from the road. It is assumed that the construction and operations of the Northern Road Link and Anaconda and Painter Lake Road upgrades will produce similar levels of dust and metal deposition as estimated for the Project.

In the absence of mitigation, measurable changes to the availability, distribution, function, and composition of peatland ecosystems may occur from increased fugitive dust emissions associated with the Project and the Northern Road Link project, Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project within the effects assessment Regional Study Area.

8.2.4.2 Mitigation Measures

It is anticipated that mitigation measures that will be implemented to minimize effects from fugitive dust emissions on retained peatland ecosystems during the construction of the Northern Road Link project, the upgraded Anaconda and Painter Lake Road upgrades, and the Rapid Lynx Broadband project will be similar to those implemented for the Project. This also applies to Operation and Maintenance of the Northern Road Link project and the Anaconda and Painter Lake Road upgrades. Specifically, it is expected that these activities will be carried following similar mitigation measures to those carried out for the Project as outlined in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). No additional mitigation measures are proposed to further mitigate cumulative effects.

It is expected that the effectiveness of mitigation measures for these activities, including the Project, will be evaluated throughout Construction and Operation and Maintenance, and will be modified or enhanced as necessary through adaptive management.

8.2.4.3 Predicted Cumulative Effects

After mitigation, the Project and reasonably foreseeable activities are expected to result in an increased residual effect from fugitive dust emissions on the conditions of retained peatland ecosystems during the Construction Phases and the Operation and Maintenance Phases relative to existing conditions. Therefore, potential cumulative effects from fugitive dust emissions are carried forward in the assessment of predicted cumulative effects on peatland ecosystems**.**

8.2.4.4 Characterization of Cumulative Effects

The Project and other reasonably foreseeable developments are expected to increase fugitive dust emissions. Although mitigations will be implemented to reduce dust emissions, dust deposition during the Construction and the Operation and Maintenance Phases is predicted to degrade vegetation immediately adjacent to each project. Effects from dust emissions are predicted to be **certain, permanent** (irreversible), **continuous**, and confined to the effects assessment Regional Study Area. Effects from dust emissions on peatland ecosystems in the effects assessment Regional Study Area are anticipated to be **negative** but **negligible** in magnitude as they will impact only a relatively small area.

8.2.5 Assessment of Significance

The Project and other reasonably foreseeable developments would contribute to negative changes in the availability, distribution, composition and function of peatland ecosystems. These changes are predicted to be either negligible, low or medium in magnitude and generally within the resilience limits and adaptive capacity of existing peatland ecosystems.

Relative to existing conditions, peatland ecosystems are expected to remain abundant, intact, and well distributed across the effects assessment Regional Study Area; however, this is dependent on the success of the proposed mitigations including the implementation of the “floating road” construction technique for crossing peatland ecosystems. While it is predicted that the contribution of the Project and other reasonably foreseeable developments to cumulative residual effects on peatland ecosystems in the effects assessment Regional Study Area are not expected to change the self-sustaining and ecologically effective status of peatland ecosystems, there is still a high level of uncertainty surrounding the Projects cumulative residual effect on peatland ecosystems resulting from changes to groundwater and the ability of the “floating road” construction technique to mitigate potential effects. As a result, a precautionary approach has been applied and cumulative residual effects on peatland ecosystems are predicted to be **significant**.

The effects related to climate change are uncertain, but probable to occur and may alter the processes that influence the availability and distribution of peatland ecosystems. Effects of climate change would likely occur beyond the effects assessment Regional Study Area. However, climate change is not expected to significantly influence the availability and distribution of peatland ecosystems relative to existing conditions and does not alter the assessment of no significant cumulative residual effects from the Project and other reasonably foreseeable developments as climate change effects are expected to occur regardless of whether the Project and other reasonably foreseeable projects are constructed.

8.2.6 Prediction Confidence and Uncertainty

Within a cumulative effects assessment, there is inherently a level of uncertainty due to the lack of information available regarding other potential projects, including reasonably foreseeable developments. Primary factors affecting confidence in the predictions made in the peatlands assessment include:

- Availability and accuracy of existing conditions data (e.g., accuracy of peatland mapping);
- Level of understanding of existing peatland conditions, range of natural variation, and the resilience of peatland ecosystems 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 and other reasonably foreseeable developments would influence peatland ecosystems);
- Level of certainty associated with the effectiveness of proposed mitigations, where applicable; and
- Level of understanding of the cumulative drivers of change in measurement indicators.

It is anticipated that the existing conditions data are sufficient for understanding existing conditions and future changes not related to the Project, and Project-related effects are mostly understood. There is a generally good understanding of effects on peatland communities related to permanent roads, road upgrades, and fibre-optic cable installation projects. Similarly, the mitigation measures and best management practices for these types of projects are standard and have been routinely and effectively implemented across Canada. One exception is the “floating road” construction methodology and there is uncertainty regarding the effectiveness of this method in relation to groundwater movement.

There is also uncertainty regarding the design, permanent footprints, and activities associated with the other reasonably foreseeable developments. Similarly, the magnitude of effects related to climate change are uncertain.

Uncertainty was managed by:

- Rolling-up the peatlands mapping from ecosites to peatland community groupings (i.e., bog, fen, organic marsh, and organic swamp) and completing the effects assessment on these groupings. This reduces uncertainty because the confidence that an area is classified correctly as a fen is greater than the certainty that a more granular classification is correct (e.g., Open Moderately Rich Fen);
- Completing quality assurance and quality control of existing conditions data; and
- Comparing assessment results to relevant published scientific literature.

In addition to the measures listed above, conservative assumptions were implemented that overestimate potential direct peatland loss and fragmentation to increase confidence that the effects were not underestimated. Peatland loss was assumed to occur over the entire footprint of the Project and other reasonably foreseeable developments even though some temporary work areas are anticipated to be restored or vegetated in accordance with the Rehabilitation Plan. Peatland loss was also overestimated by assuming larger than expected footprints for developments. For example, a 100 m buffer was applied to all-season roads and utility lines to account for impacts on each side of the line. However, the actual footprints are anticipated to be narrower.

Overall, confidence levels for the cumulative effects assessment are **moderate** because there were existing conditions data for the effects assessment Local and Regional Study Areas, the Project-related effects are mostly understood, the level of certainty associated with the effectiveness of proposed mitigations is moderate to high, and conservative assumptions have been applied.

8.2.7 Summary

Table 8-6 summarizes the cumulative effects assessment.

Table 8-6: Characterization of Predicted Cumulative Effects for Peatland Valued Component

Valued Component	Predicted Cumulative Effect	Phase	Context	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance	Uncertainty
Peatland Ecosystems	Changes to peatland ecosystem availability, distribution, composition and function as a result of **direct peatland loss**	Construction	Peatland ecosystems represent approximately 66% of the effects assessment Local Study Area and 64% of the effects assessment Regional Study Area.	Negative	**Low** 4,532.5 ha or <1% of the peatland ecosystems within the effects assessment Regional Study Area will be directly affected	**Regional** (reasonably foreseeable developments) **Beyond regional** (due to climate change)	**Long term** and **Irreversible** (for permanent impacts) **Long term** and **Reversible** (for temporary impacts where peatland ecosystems can and will be restored)	Continuous	**Certain** (reasonably foreseeable developments) **Probable** (climate change)	Not significant	Moderate
	Changes to peatland ecosystem availability, distribution, composition and function as a result of **changes to Groundwater**	Construction	Mitigations to limit changes to groundwater are well understood and the methods have been demonstrated to be effective for the majority of effect pathways. However, there is uncertainty about the effectiveness of the “floating road” construction methodology.	Negative	**Medium** Measurable changes to groundwater quality and quantity possible that result in changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Regional Study Area	Regional	Long term and Irreversible	Continuous	Probable	Significant	High
	Changes to peatland ecosystem availability, distribution, composition and function as a result of **Fragmentation and Edge Effects**	Construction	The existing landscape is largely intact; however, there are natural disturbances (e.g., fire) that have influenced the landscape as well as some small areas of anthropogenic disturbances. New anthropogenic disturbances will be introduced that will cause fragmentation and edge effects.	Negative	**Negligible** in magnitude, given that boreal forests are generally adapted to large-scale natural disturbances and are less influenced by fragmentation and edge effects than temperate and tropical forests	Regional	Medium term and Irreversible	Frequent	Probable	Not significant	Moderate
	Changes to peatland ecosystem availability, distribution, composition and function as a result of **Fugitive Dust Emissions**	Construction / Operations and Maintenance	Construction and operations / maintenance of the projects are expected to produce fugitive dust emissions.	Negative	**Negligible** changes to peatland ecosystem availability, distribution, composition, and function in the effects assessment Regional Study Areas.	Regional	Long term and Irreversible	Continuous	Certain	Not significant	Moderate

% = percent; ha = hectare; < = less than.

9. Monitoring Programs and Future Commitments

A monitoring program verifies the accuracy of the effects assessment and evaluates the effectiveness of mitigation measures. Monitoring programs also include future commitments related to mitigating residual effects and addressing uncertainty. A Project-specific Environmental Monitoring Program will be developed and implemented that includes the monitoring commitments related to the peatland ecosystems presented in this section.

9.1 Pre-Construction Monitoring Program

During detailed design, the following tasks will be undertaken to minimize effects on peatland ecosystems:

- Refine peatland community mapping and field-verify the locations of sensitive or difficult to restore communities (e.g., fens and bogs) to inform the micro-siting of temporary access roads, staging areas, camps, debris and / or timber stockpiles, as well as the centreline of the Community Access Road within the 100 m cleared right-of-way; and
- Complete an assessment of pit / quarry locations to identify potential effects due to changes in hydrogeology / hydrology on peatland communities within the radius of influence for dewatering programs.
- Airborne Electromagnetic (AEM) Surveying to produce continuous peat depth mapping which is critical for construction planning such as identifying saturated or sensitive areas that may require specialized engineering solutions.

In addition, the following pre-construction monitoring programs and additional studies will be developed and initiated:

- A peatlands groundwater monitoring and water budget study will be developed and implemented during detailed design to determine groundwater flow and influence on peatland ecosystems. This will further inform the assessment of the potential Project impacts on peatland ecosystems and the associated mitigation recommendations that will be confirmed and refined at detailed design.
- A program designed to monitor groundwater on both sides of the Community Access Road and in areas of dewatering programs to establish pre-construction groundwater levels, as well as monitor groundwater levels during and post construction. This program will include pre-construction, during-construction and post-construction components.

This also includes the creation of a monitoring program to include further geochemical testing on exposed bedrock and soils and determine the potential for acid rock drainage and / or metal leaching as it relates to methylmercury production in peatland communities present within the Construction Disturbance Area. The program will also monitor potential increases in methylmercury production related to changes in groundwater levels as a result of the construction of the Community Access Road. At a minimum, the program will include the following activities. Monitoring requirements will be further developed during detailed design.

- Locations of groundwater monitoring instruments (e.g., piezometers) will be established approximately every 1,000 m along sections of the road that will be constructed with the "floating road" construction methodology. Details of the monitoring plan including the final placement of piezometers and the duration of monitoring will be developed and refined during detailed design.
- Monitoring locations will be established both up- and down-gradient of the future road to capture pre, during and post construction groundwater levels and movement patterns. Monitoring locations should be located away from equalization culverts.
- Monitoring will occur three times annually (spring, summer, fall).
- In addition to the pre-construction surface water monitoring programs specified in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), a pre-construction peatlands hydrological monitoring and water budget study will be developed and implemented. This will further inform the assessment of potential Project impacts on peatlands and the associated recommended mitigation measures (e.g., culvert size and locations) that will be confirmed at detailed design.

9.2 Construction Monitoring Program

During construction, the following monitoring programs will be required. These programs will be further developed during the preparation of the Environmental Protection Plan in consultation with Indigenous communities:

- An invasive species monitoring program designed to prevent, detect, and control (i.e., remove) invasive species and monitor areas where invasive species were removed;
- A program designed to monitor groundwater on both sides of the Community Access Road to determine whether water flow beneath the road is being maintained throughout construction will be carried out where the "floating road" construction methodology is used through peatland communities. Monitoring will occur at the same locations established during pre-construction and will occur three times annually (spring, summer, fall) throughout the duration of construction;

- A program to monitor peatland community response to any potential changes in hydrogeology throughout construction (e.g., in the vicinity of dewatering activities and either side of “floating road” segments);
- A program to monitor for peatland condition in the vicinity of project activities. The program will include science-based thresholds or indicators of peatland condition based on research and established standards, as well as mitigation and adaptive response plan to prevent long term damage or carbon release.
- In addition to the construction surface water monitoring programs specified in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), monitoring of peatland hydrology will also be conducted. The requirements of this monitoring program will be determined at detailed design, and
- A program to monitor whether erosion and sedimentation control measures are functioning as intended and to direct repair and adaptive management measures, where required.

9.3 Operations Monitoring Program

During operations, the following monitoring programs will be required. These programs will be further detailed during subsequent Project phases, in consultation with Indigenous communities:

- A program designed to monitor and manage any rehabilitated and restored peatland communities as well as any wetland offset areas. Details regarding the number of monitoring locations, level of effort and length of the monitoring period will be determined during detailed design, if any peatland communities are restored or created;
- A program designed to monitor installed groundwater wells to confirm water flow beneath the road is being maintained. Monitoring will occur at the same locations established during pre-construction and will occur three times annually (spring, summer, fall) for a length of time to be determined during detailed design;
- A program designed to monitor peatland community responses to any potential changes in hydrogeology. Details regarding the number of monitoring locations and the length of the monitoring period will be determined in subsequent Project phases;
- A program to monitor for peatland condition in the vicinity of project activities. The program will include science-based thresholds or indicators of peatland condition based on research and established standards, as well as mitigation and adaptive response plan to prevent long term damage or carbon release. Details regarding the number of monitoring locations and the length of the monitoring period will be determined in subsequent Project phases; and

- In addition to the Operation and Maintenance surface water monitoring programs specified in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e), monitoring of peatland hydrology will also be conducted. The requirements of this monitoring program will be determined at detailed design.

9.4 Future Commitments

All mitigation measures outlined in **Section 7** will be adhered to. Mitigation measures are summarized in **Table 7-4**. The effectiveness of mitigation measures will be evaluated during construction and operations and will be modified or enhanced as necessary through adaptive management.

A Preliminary Biodiversity Offset Plan has been developed and will be implemented for the Project to provide a net positive increase in wetland habitat (Refer to *Appendix AB – Preliminary Biodiversity Offset Plan* as part of the *Environmental Assessment / Impact Statement Report*. The specific approach will be determined through consultation with Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, but will generally follow a hierarchy of restoration, reclamation and offset alternatives (e.g., financial compensation directed towards wetland research or inventory work to fill existing information gaps). The Preliminary Biodiversity Offset Plan will focus on activities within the same Ecoregions as the Project (i.e., Ecoregions 2W and 2E), to the extent feasible, followed by opportunities available in adjacent Ecoregions (e.g., Ecoregions 1E, 3W, and 3E) or other Ecoregions where wetland ecosystems are rare (e.g., Ecoregion 6E or 7E) and offset activities may provide a larger overall benefit.

In addition, a Vegetation Restoration Plan will be developed at detailed design. This plan will include measures that are specific to peatland communities and peatland restoration, including peat stockpile management. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.

Table 9-1: Summary of Future Commitments

Valued Component	Commitment	Phase	Section Reference
Peatland Ecosystems	Refine peatland community mapping and field-verify the locations of sensitive or difficult to restore vegetation communities (e.g., fens and bogs) to inform the micro-siting of temporary access roads, staging areas, camps, debris and / or timber stockpiles, as well as the centreline of the Community Access Road within the 100 m cleared right-of-way.	Detailed Design	**Section 7.3.1.1**
	Complete an assessment of pit / quarry locations to identify potential effects due to changes in hydrogeology / hydrology on peatland communities within the radius of influence for dewatering programs.	Detailed Design	**Section 7.3.1.4**
	Prepare a Vegetation Restoration Plan that includes measures specific to peatland communities and peatland restoration, including peat stockpile management. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.	Detailed Design	**Section 7.3.1.1.2** and **Section 7.2.1.12.2**
	Implement a program designed to monitor groundwater on both sides of the Community Access Road and in areas of dewatering programs to establish pre-construction groundwater levels, as well as monitor groundwater levels during and post construction.	Detailed Design, Construction and Operation and Maintenance	**Section 7.3.1.4**
	Develop a pre-construction peatlands hydrological monitoring and water budget study to further inform the assessment of potential Project impacts on peatlands and the associated recommended mitigation measures (e.g., culvert size and locations) that will be confirmed at detailed design.	Detailed Design	**Section 7.3.1.3**

m = metre.

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 provincial, federal government and other jurisdictional agencies will need to be acquired; however, there are no permits and / or approvals specific to peatlands.

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:

- Ontario *Planning Act;*
- Ontario *Water Resources Act;*
- Ontario *Environmental Protection Act;*
- Ontario *Endangered Species Act*; and
- Federal *Species at Risk Act.*

10. Summary and Recommendations

The summary of potential effects and recommendations for peatland ecosystems 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 peatland ecosystems that are presented in **Table 10-1**.

Mitigation, Protection, Monitoring, and Study Commitments described in **Table 10-1** are assumed to be applicable to the detailed design and Construction / Operation and Maintenance Phases of reasonably foreseeable developments included in the Cumulative Effects Assessment (**Section 8**).

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
P-01	Peatland Ecosystems	Changes to peatland ecosystems as a result of direct peatland loss	Construction	Ministry of Natural Resources Environment and Climate Change Canada	■ Refine peatland mapping and field-verify the locations of sensitive or difficult to restore vegetation communities (e.g., fens and bogs) to inform micro-siting of the Project footprint. ■ Complete an assessment of pit / quarry locations to identify potential effects due to changes in hydrogeology on peatland communities within the radius of influence for dewatering programs. ■ Prepare and implement a Vegetation Restoration Plan that includes measures specific to peatland communities and peatland restoration, including peat stockpile management. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.	■ Perform clearing and construction activities in winter months where feasible, to minimize compaction of peat. A review of the project construction schedule will be completed during detailed design to coordinate work based on environmental timing windows and timing restrictions. ■ Limit vegetation clearing to within the 100 m right-of-way and reduce to less than this width whenever and wherever possible: ○ Minimize clearing widths in peatland ecosystems to the extent feasible, given the difficulty of effective restoration of these ecosystems. ○ Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction. ○ Limit clearing of riparian vegetation (i.e., within 30 m of waterbodies) to the extent possible and to the requirement of the access road and alignment clearing width only. ○ Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles in less sensitive ecosystems (e.g., upland ecosystems), where feasible. Avoid peatland communities for temporary features wherever feasible. ■ Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan. Upon completion of construction, sand and gravel pits, including temporary access roads leading to the pits, will be rehabilitated (progressive and final rehabilitation) and surrendered in accordance with the *Aggregate Resource Act*, which will include backfilling, levelling, recompacting, and redistributing organic materials to encourage natural revegetation. Temporary access roads leading to temporary quarry areas will also be decommissioned. Temporary quarries not required for maintenance activities will be vegetated in accordance with the Rehabilitation Plan. Quarries maintained for operations will be blocked to discourage public use but facilitate access for ongoing road maintenance. The number of quarries required for maintenance are will be determined during the detailed design phase.

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
						■ Develop and implement a Project-specific Environmental Protection Plan.
P-02	Peatland Ecosystems	Changes to peatland ecosystems as a result of direct peatland loss	Operation and Maintenance	Ministry of Natural Resources Environment and Climate Change Canada	■ N/A	■ Avoid re-entry and disturbance of restored temporary access areas post-construction. ■ Design and implement a program to monitor for peatland condition in the vicinity of project activities. The program will include science-based thresholds or indicators of peatland condition based on research and established standards, like those presented in Minasny et. al, 2023, as well as mitigation and adaptive response plan to prevent long term damage or carbon release. Details regarding the thresholds and indicators as well as the number of monitoring locations and the length of the monitoring period will be determined in subsequent Project phases. ■ Implement a program designed to monitor and manage restored peatland communities as well as any wetland offset areas. Details regarding the number of monitoring locations, level of effort and length of the monitoring period will be determined in subsequent Project phases, if any peatland communities are restored or created.
P-03	Peatland Ecosystems	Changes to peatland ecosystems as a result of changes to hydrology	Construction, Operation and Maintenance	Ministry of Natural Resources Fisheries and Oceans Canada	■ During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of surface water; and ■ Design and implement a pre-, during- and post-construction monitoring program that assesses surface water movement and helps to ensure that pre-construction conditions are maintained to the extent feasible (**Section 9**).	■ Mitigation measures as outlined in the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e). ■ Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan; ■ Design and implement a pre-, during- and post-construction monitoring program that assesses surface water movement and helps to ensure that pre-construction conditions are maintained to the extent feasible (**Section 9**); and ■ Implement adaptive management measures if drainage patterns are determined to be significantly altered. Adaptive management measures will be determined through the development of the Environmental Protection Plan.
P-04	Peatland Ecosystems	Changes to peatland ecosystems as a result of changes to groundwater	Construction, Operation and Maintenance	Ministry of Natural Resources Fisheries and Oceans Canada	■ Construct the Community Access Road through peatland communities using a “floating road” construction methodology to allow for groundwater movement below and through the road embankment. This approach will involve: ○ Completing a detailed ground survey, characterizing the peat and local hydrology at detailed design.	■ Mitigation measures as outlined in the *Groundwater and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c). ■ Design and implement a pre-, during- and post-construction monitoring program that assesses surface and groundwater movement and allows for the maintenance of pre-construction conditions to the extent feasible (**Section 9**). This includes the creation of a monitoring program that involves geochemical testing on

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
					○ Identifying site-specific, appropriate values for peat strength. ○ Using a geogrid base to act as a separator and strengthener between the road subgrade fill materials and the peat. ○ Using additional geogrid and geotextile materials in layers combined with road aggregate material above the embankment fill to form a mechanically stabilized layer. This layer will provide the required strength and stiffness for the road to perform during all seasons, including spring thaw. ○ Designing the Floating Road Plan, profile and cross-section for each road section based on context-sensitive design standards, geometry and loading. ○ Providing transitions between “floating road” sections, excavated and fill sections. ○ Scheduling construction to allow for primary settlement of the peat without risk of shear failure. ○ Monitoring the work through construction, measuring and recording lateral movement and settlements. Being prepared to adjust the design based on observation and monitoring. ■ During detailed design, carefully consider placement of culverts in peatland environments with a particular emphasis on the installation of culverts in areas where the road runs perpendicular to the natural flow of groundwater. ■ AEM Surveying to produce continuous peat depth mapping which is critical for construction planning such as identifying saturated or sensitive areas that may require specialized engineering solutions.	exposed bedrock and soils to assess the potential for acid rock drainage and / or metal leaching as it relates to methylmercury production in peatland communities present within the Construction Disturbance Area. The program will also monitor potential increases in methylmercury production related to changes in groundwater levels as a result of the construction of the Community Access Road. The program will include the following activities: ○ Locations of groundwater monitoring instruments (e.g., piezometers) will be established approximately every 1,000 m along sections of the road that will be constructed with the “floating road” construction methodology. ○ Monitoring locations will be established both up and downgradient of the future road to capture pre-, during and post-construction groundwater levels and movement patterns. Monitoring locations should be located away from equalization culverts. ○ Monitoring will occur three times annually (spring, summer, fall). ○ Details of the monitoring plan including the final placement of piezometers and the duration of monitoring will be developed and refined during detailed design. ■ Design and implement a program to monitor peatland community response to any potential changes in hydrogeology throughout construction (e.g., in the vicinity of dewatering activities and either side of “floating road” segments). ■ Have Environmental Monitors and Indigenous Environmental Monitors on-site during construction to confirm that all mitigation measures are being implemented appropriately. Details regarding Environmental Monitors and their role during the project will be determined through the development of the Environmental Protection Plan. ■ Implement adaptive management measures if groundwater flow patterns are determined to be significantly altered. Adaptive management measures will be determined through the development of the Environmental Protection Plan.
P-05	Peatland Ecosystems	Changes to peatland ecosystems from the introduction and spread of invasive plant species	Construction	Ministry of Natural Resources Environment and Climate Change Canada	■ An Environmental Protection Plan will be developed, and will be implemented during construction to prevent, detect, control (i.e., remove), and monitor areas with invasive species. The plan should also include the following measures: ○ Thoroughly inspect and clean construction equipment and vehicles prior to bringing them to the work area and when moving between work areas within the	■ Implement all components of the Environmental Protection Plan

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
					Project. Cleaning shall be completed in accordance with the most up to date version of the Clean Equipment Protocol for Industry (Halloran et al., 2013). Documentation of the results of each inspection will be a requirement of the Environmental Protection Plan. Additional recommendations for the cleaning of equipment (e.g., the use of specific cleaning stations and their location) will be determined through the development of the Environmental Protection Plan. ○ Use reduced disturbance techniques to prevent topsoil removal and preserve adequate substrate to promote natural revegetation (e.g., use a low impact method to leave the surface vegetation root mat intact). ○ Contour disturbed areas to minimize soil and water erosion and encourage growth of native vegetation. ○ Limit off-road vehicle use by contractors during Construction, Operation and Maintenance. Inspections and maintenance activities that will include cleaning of off-road vehicles before and after each use to prevent the spread of invasive species. Recommendations related to the use of off-road vehicles will be determined at detailed design and / or through the development of the Environmental Protection Plan. ○ Use seed mixes with appropriate native species for all seeding and restoration works. Seed mixes must be tested / certified to be free of invasive species. Native seed should be sourced from local populations whenever possible. ○ Follow Ministry of Transportation Ontario *Provincial Standard Specification 803* to avoid spreading invasive plant species. ○ Herbicides 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.	
P-06	Peatland Ecosystems	Changes to peatland ecosystems from the introduction and spread of invasive plant species	Operation and Maintenance	Ministry of Natural Resources Environment and Climate Change Canada	■ N/A	■ Require that the road operator follows Ministry of Transportation Ontario *Provincial Standard Specification 803* to avoid spreading invasive plant species. ■ Herbicides 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

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
						equipment, while leaving the undergrowth and duff layer undisturbed to prevent erosion. ■ Design and implement a post-construction invasive species monitoring program to detect invasive species presence and control (i.e., remove) new introductions. Details of the post-construction invasive species monitoring program will be included in the Environmental Protection Plan.
P-07	Peatland Ecosystems	Changes to peatland ecosystems as a result of fragmentation and edge effects	Construction	Ministry of Natural Resources Environment and Climate Change Canada	■ Adjust the alignment or clear off centre within the right-of-way to minimize peatland fragmentation and the creation of new forested swamp edges, where feasible. These details will be refined during detailed design. ■ Construct temporary laydown areas and temporary construction camps on existing disturbed areas, wherever possible. The availability of existing disturbed areas for the construction of temporary laydown areas and temporary construction camps will be determined at detailed design.	■ Avoid grubbing along newly created forested swamp edges to promote natural regeneration which will quickly "seal" the new forested swamp edge. ■ Use reduced disturbance techniques during construction to prevent topsoil removal, preserve adequate substrate to promote natural revegetation (e.g., use a low impact method to leave the surface vegetation root mat intact). Recommendations for reduced disturbance techniques will be described in detailed design. ■ Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed. Progressive restoration techniques will be provided in the Environmental Protection Plan.
P-08	Peatland Ecosystems	Changes to peatland ecosystems from the release of sediment	Construction	Ministry of Transportation Fisheries and Oceans Canada	■ Develop and implement a Project-specific Environmental Protection Plan. ■ Develop and implement a Project-specific Erosion and Sediment Control Plan. Erosion and sediment control measures will be developed and implemented in accordance with Ontario Provincial Standard Specifications (*OPSS.PROV.804* and *OPSS.MUNI.805*). Environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction. Installed erosion and sediment control measures are not expected to affect the water movement to peatlands.	■ Regularly inspect and maintain Erosion and Sediment Control structures (e.g., sediment fences, rip rap, or other sediment control structures) in accordance with Ontario Provincial Standard Specification *OPSS.PROV 804* during all phases of the Project and modify measures as necessary. If control measures are not functioning properly, no further work will occur until the problem is resolved. ■ Stabilize disturbed areas through revegetation with native plant species or other appropriate means (e.g., erosion control blankets) following completion of the works. ■ Reschedule work or reduce traffic in areas where soils are considered to be excessively wet or where there is a heavy rainfall risk. Areas where a reduction in traffic are required will be determined during the detailed design phase. ■ Earthworks should be avoided during periods of heavy rainfall, particularly in areas adjacent to watercourses and wetlands. ■ Mitigation measures as outlined in the *Fish & Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026b) and the *Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e).
P-09	Peatland Ecosystems	Changes to peatland ecosystems from spills of fuel or other contaminants	Construction, Operation and Maintenance	Ministry of Natural Resources	■ Develop and implement a Project-specific Environmental Protection Plan.	■ Mitigation measures as outlined in the *Fish & Fish Habitat Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026b), *Groundwater*

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
				Environment and Climate Change Canada		*and Geochemistry Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026c) and the *Draft Surface Water Technical Support Document: Existing Conditions & Effects Assessment Report* (WSP, 2026e). ■ During operations, mitigation measures will include a posting and enforcement of a speed limit on the highway, which should reduce potential for chemical or hazardous material spills by reducing vehicle collision risk.
P-10	Peatland Ecosystems	Changes to peatland ecosystems as a result of the deposition of air contaminants	Construction, Operation and Maintenance	Ministry of Transportation	■ N/A	■ Mitigation measures as outlined in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). ■ Environmental approval conditions, permits, or authorizations issued for the Project construction, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction.
P-11	Peatland Ecosystems	Changes to peatland ecosystems as a result of fugitive dust emissions	Construction, Operation and Maintenance	Ministry of Transportation	■ N/A	■ Mitigation measures as outlined in the *Air Quality and Greenhouse Gas Technical Support Document: Existing Conditions & Effects Assessment Report* (Dillon, 2026). ■ Environmental approval conditions, permits, or authorizations issued for the Project, including those issued from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks and Ontario Ministry of Natural Resources, will be followed during Construction.
P-12	Peatland Ecosystems	Changes to peatland ecosystems as a result of increased public access	Construction, Operation and Maintenance	Ministry of Natural Resources Environment and Climate Change Canada	■ Minimize the Project footprint, vegetation clearing and access road requirements as much as possible (e.g., share / coordinate access, concentrate temporary activities spatially, leave habitat outside of scoped Construction Disturbance Area, selective clearing, and use existing access roads when available). Reducing cleared areas and the number of access roads through coordination, can reduce the number of cleared areas and access roads that will be present during and following construction that may provide access to previously inaccessible lands.	■ Limit the Project footprint, vegetation clearing and access road requirements to the extent feasible (e.g., share / coordinate access, concentrate temporary activities spatially, leave habitat outside the scoped Construction Disturbance Area, selective clearing, and use existing access roads when available); ■ Use progressive restoration on-site once temporary work areas (e.g., staging areas) are no longer needed and prevent ongoing use of inactive areas through combined use of physical control measures (rollback, removal of creek crossings, recontouring to surrounding topography, revegetation / reforesting and / or barriers at junctions with active access);Develop a policy for Project personnel while on shift or at temporary construction camps regarding any plant or timber harvesting activities; and ■ Develop a wildfire prevention plan for the construction works that outlines protocols for hot works or any other activity with the potential to trigger a fire, required fire suppression equipment, and a response plan if a fire is triggered.

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
P-13	Peatland Ecosystems	Changes to peatland ecosystem carbon storage and flux	Construction, Operation and Maintenance	Ministry of Natural Resources Environment and Climate Change Canada	■ Construct the Community Access Road through peatland communities using a “floating road” construction methodology to allow for groundwater movement below and through the road embankment and to avoid the need for stripping of peat and the associated release of carbon. ■ Limit vegetation clearing to within the 100 m right-of-way and reduce to less than this width whenever and wherever possible: ○ Minimize clearing widths in peatland ecosystems given the difficulty of restoration efforts in these systems. ○ Adjust the alignment or clear off centre within the right-of-way where warranted, to minimize effects on peatland ecosystems. These details will be refined during detailed design, prior to construction. ○ Limit clearing of riparian vegetation (i.e., within 30 m of waterbodies) to the extent possible and to the requirement of the access road and alignment clearing width only. ○ Locate temporary access roads, staging areas, camps, and debris and / or timber stockpiles in less sensitive ecosystems (e.g., upland ecosystems), where possible. Avoid peatland communities for temporary features wherever possible. ■ Prepare and Implement a Vegetation Restoration Plan that includes measures specific to peatland communities and peatland restoration, including peat stockpile management. These measures will be determined at detailed design and/or when the Vegetation Restoration Plan is developed. This plan will be developed through engagement and consultation with Indigenous communities and integration of local Indigenous Knowledge and stewardship protocols.	■ Decommission and rehabilitate temporary access roads, staging areas, camps, and debris and / or timber stockpiles following construction. Details related to peatland rehabilitation will be determined at detailed design and/or when the Vegetation Restoration Plan is developed.

ID = identifier; m = metre; N/A = not applicable.

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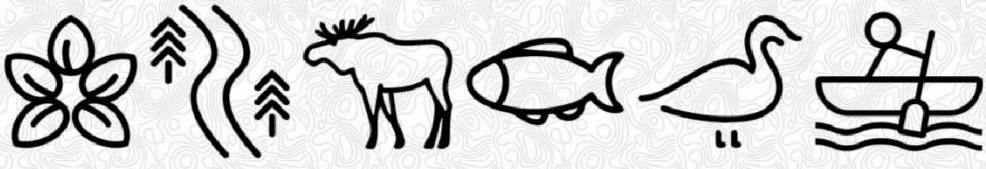
Attachment A – Draft Study Plan, Workplan and Regulator Comments

MARTEN FALLS FIRST NATION
ALL SEASON COMMUNITY ACCESS ROAD

FINAL

Peatlands Study Plan

May 2021



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Revision History

Rev #	Date	Revision Description
Draft	June 2020	Submitted “Study Plan – Peatlands DRAFT FOR DISCUSSION” to the Agency
Final	May 2021	Revised to address federal agency comments

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Appendices

Appendix A. Preliminary List of Data Sources
Appendix B. Agency Comments on the Draft Study Plan

Acronyms

Agency, the ... Impact Assessment Agency of Canada
AR5 ..... the IPCC's Fifth Assessment Report
CADE ..... Climate Analytics Data Engine
CAR ..... Community Access Road
CO2 ..... Carbon dioxide
CH_4 ..... Methane
cm ..... centimeter
EA ..... Environmental Assessment
ECCC ..... Environment and Climate Change Canada
GHG ..... Greenhouse Gas
GIS ..... Geographic Information System
IA ..... Impact Assessment
IAA ..... *Impact Assessment Act*
IPCC ..... Intergovernmental Panel on Climate Change
IS ..... Impact Statement
kg ..... kilogram
km ..... kilometre
LiDAR ..... Light Detection and Ranging
LSA ..... Local Study Area
m ..... metre
MECP ..... Ontario Ministry of the Environment, Conservation and Parks
MFFN ..... Marten Falls First Nation
PDA ..... Project Development Area
RCP ..... Representative Concentration Pathways
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 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 Peatlands 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 ■ Cultural Continuity (ability to practice and transmit cultural traditions)
Atmospheric Environment	■ Atmospheric Environment and Greenhouse Gases Study Plan	■ Air Quality ■ Greenhouse Gas Emissions
Climate Change	■ Climate Adaptation and Resiliency Study Plan	■ Climate Change
Acoustic and Vibration Environment	■ Acoustic and Vibration Environment Study Plan	■ Noise ■ 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 ■ Upland Ecosystems ■ Designated Areas (Areas of Natural and Scientific Interest, Environmentally Significant Areas, Significant Woodlands, Critical Landform / Vegetation Associations) ■ 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*]) ■ Amphibians and Reptiles ■ Pollinating Insects
	■ Ungulates (Moose and Caribou) Study Plan	■ Moose (*Alces alces*) ■ 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 ■ Raptors (proxy VC of Osprey [*Pandion haliaetus*] for diurnal raptors and Boreal Owl [*Aegolius funereus*] for nocturnal raptors ■ Shorebirds (proxy VC of Wilson's Snipe [*Gallingo delicata*]) ■ Waterfowl (proxy VC of Mallard [*Anas platyrhynchos*]) ■ 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. ■ 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*) ■ Walleye (*Sander vitreus*) ■ Brook Trout (*Salvelinus fontinalis*) ■ Northern Pike (*Esox lucius*) ■ Lake Whitefish (*Coregonus clupeaformis*) ■ Chain Pickerel (*Esox niger*) ■ Yellow Perch (*Perca flavescens*)

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)
		■ Cisco (*Coregonus artedii*) ■ Burbot (*Lota lota*) ■ Longnose Sucker (*Catostomus catostomus*) ■ White Sucker (*Catostomus commersonii*) ■ Forage / Prey Species (including species such as Lake Chub [*Couesius plumbeus*]) ■ Lower Trophic Organisms (e.g., benthic invertebrates)
Social	■ Social Study Plan	■ Housing and Accommodation ■ Community Service and Infrastructure ■ Transportation ■ Community Well-being ■ Populations and Demographics
Economy	■ Economic Study Plan	■ Regional Economy ■ Labour Force and Employment ■ Government Finances
Land and Resource Use	■ Land and Resource Use Study Plan	■ Land Use Compatibility ■ Parks and Protected Areas ■ Extractive Industry ■ Forestry Industry ■ Energy and Linear Infrastructure ■ Recreation and Tourism
Human Health and Community Safety	■ Human Health and Community Safety Study Plan	■ Public Safety ■ Public Health ■ Diet ■ Environmental Factors Influencing Health
Visual Aesthetics	■ Visual Aesthetics Study Plan	■ Visual Contrast / Character ■ Visibility ■ Visual Sensitivity
Archaeological and Cultural Heritage	■ Cultural Heritage Study Plan	■ Archaeological Sites and Resources ■ 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 Peatlands 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 such information 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, the 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 and 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, 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 this Project.

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 other applicable agencies. A summary of technical discussions and correspondence held to date on this Study Plan has been provided in **Table 3-1.**

Table 3-1: Summary of Study Plan Technical Discussions

Attendees / Responsible Party	Correspondence	Discussion Point	Solution
■ **The Agency**	■ Preliminary comments received following submission and review of draft Study Plan	■ **17-August-2020:** Comments and clarification questions received, including additional information requirements regarding baseline study design, desktop assessment and concordance with federal and provincial requirements.	■ Additional details and clarification provided within this Study Plan, and responses to these comments are in **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[5] 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

5. *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) ■ Aroland First Nation ■ Constance Lake First Nation ■ Eabametoong First Nation ■ Ginoogaming First Nation ■ Neskantaga First Nation ■ Nibinamik First Nation ■ 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 ■ Fort Albany First Nation ■ Kashechewan First Nation
Shibogama First Nations Council (Nishnawbe Aski Nation)	■ Kasabonika Lake First Nation ■ Kingfisher Lake First Nation ■ Wapekeka First Nation ■ Wawakapewin First Nation ■ Wunnumin Lake First Nation
Independent First Nations Alliance *(Nishnawbe Aski Nation)*	■ Kitchenuhmaykoosib Inninuwug First Nation
Independent First Nations *(Nishnawbe Aski Nation)*	■ Mishkeegogamang First Nation ■ Weenusk First Nation
Nokiiwin Tribal Council	■ Animbiigoo Zaagi'igan Anishinaabek First Nation*
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 the MECP who should be consulted on the basis that they may be interested in the Community Access Road.*
*** The 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.

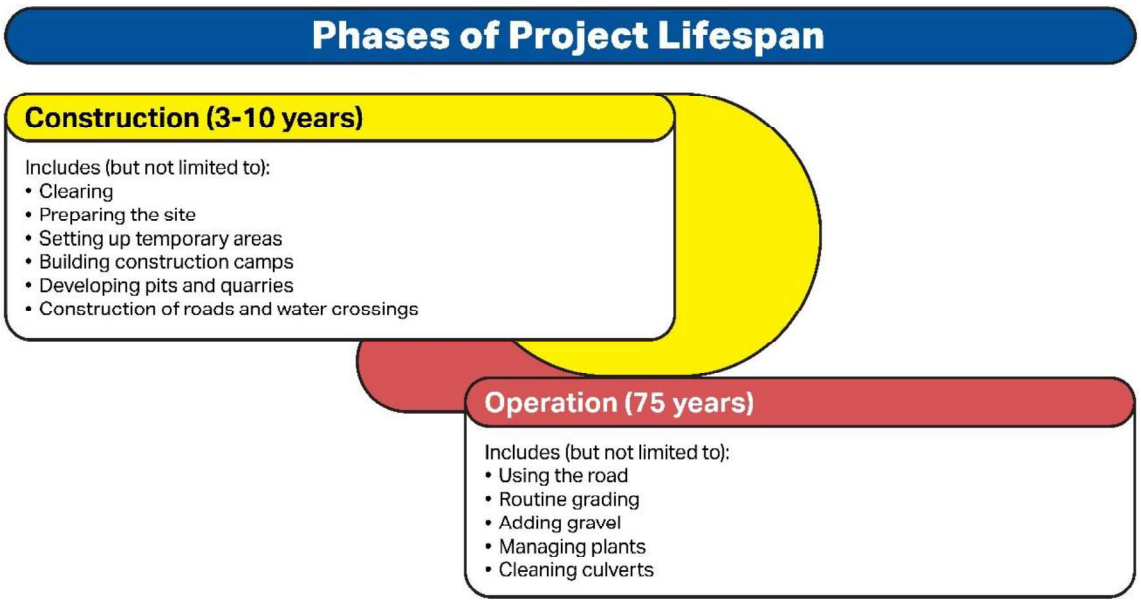
6. Assessment Boundaries

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.

Figure 6-1: Project Schedule



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[6]). 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.

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). Location for Project components other than the route itself (e.g., temporary construction access roads, work areas, worker

6. *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.*

camps, and pits, quarries and associated access roads) are unknown at this time; however, the PDA and LSA will be adjusted accordingly as the Project design progresses and as required.

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 Peatlands Study Areas

The LSA and RSA boundaries for Peatlands are detailed in **Table 6-1** and shown on **Figure 6-2**.

Table 6-1: Peatlands Study Areas

Study Area	Geographic Extent	Rationale
Local Study Area	■ 2.5 km buffer surrounding the PDA (may be refined following desktop analysis and input from other VCs that may indirectly affect Peatlands)	■ The LSA will encompass the PDA and will consider areas outside of the PDA where direct or indirect Project effects Peatlands can occur (e.g., erosion and sedimentation, spills, or dust deposition) ■ To account for potential shifts in route alignment or positioning of temporary infrastructure ■ To encompass the LSAs of other VCs that may affect Peatlands (e.g., Surface Water)
Regional Study Area	■ Borders of overlapping quaternary watershed boundaries (may be refined following desktop analysis and input from other VCs that may indirectly affect Peatlands)	■ Using a boundary at the quaternary watershed spatial area will allow for a large enough area to assess cumulative effects on ecosystems that are found within peatland communities within the RSA.

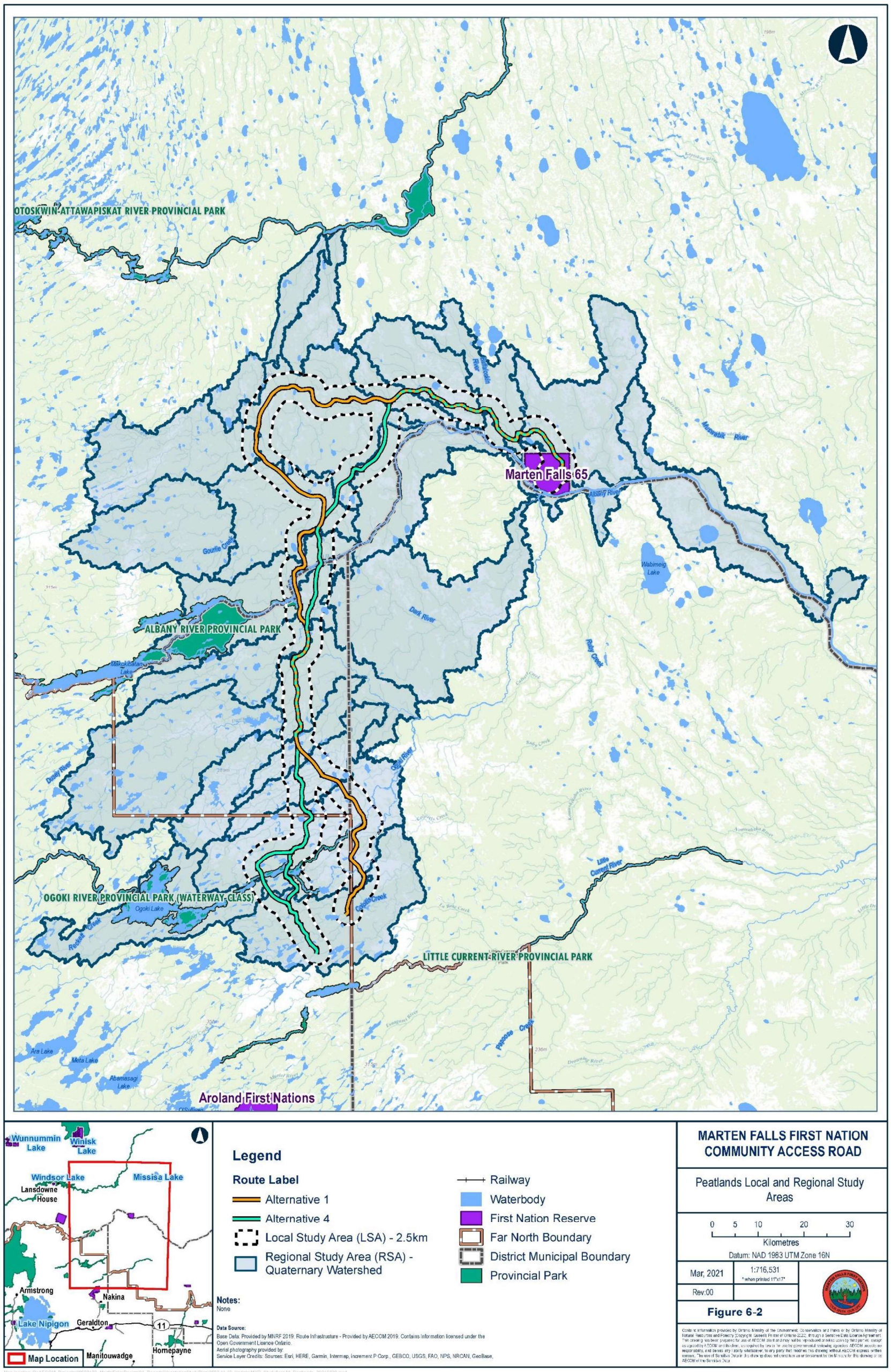
The LSA for Peatlands differs slightly from what is generally being considered, which is an area within 2.5 km of the centreline of Alternative 1 and Alternative 4. This span would generally allow for documentation of existing conditions and prediction of environmental effects. The LSA will be refined during the collection of baseline data where the boundary could extend beyond the general 2.5 km from the PDA. The definition of the LSA will take an ecosystem-centred approach as outlined in the Canadian Environmental Assessment Agency's document Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act* and will consider the topography, climate, soils vegetation and geology of the area (Canadian Environmental Assessment Agency 2018).

The RSA includes the PDA and associated LSA. The RSA was selected to capture the maximum spatial extent of the combined direct and indirect effects that extend beyond the PDA and LSA of the CAR on Peatlands. This is in accordance with the TISG which states that, "study area boundaries should include areas potentially affected by changes to water quality and quantity or changes in flow in the watershed and hydrologically connected waters." The RSA represents the largest of the three study areas and encompasses all far-reaching effects of the CAR. The Peatlands RSA is defined by the borders of all overlapping quaternary watersheds in the Project area. Quaternary watersheds are defined as the drainage areas that make up over 1000 individual subdivisions within the tertiary watersheds in the province of Ontario. Quaternary watersheds were chosen as the geographic extent for the RSA as the farthest-reaching indirect effects on Peatlands are hydrologically driven, and quaternary watersheds provide a representative

boundary and is considered of sufficient size to capture effects to Peatlands within the larger drainage area. The following quaternary watersheds make up the general RSA:

- Garvey Lake-Seabrook Lake;
- Robins Island-Albany River;
- Marten Falls-Albany River;
- Wabassi River-Mouth;
- Gourlie Creek;
- Macina Falls-Wabassi River;
- Tolfree Lake;
- Gittins Lake;
- Buffaloskin River;
- North Channel-Ogoki River;
- Dusey River-Mouth;
- Dark River;
- Jenner Creek-Colpitts Creek;
- Brundrit Lake;
- Tanase Lake;
- Purcell Lake-Albany River; and,
- Stonebasket Island.

Figure 6-2: Peatlands Local and Regional Study Areas



7. Baseline Study Design

In accordance with the TISG, the objective of the Baseline Study Design for the Peatlands Study Plan is to collect data in a manner that enables reliable analysis, extrapolations and predictions for the estimation of baseline conditions at peatland environments. Peatlands is an interdisciplinary field where knowledge of climate, landform, soils, surface water, groundwater, and vegetation are needed to determine the baseline conditions. Therefore, the Peatlands Baseline Study Design aims to build upon and integrate the results of the following Study Plans:

- Atmospheric Environment;
- Climate Adaptation and Resiliency;
- Physiography, Terrain and Soils;
- Surface Water;
- Groundwater and Geochemistry;
- Vegetation; and
- Land and Resource Use.

This approach enables efficiencies in the field when considering logistical challenges such as the remoteness of the site, the short growing season, and the vast tracts of peatland terrain in the subject area. The study design described in the following sections outlines the methods in which the baseline conditions of Peatlands within the Project study areas will be characterized.

7.1 Context

Peatland is a collective term for wetlands that accumulate more than 40 cm of organic soil derived from Sphagnum moss species (Asada and Warner 2005, National Wetlands Working Group 1997, Sims and Baldwin 1996, National Wetlands Working Group 1988). These types of wetlands are considered an important ecosystem both locally and globally in terms of biodiversity, ecosystem function, and carbon storage and flux and, hence, represent a key component to the IS / EA. The following describes the importance of Peatlands in relation to the IS / EA.

Peatlands are home to an extraordinary diversity of life (Tickner et al. 2020). Permanent saturation, high acidity and low electrolyte and nutrient content mean that peatland habitats are colonized by highly adapted

plant and animal species thereby contributing considerably to species diversity (Wolfgang et al. 2006). There are over one thousand documented plant and animal species known to inhabit Peatlands and include a variety of lichens, bryophytes, ferns and allies, herbaceous wetland and terrestrial plants, aquatic and terrestrial invertebrates, birds, and mammals (Wolfgang et al. 2006).

Peatland form and function is largely determined by hydrological processes resulting from water exchange dictated by climate, topography, soil character, vegetation cover and land use. The mechanisms by which water flows overland and through the subsurface is complex. Water movement can occur between branches and leaves and up the stem and through tight networks of peat (Thompson and Waddington 2008). Subsurface flow can also be through a series of macropores and natural pipes or channels and can occur at depth in peat isolated from large-scale groundwater flow systems (Holden 2005, Devito et al. 1997). Subsurface flow within a peatland can also reverse in direction in response to water deficit and water table drawdown (Devito et al. 1997).

Peatlands also form one of the largest carbon sinks[7] in the terrestrial biosphere, representing approximately one third of the world's carbon (Waddington and Price 2000). Peatlands in Canada are most widespread in the Boreal and Subarctic Wetland Regions (Tarnocai et al. 2000, 2005; National Wetlands Working Group 1986) and make up a total surface coverage of approximately 1,135,607 km^2, which accounts for 91% of the total wetlands, or 12% of the land area in Canada (Tarnocai 2006). Because of the large area they cover and their high organic carbon content, Canadian Peatlands contain approximately 147 Gigatonne soil carbon, which is approximately 56% of the organic carbon stored in all Canadian soils (Tarnocai 2006). The movement of water in Peatlands drives carbon storage and flux and it is these small-scale processes that can have global impacts through exacerbated terrestrial carbon release (Holden 2005). When the water table lowers, more peat is exposed to oxygen, therefore decomposing and releasing the previously stored carbon into the atmosphere the forms of carbon dioxide and methane (Holden 2005).

7.2 Desktop Assessment

A desktop review of existing information sources will be completed to identify the relevant information gaps to be addressed through further study. Based on the guidance provided in Section 7.2 'Sources of baseline information' in the Agency's TISG for this Project, a preliminary list of applicable information sources and academic papers have been included in **Appendix A** and reflects federal and provincial guidance received to date. The purpose of the desktop assessment is to confirm that the most up-to-date and relevant science

7. *Carbon sinks are natural environments, such as Peatlands, that absorb carbon from the atmosphere into plant tissues through photosynthesis and prevent the carbon from easily re-entering the atmosphere (International Union for Conservation of Nature 2017)*

and methods are being used for field assessment; to help to ensure information that has already been collected is effectively utilized in the determination of baseline conditions; and to logistically plan for field assessment.

The desktop assessment will include:

- Review of Previous Studies: A review of previous regional baseline studies that pertain to the Project scope and / or RSA will be completed to provide additional climate, hydrogeological, geological, hydrological, geochemical or biological data. If any data are referenced, justification for utilizing these data (i.e., spatial and temporal relevance with respect to the Project RSA), detailed descriptions, and specific data sources will be provided in the Baseline Report.
- Review of existing databases: Existing climate, geological, hydrological and biological databases will be reviewed, a list of which is provided in **Appendix A**.
- Review of relevant academic papers: A list of recommended academic papers is provided in **Appendix A**.
- Review of existing mapping, light detection and ranging (LiDAR) data and aerial photography: A review of existing wetland mapping, Far North Landcover mapping (OMNRF 2014), LiDAR imagery and aerial photography will be conducted to further support the baseline characterization studies.
- Pre-typing of Peatland Communities: The delineation of Peatlands will be completed using background information such as: Far North Land Cover Mapping (OMNRF 2014), Forest Resource Inventory mapping – Ogoki Forest (OMNRF 2020) and surficial geology information, as well as highly detailed LiDAR data that has been procured for the PDA and LSA.
- Coordination with related disciplines: collaboration and coordination will take place with other disciplines to verify that, where applicable, the data requirements to develop the Peatlands assessment have been captured in supporting technical study plans.

The results of the desktop assessment for Peatlands will be documented in the Baseline Report. This report will include:

- a literature review of existing studies to characterize baseline conditions. A list of documents that were reviewed will be provided as an appendix;
- a description of the overall landform, geology and soils that will be based on the results of the Physiography, Terrain and Soils Study Plan;

- a description of the historical climate including annual trends for air temperature, rainfall, snowfall and wind that will be based on the results of the Atmospheric Environment and Climate Adaptation and Resiliency Study Plans;
- a gap analysis to provide the basis for completing additional field or desktop studies to support the baseline characterization studies; and
- a description of the extent of Peatlands within the LSA and RSA as determined through the desktop assessment, coupled with a summary of where these features are known to overlap with water body crossing locations (based on the results of the Surface Water Study Plan and specific to peatland-influenced watercourses that are expected to be crossed by the Project alignment).

7.2.1 Peatland Availability and Distribution

Preliminary desktop mapping will be completed to identify peatland features within the PDA and LSA. Peatlands will be mapped with support of the Physiography, Terrain and Soils studies as well as the Vegetation studies. As per the recommendations outlined by the Physiography, Terrain and Soils Study Plan, terrain mapping will be completed at a scale between 1:2,000 and 1:5,000 using digital stereo imagery. All features identified as organic during the terrain mapping will be further reviewed and classified to peatland formation (swamp, bog, fen, palsa / peat plateau, marsh, open water [poor fen]) and subformation (i.e., open or treed). Results of the terrain mapping and classification of organic terrain features will be verified against vegetation community pre-typing to confirm the extent of Peatlands within the PDA and LSA. In accordance with the requirements of the TISG, Peatlands will be mapped to ecosite (i.e., open, shrub and treed bog / fen / swamp) per the Northern Ecological Land Classification methods within the LSA to the extent possible.

The RSA will not be delineated through the Ecosites of Ontario (Banton et al., 2009) classification methods but will be left to the scale of the Far North Land Cover mapping. Classification of the RSA will remain consistent with the approach suggested by related disciplines (e.g., vegetation). The level of existing information on vegetation and peatland communities within the RSA (Far North Land Cover) is considered adequate to support an assessment of indirect effects on Peatland VCs within the RSA. No additional desktop delineation or classification in the RSA will occur. Concordance tables will be created to provide consensus between the two classification systems, with the Ecosites of Ontario classification being grouped into the broader categories of the Far North Land Cover during assessment of the Project at the RSA scale. Variation of peatland types observed in the LSA will be used to provide a qualitative narrative of the Far North Land Cover data.

7.2.2 Peatland Carbon Storage and Flux

Peatlands represent a large net carbon sink, sequestering between 10 and 35 grams of carbon per metre squared per year (g-C/m^2/y) (Packalen et al. 2014, Roulet et al. 2007, Strack et al. 2016, Vitt et al. 2000). Carbon dynamics in Peatlands include uptake and release of atmospheric CO_2, release of methane (CH_4) to the atmosphere, and export of dissolved organic carbon in water (Roulet et al. 2007). Peatland carbon storage and flux will be determined based on methods outlined in the *Assessment of the vulnerability of peatland carbon in the Albany Ecodistrict of the Hudson Bay Lowlands, Ontario, Canada to climate change* (McLaughlin et al. 2018) and using secondary sources identified in **Appendix A**. Estimating carbon storage will be evaluated from the area of Peatlands and the carbon mass will be estimated per the following regression equation (McLaughlin et al. 2018):

$$\text{Carbon mass (kg m}^{-2}) = 0.4^* \text{ peat depth (m)} + 17.2$$

Peat depth will be estimated during terrain mapping as per the Physiography, Terrain and Soils Study Plan. Field peat depth measurements will be collected during peatland classification and terrain field studies to refine the carbon storage estimates. During the field studies, the peat depths will be measured at field plot locations, noting that plots will be augered to a depth of 2 m, with a plan to characterize individual soil and peat profiles.

Existing regional datasets and secondary sources identified in **Appendix A** will act as the basis for estimating the carbon flux in the form of CO_2 and CH_4 for the Project and will be consistent with the approach used in *Assessment of the vulnerability of peatland carbon in the Albany Ecodistrict of the Hudson Bay Lowlands, Ontario, Canada to climate change* (McLaughlin et al. 2018). The export of dissolved organic carbon is not considered as part of the assessment for the Project. The assessment will focus on atmospheric flux of carbon. The off-site waterborne carbon losses are not anticipated to be significant compared to the on-site emissions.

The assessment to determine peatland carbon storage and flux will include:

- Development of a spreadsheet providing the relevant parameters used to calculate carbon storage and flux with final calculation for each peatland type.
- Assessment of Peatlands with consideration of the pertinent peatland characteristics including peat classification and subform, peat wetness, water table depth, and permafrost.

7.2.3 Peatland Climate

The desktop studies will include an assessment of the potential effects of climate change on peatland function and carbon storage and flux. Peatland primary production, and therefore its ability to act as a carbon sink may be affected by changes in climate (McLaughlin et al. 2018). For example, increased temperatures can drive higher evapotranspiration rates, leading to drier peatland communities. Effects of climate change will be evaluated specifically in response to increased temperature and changes in rainfall patterns. Precipitation changes will be assessed based on their range and seasonality. The climate indices and expressions of change are not expected to be Project driven. However, it is important to understand the context of these changes and how they relate to evolving baseline conditions and anticipated Project effects.

Baseline and projected future climate data will be developed for the assessment of climate change impacts on Peatlands for the Project. One 30-year baseline historical record and two 30-year periods centred on the 2050s (2041 – 2070) and the 2080s (2071 – 2100) will be used to align the assessment of climate change impacts on Peatlands (ECCC 2021, IPCC 2014). This assessment will be developed across time horizons consistent with design life expectations for the Project.

Future climate projections for each assessment time horizon will be reviewed and historical and projected climate information will be compiled for climate factors relevant to Peatlands from locations in proximity to the preferred CAR route. The assessment will use a Climate Analytics Data Engine (CADE) to access credible, quality-checked (by ECCC) historical and projected climate data on relevant climate factors. The CADE Tool develops climate analytics through leveraging a large collection of datasets, including:

- Dataset of available ECCC observation stations (of various record lengths) dating back to 1900 for some stations (daily observations with hourly observations from major airports);
- Dataset of observed historical gridded data for Canada (CANGRD) developed by ECCC and Natural Resources Canada (NRCan) at 10 km resolution;
- For climate projections full datasets of officially available Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) (IPCC 2014) Global Climate Models (GCMs), with consideration of simulations from approximately 40 IPCC GCMs;
- Available ECCC Intensity-Duration-Frequency datasets from across Canada;
- Dataset of ECCC historical Canadian tornadoes; and,
- Dataset of National Building Code of Canada meteorological code standards from across Canada.

7.3 Field Study Methods

Baseline field studies will be completed for peatland environments to confirm and further augment the results of the desktop review of existing information. The purpose of the baseline field studies is to collect site-specific data to enable reliable analysis and extrapolation for estimating baseline conditions and predicting Project-effects on peatland environments both spatially (i.e., within and across the PDA, LSA and RSA) and temporally (i.e., between years). The baseline field study component of this Study Plan will focus on collecting data to determine the following characteristics for Peatlands:

- Peatland Hydrology and Hydrogeology;
- Peatland Composition; and
- Peatland Function

Data collected for these components will be through a combination of in-field and modelling studies.

7.3.1 Peatland Hydrology and Hydrogeology

Peatland hydrology and hydrogeology will be characterized based on the field data collected as part of the Groundwater and Geochemistry Study Plan and Surface Water Study Plan, recognizing that the groundwater field studies will include borehole and associated hydrogeological investigations in peatland environments, while the surface water field studies will involve multi-season flow measurements and water quality sampling at peatland-influenced water body crossing locations. The field studies for the surface water and groundwater monitoring stations have been developed with inputs from the Peatlands Study Plan Lead to confirm that selected monitoring / sampling stations occur within representative Peatlands (as described in **Section 7.3.2)**.

Data required from the Groundwater and Geochemistry Study Plan and Surface Water Study Plan include:

- Depth of groundwater table;
- Location of defined water bodies (i.e., watercourses, lakes, and ponds to be targeted as crossing locations);
- Inferred surface water – groundwater connections at water body crossing locations;
- Estimated drainage area for water body crossing locations;

- Measured / observed variation in surface water flow and water quality for water body crossing locations; and
- Dominant flow direction both in areas that support focused and diffuse flow patterns.

The findings of this field assessment will be provided as part of a Baseline Report. This document will include:

- A characterization of existing surface water and groundwater conditions within peatland ecosystems;
- A description of landscape and / or watershed considering topography, soil types and hydrological linkages associated with peatland-influenced water bodies; and
- A description of hydrological and other functions.

The general timing of this assessment will be conducted in line with field work completed per the Groundwater and Geochemistry Study Plan and Surface Water Study Plan. Results of the Baseline Report will be used to inform the required mitigation measures for the Project (e.g., use of equalization culverts, collection ditches, permeable fill materials) to avoid road-related impacts such as flow disruption and associated loss to peatland environments.

7.3.2 Peatland Composition

It is important to understand the types of Peatlands that may be affected by the Project, given that the various types, or subforms, react differently to environmental and anthropogenic influences (Sims and Baldwin 1996). These considerations will be assessed through the planned field surveys for the Physiography, Terrain and Soils Study Plan and Vegetation Study Plan, with a plan to use these field studies to describe the general composition of representative peatland communities as described in the within the PDA and LSA.

Aerial and ground-based field survey locations, coupled with sample numbers, for the supporting Vegetation Study Plan will be determined based on the field survey site selection and statistical analysis for wetland communities. Representative areas to be ground-surveyed are to include a sample of each peatland ecosite found within the LSA. There will be no ground surveys within the broader RSA.

At each ground and aerial survey location, the peatland will be classified to formations (swamp, bog, fen, palsa / peat plateau, marsh, open water [poor fen]) and subformation (i.e., open or treed) in accordance with the *Ontario Peatland Inventory: Field work Methods* (Riley and Michaud 1994), the *Ontario Wetland*

Evaluation System Northern Manual (OMNRF 2014) as well as the Canadian Wetlands Classification System (National Wetlands Working Group 1997). The following data will be collected at each ground sample point:

- GPS Point: The location of sample point will be recorded in UTM geographic coordinates, including elevation;
- Classification: Peatland will be classified as per the Canadian Wetland Classification System and Ecosites of Ontario based on the vegetation, hydrology, and soils.
- Sphagnum spp. Identification: Sphagnum mosses will be identified to species level by qualified field staff who have the knowledge and experience or have been trained to identify Sphagnum to species within a 1 m x 1 m grid quadrant placed to reflect representative vegetation. Where required, field samples may be collected and submitted to a taxonomic expert for identification. Field resources such as the field guide for identifying Sphagnum species in northwestern Ontario (Sims and Baldwin 1996) will be used, a link of which is provided in **Appendix A.**
- Surface Wetness: This is a general characterization and relative estimate of wetness of the top 20 cm of peat will be categorized into the following:
  - 1 – Dry
  - 2 – Moist
  - 3 – Wet (i.e., water table at 10 to 25 cm below the surface)
  - 4 – Very Wet
  - 5 – Water above Surface
- Geomorphology and Hydrology: Several considerations will be documented including: geomorphology of the peatland (e.g., depressional, riverine, lake fringe, extensive peatland); presence of surface water, flow patterns, connectivity, inputs, outputs, water depth, and evidence of groundwater influence; and existing hydrology alterations (e.g., ditching, beaver activity) will be documented.
- Hummock-Hollow Topography and Average Depth to Water: Microtopographic variability of hummocks consisting of Sphagnum spp. and hollows (pools of wetter graminoid or forb vegetation) may be present within Peatlands and will be recorded as a cover percentage within the 5 m radius of the sample point. The general height of the hummock will be recorded. Average depth to water will be recorded for hummocks and hollows as per the *Ontario Peatland Inventory: Field work Methods* (Riley and Michaud 1994).

- Peat depth and stratification: A Mini-Macaulay auger or a Miller auger is recommended to be used to identify changes in peat type and decomposition using the von Post scale (Ekono 1981) as well as noting capillary characteristics, noting that peat will be sampled in the field to a depth of 2 m.
- Peat decomposition: Substrate decomposition rates will be described using the von Post scale (Ekono 1981).
- Basal sediment: Where encountered, identification of basal sediment (rock, gravel, sand, silt, clay, till) will be made from a relatively small amount of sample taken from the bottom of the auger.
- Canopy height: The height of the canopy will be estimated.
- Vascular plant density / cover percentages: The cover percentages of different structural strata of vegetation (e.g., tree cover, tall shrub, low shrub, graminoid and herbaceous, and moss and lichen species) will be obtained within 5 m of the plot radius.
- Representative Photographs: A series of representative photographs will be taken for each ground survey completed. Landscape photographs will be taken at each cardinal direction (i.e., north, south, east, west) as well as a photograph looking down on the 1 m x 1 m quadrant.

7.3.3 Peatland Function

A functional assessment for the peatland sites will be completed at all ground survey locations. The *Wetland Ecological Functions Assessment: An Overview of Approaches* (Hanson et al. 2008) provides a summary of potential methods that will be used to assess peatland function, indicates the type of data that will be collected, and provides a list of functions that can be expected for each of the different peatland classes (Hanson et al. 2008). These function assessments help to inform the IS / EA Report by providing baseline conditions of the relative functions that the peatland provides to the landscape. The quantitative analysis of peatland function will provide a better understanding of the potential for Project-related effects to Peatlands. The results of the functional assessment will be detailed in the IS / EA Report.

The data collection protocol for the functional assessment will be adapted from the *Wisconsin Rapid Assessment Methodology* (Wisconsin Department of Natural Resources 2014), *Ontario Wetland Evaluation System* (OMNRF 2014), and *the Wetland Ecological Functions Assessment: An Overview of Approaches* (Hanson et al. 2008), noting that these guidelines complement the recommended approaches from ECCC. Peatland composition information collected during the vegetation and physiography, terrain and soils field components (**Section 7.3.2**) will be used to assess the habitat and hydrological function of the peatland

ecosystems. Habitat suitability, and wildlife observations captured as described in the Bird, Ungulates and Wildlife Study Plans will also be incorporated into the functional assessment.

Field assessments for the vegetation studies will be conducted during the leaf-on season which typically occurs from late May through early September. The results of these field surveys will be provided in the Baseline Report for Peatlands, with consideration of the following:

- updated peatland mapping indicating the Ecosite, subformation and location of where ground and aerial surveys were completed for the LSA, noting that feature boundaries will also be refined where applicable;
- a representative description of each peatland subformation including a list of vascular plants and Sphagnum spp observed where applicable;
- completed datasheets will be included as an appendix; and
- representative photographs will be included as an appendix.

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.

8.1 Field Surveys

To maintain consistency and for QA / QC of the data collected, standardized datasheets (either digital or paper) paired with mapping software will be used in the field. Field studies will follow technical protocols that will outline specific work instructions and will be / have been developed to follow provincially and federally acceptable methods. Completeness and accuracy of field data will be verified daily during field verification and field photos and coordinate information will be backed up daily.

8.2 GIS

Finalized Baseline Mapping will be made available in geographic information system (GIS) format and will be provided as electronic geospatial data file(s) compliant with the ISO 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. This is per the terms of the Open Government License – Canada as applicable with exclusion of sensitive data and confidential Indigenous Knowledge.

Complete data sets from all survey sites will be provided. They will 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 will be accompanied by detailed metadata that meets ISO 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.

8.3 Peatland Functional Assessment

Each peatland visited during the ground survey locations will be assigned a function ranking / score (e.g., high, moderate, low) based on its relative contribution of various peatland functions (i.e., habitat, hydrology,

biogeochemical) to the surrounding ecological systems. The following will be considered when determining a ranking:

- Surrounding land use types and existing disturbances;
- Hydrological connectivity (flow, isolated wetland vs. wetland complex);
- Hydraulic conductivity (water permanence);
- Vegetation density and open water components;
- Carbon storage and flux;
- Biodiversity, presence of sensitive species or species of cultural importance and habitat suitability; and,
- Water storage and decomposition rates.

This methodology will provide a qualitative and quantitative measure of Peatlands within the PDA and LSA and is anticipated to include sufficient information to describe baseline conditions of peatland abundance and function.

8.4 Peatland Climate

QA / QC routines and algorithms will be applied to identify potentially non-valid data points, and complete additional measures to confirm if outliers represent instrumentation errors or actual extremes values in the data. When data gaps require data supplementation from other sources, those sources will be identified, with the relevant methods and rationale described for their application in this study.

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. 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 the Peatlands Study Plan 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	Peatlands
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	**x**
	Pits and Quarries[1]	
	Drilling / Blasting / Aggregate Production	
	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	

Project Phases	Project Activities	Peatlands
Construction Phase: Decommissioning	*Pits and Quarries*	
	Temporary Camps, Roads / Trails and Staging Areas	**x**
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.

The VCs for Peatlands have been determined through consideration of the following factors listed in the TISG[8]:

- VC presence in the study area;
- 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;

8. *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 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 Peatlands.

Table 9-2: Peatlands Indicators

Valued Component	Indicators	Rationale for Selection
Peatland Ecosystems	■ Availability (decrease / increase of overall amount of peatland area) ■ Distribution (changes to the arrangement and connectivity of Peatlands)	■ Social / cultural importance; ■ Available habitat for wildlife; and ■ Ecosystem and landscape level biodiversity.
	■ Function and Composition (change in plant species composition or ecological function).	■ Peatlands provide hydrologic and biogeochemical functions; ■ Sensitive to changes in climate, hydrology and anthropogenic disturbance; and ■ Peatlands can affect subsurface water flow in response to hydrological changes (Devito et al. 1997).
	■ Carbon Storage and Flux	■ Northern Peatlands represent a large portion of the Earth's total terrestrial carbon stores (Thompson and Waddington 2008); and ■ Peatland disturbance is a source of greenhouse gas emissions to the atmosphere (Nugent et al. 2018).
	■ Peatland Climate (changes in temperature, rainfall, seasonal snow accumulation, freeze thaw cycles and / or evapotranspiration rates)	■ Higher temperatures can lead to drying out of peat, increased likelihood of wildfire (and peatland loss), falling water table, increased respiration during warmer months, cracking and erosion (Thompson and Waddington 2008); ■ Changes in rainfall and snow accumulation may impact hydrological cycles (i.e., spring recharge via snowmelt); ■ Changes in freeze / thaw cycles, winter snowmelt events with potential to reduce snowpack available for spring recharge from spring melt runoff; and ■ Drought conditions caused by higher summer temperatures and higher rates of evapotranspiration.

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 Peatlands 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 Peatlands may result in indirect effects to other environmental disciplines.

9.4 Methods for Predicting Future Conditions

Assessments of biodiversity metrics, relative abundance and distribution of communities of ecological, economic or human importance will be included in the prediction of future conditions. Percentage of landcover types and changes to land cover can provide critical information on broad scale ecosystem changes. In addition, the extent of wetland cover and amount of wetland loss are also strong indicators of change in biodiversity (Ontario Biodiversity Council 2020). To predict future conditions for the Peatlands VCs, an assessment of the level of pre-existing disturbance versus new disturbance will be assessed. Burned areas, and forestry cut blocks will be included as existing disturbance. The baseline data gathered in terms of area of vegetation communities and abundance, minus existing disturbed areas will be compared to the area and abundance of peatland communities that will be lost or affected by the Project within the PDA, LSA, and RSA.

In addition, fragmentation of the landscape will also need to be assessed. Landscape fragmentation effects both plants and animals by depriving them of habitat however, fragmentation also causes indirect effects which together can result in declines of species populations and richness as well as community composition. An assessment of fragmentation prior to Project development and predicted effects post-development will be included within the IA / EA.

Table 9-3: Potential Discipline Interactions

Discipline and Associated Valued Components	Aboriginal and Treaty Rights and Interests	Atmospheric Environment	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
Peatlands ■ **Peatland Ecosystems**	X	X	-	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.

Pre-Project specific peatland conditions will rely heavily on data gathered by wildlife, vegetation, physiography, soils and terrain, surface water, and groundwater assessments that will be conducted as outlined under separate Study Plans. The data gathered under these Study Plans will be used to characterize the general hydrological functions of Peatlands within the study area. Assessments will also consider whether Peatlands within the study areas are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or are considered ecologically, socially or economically important to the region.

Climate change projections of temperature and precipitation will be derived from an ensemble of nearly 40 Global Climate Models from the most recent IPCC AR5 (IPCC 2014). These values will be calculated from the AR5 datasets using CADE tools. Within the CADE system, projected values are generated using the "Delta Method", which consists of applying the average projected difference (the "delta") for a given climate parameter to the historical average or baseline value. Projections will be developed for two 30-year periods (time horizons), centred on the 2050s (2041–2070) and the 2080s (2071–2100).

Four future global greenhouse gas (GHG) concentration scenarios have been established by the IPCC. Each of these scenarios is defined by different Representative Concentration Pathways (RCPs). The RCPs are:

- RCP 8.5: considered the global "Business As Usual" (BAU) GHG global emissions regime. This is the current global trajectory based on current global GHG emissions.
- RCP 6.0: GHG emissions double by 2060 and then decrease dramatically but remain above current GHG levels.
- RCP 4.5: a medium GHG scenario derived from assumptions that global GHG emission reduction efforts result in approximately half of the emissions observed under RCP 8.5; and,
- RCP 2.6: a scenario that aligns with global GHG emission reductions that maintain global warming below 2°C above pre-industrial global temperatures.

The IPCC's Special Report on Global Warming (2018) confirms that global GHG emissions continue to track along the RCP 8.5 pathway. This assessment will accordingly apply the RCP 8.5 scenario for the projections used to anticipate future conditions as a conservative approach to risk management. Of the RCP scenarios, the RCP 8.5 pathway, although extreme, represents the closest pathway to historical observations. The RCP 2.6 and 4.5 pathways are highly unlikely pathways given the current data and will therefore not be considered as part of the assessment for the Project. Although the RCP 6.0 pathway is a

plausible scenario, the use of RCP 8.5 allows for an approach that will possibly overestimate climate effects versus an underestimation of climate change.

The IS / EA Report will describe the anticipated activities during the construction and operations phase and will consider the resilience of Peatlands to the effects of the Project. Ecological processes will be evaluated for potential susceptibility to adverse effects from the Project such as considerations for availability, patterns, and connectivity of peatland and the continuation of key ecological and hydrological processes associated with peatland complexes.

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. Proposed mitigation measures will be clearly linked to the extent possible to mitigating potential effects on Peatlands resulting from specific Project components or activities (e.g., vegetation removal, design of equalization culverts, maintenance of hydrological functions) and will be updated as appropriate based on comments received from federal and provincial agencies and stakeholders through the engagement activities. 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

The TISG Section 20 requirements for Peatlands (i.e., wetlands) are listed below.

- Describe measures to be used for stockpiling all stripped peat for use during site reclamation or describe the plan for stockpiling stripped peat and mitigate effects related to its long-term stockpiling or removal.

- Provide best technically and economically feasible mitigation approaches to habitat mitigation that follow the hierarchy:
  - Avoid potential impact.
  - Minimize potential impact.
  - Provide biodiversity offsets to address any residual adverse environmental effects that cannot be avoided or sufficiently minimized.
  - Provide justification for moving from one mitigation alternative to the next.
- In relation to wetlands, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement. In addition, the following mitigation measures should be considered by the proponent:
  - Demonstrate what efforts have been made to avoid and minimize effects to wetlands, and that the mitigation hierarchy has been followed.
  - Demonstrate that mitigation measures have taken into account the health, integrity, and availability of wetland (including peatlands) habitats for the species that rely on them.
  - Explain why alternative locations or means to carry out the Project, or alternatives to the Project were not possible, and how effects to the wetlands will be minimized.
  - Explain how avoidance was considered as the first option and how it can be achieved by identifying alternate means of carrying out the Project (e.g., project location or design) and by considering alternatives to the Project.
  - Explain how minimization can be achieved through project modification or implementation under special conditions after alternative means to the Project have been considered.
  - Describe how the following were considered:
    - Standard procedures and techniques if available for sector or jurisdiction.
    - Procedures and techniques based on sound ecological principles and the best science available.
    - Proven measures over new or experimental techniques.
    - Minimization techniques that take natural succession into account, and should provide for environmental variability over time.
    - Compensation for any residual effect that couldn't be minimized through the following order: restoration, enhancement of existing wetlands, or creation of new wetlands.
    - Evidence that functions can be replaced by the proposed offset activities; and

  - Note that the above requirements are particularly important for peatlands as there is little experience in carrying out restoration or offsets.

- Explain mitigation measures developed specifically for peatlands. For example, mitigation measures to reduce to chance of fire, or build fire resilience; measures to mitigate changes in permafrost; and measures to mitigate changes in hydrological regime.
- In relation to designing offsets for wetlands, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement. In addition, the following mitigation measures should be considered by the proponent:
  - indicate if it isn't possible to compensate for lost functions in cases where wetlands are unique, or have habitat functions that support large proportions of migratory birds, or provide habitat required by species at risk, and take that into account when designing offsets.
  - use a minimum ratio of 2:1 of area of wetland restored/created to original wetland.
  - clearly indicate the number of wetlands (location, extent) for which residual effects should be addressed through offset measures;
  - prioritize restoration of drained or altered naturally occurring wetlands of the same type and function as those impacted. Restored wetlands are preferred over enhanced wetlands, both of which are preferred over newly created wetlands.
  - compensate lost wetland functions on-site if site conditions are suitable for wetland functions. Second preference is in the same watershed from which they were lost. Third preference is in the same ecosystem from which they were lost.
  - incorporate compensation measures to minimize the time lag in availability of habitat and functions between when the adverse effects occur to when they have been fully replaced; and
  - In relation to designing offsets for species at risk, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement.

Potential effects and specific mitigation measures will be established as part of the effects assessment and selection of the preferred alternative.

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). Residual effects 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[9]. In this context, direction indicates the positive or negative change from existing conditions. Magnitude indicates the expected change from existing conditions. The geographic extent indicates the spatial area that the effect is expected to occur within. Duration is the period of time an effect occurs, and frequency is how often an effect occurs over time. The reversibility of an effect defines its ability to return to existing conditions and the likelihood indicates the probability that an effect will occur. 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 migratory or calving season for wildlife). Where appropriate, information regarding residual effects will be disaggregated by sex, gender, age and other community relevant identifying factors to identify disproportionate residual effects for diverse subgroups.

For magnitude, environmental discipline-specific definitions are required and are proposed below in **Table 9-4**.

Table 9-4: Peatlands Magnitude Definition

Magnitude Level	Definition	Rationale
Negligible	■ Limited to no variation predicted in the measurement indicators for Peatlands VCs	■ Changes to peatland ecosystems are minor and largely indiscernible; therefore, no effect on ecosystem resilience.
Low	■ A small variation predicted in the peatland measurement indicators. Effects will be assessed through a qualitative narrative or numeric quantification support by a reasoned narrative.	■ Minor incremental effects to peatland ecosystems are anticipated to be discernable but remain within the limits of ecosystem resilience.
Medium	■ A moderate variation predicted in the peatland measurement indicators. Effects will be assessed through a qualitative narrative or numeric quantification support by a reasoned narrative.	■ Incremental effects to peatland ecosystems are anticipated to be measurable but is inferred to remain within the limits of ecosystem resilience.

9. *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
High	■ A large variation predicted in the peatland measurement indicators. Effects will be assessed through a qualitative narrative or numeric quantification support by a reasoned narrative. .	■ Effects to peatland ecosystems are anticipated to be severe and likely to impair ecosystem resilience.

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. For instance, offsets required as part of the *Endangered Species Act* or the *Species at Risk Act* permitting will incorporate a follow-up program, however an effects assessment and consultation will need to take place prior to formalization of a program. Therefore, the Proponent will include information on follow-up programs that address the requirements outlined in Section 26 of the TISG, 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.

9.9.1 TISG Section 26 Requirements

The below listed follow-up programs are to be considered per the TISG Section 26 requirements in relation to Peatlands:

- if reclamation plantings are created, monitor the plantings biannually (i.e., late spring and fall) during consecutive years, and undertake supplementary planting, as necessary, until the vegetation cover becomes established and continues to grow without further intervention; and
- monitor post-construction effects to wetland functions. A program to monitor wetland functions should be designed in such a way as to help to ensure that the type and amount of each wetland function would be considered individually in determining recovery success and that each wetland function would be recovered to at least the same type and amount of function as assessed during baseline.

10. Assumptions

Any assumption used in the effects assessment, for example the assumed average daily traffic on the CAR, will be clearly identified and a rationale provided in the IS / EA Report.

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[1]	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 environment on the project will be assessed in accordance with applicable standards and guidance.	■ Section 9.1
2	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
3	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 effected by the Project should be included in the description of the biophysical baseline conditions.	■ An ecosystem approach that considers how the project may affect structure and functioning of biotic and abiotic ecosystem components will be used. This includes areas of Indigenous cultural importance, descriptions of ecosystem health and integrity, the presence of protected areas and critical habitat for SAR species.	■ Wildlife Study Plan
4	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 IS / EA Report 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 ecological functions.	■ Section 9.6
5	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: – areas potentially effected by changes to water quality and quantity or changes in flow in the watershed and hydrologically connected waters; – areas potentially effected by airborne emissions or odours; – areas determined by dispersion and deposition modelling; – areas within the range of vision, light and sound and the locations and characteristics of the most sensitive receptors; – species habitat areas, usage timing and migratory patterns; – emergency planning and emergency response zones; – the geographic extent of local and regional services; – any impacted local communities, including municipalities; – all potentially impacted Indigenous groups; – areas of known Indigenous land, cultural, spiritual and resource use; and – existing effected infrastructure.	■ The Study Areas are defined and described in this Study Plan, in Section 6.2.	■ Section 6.2
6	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 ■ Section 8 ■ Section 9.4

ID #	Federal TISG Reference[1]	Requirement / Comment / Concern	Response	Study Plan Reference
7	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.	■ Complete data sets from all survey sites will be provided. They will 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 will be accompanied by detailed metadata that meets ISO 19115 standards (or equivalent). 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.	■ Section 7 ■ Section 8.2
8	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 IA/EA and are summarized in this Study Plan.	■ Section 7
9	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).	■ Methodology concerning data collection (including desktop and field-based, where appropriate) for wildlife species in the area are summarized in the Wildlife Study Plan.	■ Wildlife Study Plan
10	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 ■ Section 8
11	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. A preliminary list of data sources has been provided in Appendix A. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report.	■ Appendix A
12	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 IS / EA Report and are summarized in this Study Plan.	■ Section 7
13	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. – Federal government (e.g., Environment and Climate Change Canada, Health Canada, Indigenous Services Canada, Statistics Canada, Women and Gender Equality Canada); – Ontario provincial government (e.g., Ministry of Environment, Conservation, and Parks, Ministry of Natural Resources and Forestry;	■ Information sources relevant to the Project and study areas will be examined as part of the desktop review, as summarized in the Study Plan. A preliminary list of data sources has been provided in Appendix A.	■ Section 7 ■ Appendix A

ID #	Federal TISG Reference[1]	Requirement / Comment / Concern	Response	Study Plan Reference
		– Bird Conservation Region plans; – academic institutions; – field studies, including site-specific survey methods; – database searches, including: – federal, provincial, territorial, municipal and local data banks; – Breeding Bird Atlas - Ontario (2001-2005) – monitoring program databases protected areas, watershed or coastal management plans; – natural resource management plans; – species recovery and restoration plans; – field measurements to gather data on ambient or background levels for air, water, soil and sediment quality, light levels or acoustic environment (soundscape); – land cover data, including: • terrestrial ecosystem mapping products; • forest cover maps; • remote sensing resources; • important habitats and features to include: ○ water bodies, wetlands, watercourses; ○ riparian habitat; ○ river banks or other eroded habitats; ○ artificial water sources; ○ forest, tree patches, solitary trees (especially old decaying trees); ○ forest edges and tree rows; ○ ridges, including eskers; ○ caves and mines; ○ cliffs, rock outcrops, exposed bedrock, talus, and other karst topography; ○ buildings, bridges, and other anthropogenic features, including linear features; ○ sources of artificial lighting attracting insects; ○ critical habitat; and ○ and any other habitat features known to be important in the area. – Published literature, such as peer reviewed journals, reports by think tanks, non-government organizations and government reports; – environmental assessment documentation, including monitoring reports, from prior projects in the area and similar projects outside the area; – regional studies, project assessments and strategic assessments; – renewable harvest data; – Indigenous knowledge, including oral histories and knowledge gathered by spending time on the land with knowledge holders; – community based monitoring and studies conducted by Indigenous communities; – expert, community, public and Indigenous engagement and consultation activities, including workshops, meetings, open houses, surveys; – qualitative information gathered from interviews, focus groups or observation; – census data; – baseline human health risk assessments; – community and regional economic profiles; – community well-being studies; and – statistical surveys, as applicable.		

ID #	Federal TISG Reference[1]	Requirement / Comment / Concern	Response	Study Plan Reference
14	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.	■ Information on the VCs will be collected from the public and Indigenous communities as described in the IS / EA Consultation Plan and the Aboriginal and Treaty Rights and Interests Study Plan. The IS / EA Report will include an assessment of the effects of the project on the VC.	■ Section 9.2
15	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, their importance and predicted effects (adverse and positive) as a result of the Project.	■ Table 1-2 ■ Table 2-1 ■ Section 9
16	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 was initially submitted to the Agency in May, 2020. The Study Plan has been updated to respond to preliminary comments from the Agency but has not undergone the full technical review by the Federal Review Team or the Government Review Team. Upon Agency review of the updated Study Plan, any necessary technical discussions will be scheduled with the Agency and other relevant government agencies.	■ Section 3
17	TISG Section 7.3, pages 34-35	■ In selecting a valued component to be included, the following factors should be considered: – 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 extent to which the valued component is being addressed through any ongoing or completed regional assessment processes; – 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.	■ 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 1.2
18	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 effected. 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: a. range of land cover types should be representative of the defined spatial extent; 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 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).	■ Geographic extent, and the extent rationale, of the PDA, LSA, and RSA for this VC is provided in this Study Plan.	■ Section 6.2

ID #	Federal TISG Reference[1]	Requirement / Comment / Concern	Response	Study Plan Reference
19	TISG Section 7.4.1, page 36	■ For valued components establish three study area spatial boundaries to assess impacts to each valued component: 1) Project Study Area: defined as the project footprint for each alternative route;" 2) Local Study Area: defined for each valued component – see below; 3) Regional Study Area: defined for each valued component – see below ■ 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.	■ Geographic extent, and the extent rationale, of the PDA, LSA, and RSA for this VC is provided in this Study Plan.	■ Section 6.2
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.	■ Geographic extent, and the extent rationale, of the PDA, LSA, and RSA for this VC is provided in this Study Plan.	■ Section 6.2
21	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.	■ Temporal boundaries are described in the Study Plan	■ Section 6.1
22	TISG Section 8.5, page 42	– identify and map all wetlands on federal lands, and all wetlands potentially directly or indirectly effected by the Project and within the scope of federal permits, authorizations, or other approvals;	■ Data files and mapped wetlands and vegetation classification features will be provided.	■ Section 7.2 ■ Section 7.3 ■ Section 8.3
23	TISG Section 8.5, page 42	■ The Impact Statement must provide written description and maps of primary, secondary and tertiary watersheds and major and minor rives and lakes;	■ Maps of primary, secondary and tertiary watersheds as well as rivers and lakes will be provided.	■ Section 7.2 ■ Section 7.3 ■ Section 8.3
24	TISG Section 8.5, page 42	■ The Impact Statement must determine whether these wetlands are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or considered ecologically or socially or economically important to a region;	■ Wetlands that are considered socially, ecologically or economically important to the region will be discussed in the IS / EA Report.	■ Section 9
25	TISG Section 8.5, page 42	■ The Impact Statement must identify and describe wetland capacities to perform hydrological and water quality functions, provide for wildlife and wildlife habitat or other ecological functions;	■ Wetland quality and function in relation to wildlife habitat will be discussed in the Wildlife Study Plan and the IS/ EA Report.	■ Wildlife Study Plan
26	TISG Section 8.5, page 42	■ The Impact Statement must quantify, delineate and describe wetlands (fens, marshes, peat lands, bogs) within the local study area potentially directly, indirectly and / or cumulatively effected by the Project in the context of: – wetland class, ecological community type and conservation status; – biodiversity with respect to both flora and fauna; – abundance at local, regional and provincial scales; – distribution; and – current level of disturbance.	■ Direct, indirect and cumulative effects of the Project on wetlands will be described in the IS / EA Report.	■ Section 7 ■ Section 9
27	TISG Section 8.5, page 43	– Collect data from representative wetlands in a manner that enables reliable extrapolations in space (i.e., at minimum to Project, local and regional study areas) and in time (i.e., across years): • design surveys so that they represent the spatial and temporal targets of modeling and extrapolations, and to produce scientifically defensible predictions of impacts and estimates of mitigation effectiveness. Survey designs should be sensitive enough to detect and quantify the impacts at the spatial and temporal scales identified above (i.e., project study area, local study area, and regional study area), any departures from predictions, and the effectiveness of mitigations. Justify the selection of modeling techniques based on current and recent scientific literature;	■ Data will be collected in ways that enable reliable extrapolations in space and in time. Surveys will be designed to represent the spatial and temporal targets of extrapolations.	■ Section 7

ID #	Federal TISG Reference[1]	Requirement / Comment / Concern	Response	Study Plan Reference
		• survey protocol planning for representative wetlands should include modeling and simulations to estimate sampling requirements, and analysis to evaluate resulting design options; and • sample size must be planned to support evaluation of the project study area within the context of the local study area and regional study area. Appropriate design of surveys will need to consider multiple survey locations in order to represent the wetland heterogeneity of the regional study area, and to yield multiple survey locations per wetland type, without requiring aggregation of habitat classes post-hoc.		
28	TISG Section 8.5, page 43	■ The Impact statement must provide a wetland functions assessment in accordance with the guiding principles of Wetland Ecological Functions Assessment: An Overview of Approaches or any subsequent approved guidelines by which to determine the most appropriate functions assessment methodology to use: – complete this assessment prior to the start of Project construction for a representative selection of wetlands that the Project would directly affect and for a representative selection of wetland(s) that are hydrologically connected. In conducting this assessment, the Proponent should show that wetlands are considered in the context of: i. the larger watersheds of which they are a part; ii. adjacent land use with a focus on hydrological and other functions; iii. landscape and / or watershed considering topography, soil types and hydrological linkages; and iv. the global significance of peatlands across the regional study area.	■ The Wetland Ecological Functions Assessment: An Overview of Approaches (Hanson et al., 2008) provides a summary of potential methods that can be used to assess wetland function, indicates the type of data that will be collected, and provides a list of functions that can be expected for each of the different wetland classes (Hanson et al. 2008). It is the intent of this Study Plant to lay out the framework for completing the IA / EA for potential effects to Peatlands as a result of the proposed CAR.	■ Section 7 ■ Section 9
29	TISG Section 8.5, page 44	– identify a regional study area of sufficient size to capture effects to wetlands within the larger drainage area and include wetlands located outside of the local study area that may be effected by hydrological changes as a result of cumulative effects.	■ Geographic extent, and the extent rationale, of the PDA, LSA, and RSA for this VC is provided in this Study Plan.	■ Section 6.2
30	TISG Section 8.5, page 44	■ Submit complete data sets from any survey sites, including GIS files. Databases and GIS files should be accompanied by detailed metadata that meets ISO 19115 standard. Contact provincial and/or local government authorities to determine if other wetland conservation policies, regulations or wetland compensation guidelines apply (refer to The Wetland Network30);	■ Complete data sets from all survey sites will be provided. They will 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 will be accompanied by detailed metadata that meets ISO 19115 standards (or equivalent). 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.	■ Section 8.2
31	TISG Section 8.5, pages 43-44	■ This assessment should be quantitative and include the collection of site-specific baseline information on wetland functions, including: – Surveys to assess for the presence, abundance, density, and distribution of migratory birds and federally listed species at risk, provincially listed species at risk, and species assessed by COSEWIC as at-risk in relation to potentially effected wetlands and associated riparian areas. Surveys should meet appropriate standards (see sections 8.9, 8.10, and 8.11), be species or bird group specific as appropriate, and be conducted during the appropriate times of the year as specified in section 8.9-8.11 of this document. Surveys for species at risk should assess species individually where possible (typically, an indicator approach is not appropriate for species at risk). Surveys should not be limited to species or groups of species that are wetland-obligate, but rather should include any species known to use wetland habitats as part of its lifecycle. Data should be sufficiently robust to identify which wetland classes are important to which species (and for how many). – The spatial location and a description of the biological characteristics of each potentially effected wetland and the ecological services and functions (hydrology, biochemical cycling, habitat, and climate) they provide. The functions assessment should be as specific as possible to the biological characteristics of the wetland and to the ecological services and functions it provides. – A supporting rationale and detailed description of the methods used in completing the wetland functions assessment, including sampling design.	■ Wetland functions assessments and related surveys have been described in the Study Plan	■ Section 7.3.3
32	TISG Section 8.9, page 50	■ Key habitat associated with species at risk should be considered valued components, including eskers and similar geologic features, wetlands and peatlands	■ Key habitat associated with SAR such as Peatlands, will be considered VCs.	■ Wildlife Study Plan
33	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.	■ The IS / EA Report will include a description of the methodology of the effects assessment, some of which is also summarized in this Study Plan.	■ Section 9

ID #	Federal TISG Reference[1]	Requirement / Comment / Concern	Response	Study Plan Reference
34	TISG Section 14.3, page 88	■ The Impact statement must describe any contaminants of concern (e.g., arsenic, chromium, mercury) potentially associated with the Project (including from spills or accidental discharges) that may affect soil, sediment, wetlands, and surface and ground water (including substances used during summer and winter maintenance activities);	■ Potential changes to surface and groundwater (quality and quantity), including subsequent effects on other VCs, will be assessed as part of the IS / EA Report. Sampling of contaminants of potential concern has been described in the Groundwater and Geochemistry Study Plan and the Surface Water Study Plan. Accidents and malfunctions will be assessed in the IS / EA Report.	■ Surface Water Study Plan ■ Groundwater and Geochemistry Study Plan
35	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;	■ Changes in surface water drainage and the subsequent effects on other VCs will be assessed in the IS / EA Report. Groundwater studies will include a sampling program for mercury and methylmercury. A qualitative assessment of potential pathways for the release of methylmercury will be included in the peatland assessment.	■ Surface Water Study Plan ■ Groundwater and Geochemistry Study Plan
36	TISG Section 14.3, page 88	■ The Impact statement must describe any hydrological or drainage changes that may alter moisture regimes and how that may affect vegetation and wetland function;	■ Changes in surface water drainage and the subsequent effects on other VCs will be assessed in the IS / EA Report.	■ Surface Water Study Plan
37	TISG Section 14.3, page 89	– describe the methodology used to identify effects;	■ Methodology related to effects assessment has been provided in the Study Plan.	■ Section 9
38	TISG Section 14.3, page 89	■ The Impact Statement must describe any positive changes (e.g., from offsets that result in re-vegetation, new wetlands etc.).	■ The effects assessment will identify positive and adverse effects that may be caused by the Project on the environment.	■ Section 9.6
39	TISG Section 14.3, pages 88-89	■ The Impact statement must describe direct, incidental and cumulative predicted positive and / or adverse effects to riparian, wetland (including separate description relevant to peatlands) and terrestrial biodiversity metrics, effects of fragmentation, changes to regional biodiversity that could be caused by all project activities, including but not limited to effects to wetland ecological functions, including effects that may alter the wetland's capacity to perform hydrological, biogeochemical cycling, habitat, and climate functions	■ Peatland predicted effects will rely heavily on data gathered by surface and groundwater assessments that will be conducted and provided under separate study plans. Information collected under these study plans will be used to characterized the existing conditions to the extent possible. Peatland availability and distribution will be used to provide an understanding of how the Project may affect peatland fragmentation and hydrological function.	■ Section 9.1
40	TISG Section 15.2, page 93	■ The Impact Statement must describe short term and long term changes to habitats and food sources of migratory and non-migratory birds (types of cover, ecological unit of the area in terms of quality, quantity, distribution and functions), with a distinction made between these two birds categories, including losses, structural changes and fragmentation of riparian habitat (aquatic grass beds, intertidal marshes), terrestrial environments (e.g., uplands, grasslands, forested, old growth, post fire) and wetlands frequented by birds. Describe changes in terms of the health, integrity and availability of habitats. Important habitats to include: eskers, (and similar upland features), forest, riparian, bog / fen / peatlands, other wetlands and open water;	■ Long- and short-term habitat changes and food sources of wetland fauna will be described and documented including changes in terms of the health, integrity and availability of habitats related to wildlife, migratory and non-migratory birds.	■ Wildlife Study Plan
41	TISG Section 15.3, page 94	■ The Impact Statement must describe changes to key habitat, including eskers and similar geologic features, wetlands and peatlands, for species important to current use of lands and resources for traditional purposes;	■ The IS / EA Report will describe changes to wetlands and Peatlands and their effects to species important to current use for traditional purposes.	■ Section 9.2
42	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.	■ Identification of and assessment of effectiveness of impact management measures will be done as a discipline or VC-specific exercise, and will be done as part of the IS / EA Report.	■ Section 9.5
43	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 IS / EA Report.	■ Section 9.6
44	TISG Section 22, pages 131-133	■ Section 22 of the TISG describes the guidance around conducting cumulative effects assessment for the project.	■ Cumulative effects assessment will be conducted as part of the IS / EA Report	■ Section 9.6
45	TISG Section 24, pages 137-138	■ Section 24 of the TISG includes guidance on how to describe the effects of the Project in the context of Canada's environmental obligations.	■ The IS / EA Report will include discussion on how the project effects contribute to Canada's environmental obligations.	■ Section 9.2
46	TISG Section 25, pages 139-140	■ Section 25 of the TISG provides guidance on how to demonstrate the Project's contributions to sustainability.	■ The sustainability assessment for the Project will be undertaken on the preferred alternative and will characterize the Project's contribution to sustainability incorporating the requirements set out in Section 25 of the TISG.	■ Section 9.7
47	TISG Section 26.2, page 143	■ 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 9.9

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	■ 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** – 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.	■ This Study Plan will be reviewed by relevant federal and provincial agencies.	■ N/A
2	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** – 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. – 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.	■ This Study Plan will be reviewed by relevant federal and provincial agencies.	■ N/A
3	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	■ **Assessment Methods** – 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. – 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.	■ Methodology concerning data collection (including desktop and field-based, where appropriate) are summarized in this Study Plan.	■ Section 7
4	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** – 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. 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.	■ This Study Plan will be reviewed by relevant federal and provincial agencies.	■ N/A

ID#	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
5	MECP	■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM	■ The project proposal and other documentation will need to identify these natural heritage features and fully consider potential impacts to and mitigation for the respective features.	■ Mitigation measures will be informed by best management practices, applicable resource management and/or recovery plan, Indigenous input, and industry standards. ■ Section 7.2 of the Draft ToR identifies potential effects of the Project and includes effects to vegetation (Section 7.2.6) and wildlife (Section 7.2.7). Vegetation and wildlife will consider natural heritage features (e.g., wetlands, significant wildlife habitat and areas of natural and scientific interest). Section 8 of the Draft ToR confirms that the EA will recommend impact management measures to avoid, eliminate or minimize potential effects of the Project. This will include the identification of measures specific to natural heritage features.	■ Section 7.2.6; Section 7.2.7; Section 8 of ToR
6	MECP	■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM	■ **2.1 Peatlands/wetlands** – Peatlands/wetland in Ontario's Far North are important on local through to global scales. The alternatives analysis should consider not only the length of road corridor that will cross through peatlands for each of the alternatives considered, but also consider how impacts to peatland/wetland function may be minimized. This should include, for example, identification and consideration of concentrated areas of peat that function as carbon sinks; impacts to biological functions of wetlands in providing wildlife habitat; effects of the project on client change and vice versa; etc.	■ The Draft ToR has been updated to include proposed criteria and indicators for the effects assessment (provided in Appendix A). Wetland ecosystems is a proposed criterion for the effects assessment. Availability, distribution, function (i.e., as a carbon sink) and composition are proposed indicators to measure changes to wetlands. The EA will assess direct effects of the alternative routes on wetlands (Section 7.2.6), and the indirect effects on wildlife habitat (Section 7.2.7) and climate change (Section 7.2 and Section 7.2.1) from changes to wetlands and / or peatlands.	■ Section 7.2 of ToR
7	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 for Peatlands have been described in Section 6.2 and Figure 6-2. The study areas are preliminary and can be further refined based on inputs from Indigenous communities and interested persons. The local and regional study areas for other disciplines, such as groundwater, surface water, or caribou, can be found in their respective study plans. ■ A preliminary study area for the EA is identified in Section 7.1.1 of the Draft ToR. The study area maps have been revised to include the area within 2.5 km of the centre line of Alternative 1 and Alternative 4 only. Although the Draft ToR identifies one preliminary study area for the EA, it is understood that the study area for each environmental component may vary to capture the area within which environmental effects are anticipated to occur. Therefore, the ToR indicates that the study area will be refined in the EA through identification of discipline-specific local and regional study areas. The local and regional study areas will be consulted on with MFFN community members, neighbouring Indigenous communities and other interested persons. Study areas are included in the EA Consultation Plan under the key milestone "Evaluation Criteria and Development of Alternatives".	■ Section 7.1.1 of ToR ■ Section 6.2 ■ Figure 6-2

ID#	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
8	MNRF	■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference	■ **Appendix A** – Missing source information: MNRF Natural Heritage Reference Manual (NHRM), 2014. Please add MNRF Natural Heritage Reference Manual (2014) to the list of published sources of information for existing conditions. The Natural Heritage Reference Manual can be referenced in conjunction with the Significant Wildlife Habitat Technical Guide (SWHTG) 2000, which are not mandatory for the EA, but provide clear guidance. The NHRM outlines evaluation processes of habitat and other natural heritage features. The SWHTG offers guidance to evaluate and identify the significance of wildlife habitat. Appendix A 1 The EA should expand upon the criteria and indicators that are provided and develop indicators that can readily be quantified (e.g. number of water crossings required, number of wetlands, number of kms of wetlands to be crossed, or sensitive areas impacted). Appendix A of the ToR should be revised to include indicators for the proposed criteria that are quantitative in nature.	■ The NHRM and SWHTG will be added to Appendix A list of resources. The criteria and indicators will be updated to include quantitative measures.	■ Appendix A ■ Table 9-2
9	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** – 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-publications – While 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.	■ Available resources will be utilized to help inform the draft criteria and indicators including those suggested.	■ Appendix A
10	MNRF	■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference	■ Peatlands / wetlands in the Far North are important on local through to global scales. The proposal should indicate the length of road corridor that will cross through peatlands for each of the alternatives considered. It should also describe the potential effects of an all-weather road on peatland / wetland functions and how these may be minimized. This should include, for example, identification of concentrated areas of peat that function as carbon sinks; measures that can be taken to sustain normal hydrological flow and related ecosystem services such as flood protection; effects to biological functions of wetlands in providing wildlife habitat; working with watershed and sub-watershed boundaries to inform routing; and consideration of the potential effects of the road and existing activities in the region to peatlands / wetlands.	■ The direct, indirect and cumulative predicted positive / and or adverse effects on the local Peatlands and their function will be investigated and documented. Potential effects that will be described include but are not limited to effects to wetland ecological functions, including effects that may alter the wetland's capacity to perform hydrological, biogeochemical cycling, habitat and climate functions. ■ Impact management measure developed specifically for Peatlands will be described and outlined in the IS / EA Report.	■ Section 9.1-9.6
11	MNRF	■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference	■ A climate change risk assessment is proposed along with estimating greenhouse gas emissions and sampling peatlands. Referencing available literature and contacting researchers such as Jim McLaughlin and Maara Packalen (MNRF) who have published research on these topics and related subjects is encouraged. Suggest contacting researchers such as Jim McLaughlin (MNRF) and Maara Packalen (MNRF) who have published research on climate change - vulnerability assessment, peatland carbon modelling and hydrology. For example: – McLaughlin, J., M. Packalen and B. Shrestha. 2018. Assessment of the vulnerability of peatland carbon in the Albany Ecodistrict of the Hudson Bay Lowlands, Ontario, Canada to climate change Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Climate Change Research Report CCRR-46	■ Resources provided will be incorporated into the climate change assessment component for the Project.	■ Section 7.2 ■ Appendix A

ID#	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
			– Packalen, M.S., S.A. Finkelstein and J. McLaughlin. 2016. Climate and peat type in relation to the spatial variation of the peatland carbon mass in the Hudson Bay Lowlands, Canada. Journal of Geophysical Research: Biogeosciences – McLaughlin, Jim and Kara Webster, 2013. Effects of a changing climate on peatlands in permafrost zones: A literature review and application to Ontario's Far North. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Climate change research report CCRR 34 – References available from: • Catalogue of natural resource scientific and technical publications. Search a list of the scientific and technical publications issued since 2004 see Catalogue-natural-resource-scientific-and-technical-publications • MNRF climate change publications see MNRF_Climate_Change_Publications • Ontario Ministry of Natural Resources and Forestry. 2019. Far North Information Knowledge Management Plan Progress Report 2008-2018. Ontario Ministry of Natural Resources and Forestry, Far North Branch, Peterborough, ON. 80p. contact: farnorthfeedback@ontario.ca		

Table 11-3: Study Plan Federal and Provincial Concordance – Requirement Deviations

ID #	Federal TISG Reference or Provincial Draft ToR Comment Reference	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 7.4.2, page 37	■ For valued components related to wetlands, eskers, birds, wildlife, and Species at Risk, define temporal boundaries in a manner that enables detection of all species that use the project study area, local study area, and regional study area throughout the year and between years, and to estimate their temporal pattern of use (e.g., breeding, or migrants stopping on northward and/or southward migration). 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).	■ Data (desktop and field-based) will be collected to represent temporal sources of variation. Data collected will be representative of the temporal perspective of multi-years of study by using baseline data from previous years / seasons and desktop studies to supplement proposed field studies.	■ The combined methodologies outlined in Sections 7.2 to 7.3 will constitute multiple years of study per 7.2 and 7.4.2 of the Guidelines. It is not anticipated that changes to the biophysical aspects of the Peatland VC will be substantially varied between subsequent years of field studies.	■ N/A

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Impact Assessment Agency of Canada, 2020a:
Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment. https://iaac-aeic.gc.ca/050/documents/p80184/133936E.pdf

Impact Assessment Agency of Canada, 2020b:
Glossary of Terms for the impact assessment of designated projects under the IAA. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/glossary-of-terms.html

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Tailored Impact Statement Guidelines for the Marten Falls Community Access Road Project. https://iaac-aeic.gc.ca/050/documents/p80184/133937E.pdf

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Appendix A

Preliminary List of Data Sources

The following lists data sources and academic papers that may be relevant to the Peatlands Study Plan.

Baseline Data Methodology

Open Government Licence – Canada:

Available at: https://open.canada.ca/en/open-government-licence-canada Standard on Geospatial Data. Available at: https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=16553

Ontario Ministry of Natural Resources, March 2010:

Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp. Available at: https://docs.ontario.ca/documents/3270/natural-heritage-reference-manual-for-natural.pdf

Ontario Ministry of Natural Resources, 2000:

Significant wildlife habitat technical guide. 151p. Available at: https://docs.ontario.ca/documents/3620/significant-wildlife-habitat-technical-guide.pdf

Conservation Issues

Fire Disturbance Area:

Available at: https://geohub.lio.gov.on.ca/datasets/fire-disturbance-area

Government of Canada's Operational Framework for the Use of Conservation Allowances

Available at: https://www.canada.ca/en/environment-climate-change/services/sustainable-development/publications/operational-framework-use-conservation-allowances.html

Interim Guidance:

Considering the Extent to which a Project Contributes to Sustainability Available at: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/interim-guidance-considering.html

Interim Framework: Implementation of the Sustainability Guidance:

Available at: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/interim-guidance.html

NatureServe Conservation Status Assessments:

Factors for Evaluating Species and Ecosystem Risk. Available at: https://www.natureserve.org/sites/default/files/publications/files/natureserveconservationstatusfactors_apr12_1.pdf

Ontario Parks and Protected Areas:
Available at: https://www.ontario.ca/page/ontarios-parks-and-protected-areas#section-4

Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012:
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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-publications

Greenhouse Gas Emissions and Climate Change

Bubier, J.L. and T.R. Moore, 1993:
Methane emissions from wetlands in the midboreal region of northern Ontario, Canada. Ecology 74(8): 240-2254.

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Government of Canada:
2019 National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada:
http://www.publications.gc.ca/site/eng/9.506002/publication.html

Government of Canada:
Canada's Changing Climate Report: https://www.nrcan.gc.ca/environment/impacts-adaptation/19918

Government of Canada:
Canadian Centre for Climate Services: https://www.canada.ca/en/environment-climate-change/services/ climate-change/canadian-centre-climate-services.html

Government of Canada:
Climate Lens – General Guidance: https://www.infrastructure.gc.ca/pub/other-autre/cl-occ-eng.html

Government of Canada:
Discussion Paper Developing a Strategic Assessment of Climate Change:
https://www.strategicassessmentclimatechange.ca/5637/documents/11224

Government of Canada:
Greenhouse gas projections: https://www.canada.ca/en/environment-climate-change/services/ climate-change/greenhouse-gas-emissions/projections.html

Government of Canada:
Impact Assessment Regulations: https://www.canada.ca/en/impact-assessment-agency/corporate/ acts-regulations/legislation-regulations.html

Government of Canada:
Mid-Century Long-Term Low-Greenhouse Gas Development Strategy: http://publications.gc.ca/site/eng/9.825953/publication.html

Government of Canada:
Pan-Canadian Framework on Clean Growth and Climate Change: https://www.canada.ca/en/services/ environment/weather/climatechange/pan-canadian-framework/climate-change-plan.html

Government of Canada:
Policy context: Considering Environmental Obligations and Commitments in Respect of Climate Change under the Impact Assessment Act: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/considering-environmental-obligations.html

Government of Canada:
Terms of Reference for conducting the Strategic Assessment of Climate Change: https://www.strategicassessmentclimatechange.ca/strategic-assessment-of-climate-change-terms-of-reference

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Hydrological feedbacks in northern peatlands. Ecohydrology 8:113-127.

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Predicting metal release from peatlands in Sudbury, Ontario, in response to drought. Water, Air, Soil Pollution 226: 103.

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Water balance wand water movement in unsaturated zones of Sphagnum hummocks in Furhrengawa Mire, Hokkaido, Japan. Journal of Hydrology 319(1-4):312-327.

Mapping

- Digital data and imagery available through GeoHub
- Infrared, black and white stereo aerial photographs or ortho-rectified digital aerial imagery
- National Topographic Series (NTS) maps
- Forest Resources Inventory (FRI) maps
- Satellite imagery (such as LandSat and SPOT)

Impact Assessment Process

Government of Canada:

Phase 5: Post Decision. Available at: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/impact-assessment-process-overview/phase5.html

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- iNaturalist available at: https://www.inaturalist.org/;
- NatureServe available at: https://www.natureserve.org/;
- Ramsar site database available at: https://www.ramsar.org/wetland/canada;
- Environment Canada's database on wetlands available at: https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/extent-wetlands.html and: https://open.canada.ca/data/en/dataset/161c7be5-0912-58b1-87f7-6da4b575a7af

Appendix B

Agency Comments on the Draft Study Plan

Draft Study Plan Comments – Federal

Comment # / Ref #	Study Plan Section	Comment / Context	Action Item	Final Response	Study Plan Reference
PL-01	■ GC	■ 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 Marten Falls First Nation - General Comments on MFCAR Draft Study Plans". The Agency has provided these other required actions to highlight common sections of the Tailored Impact Statement Guidelines (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.		■ 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
PL-02	■ Section 4 Baseline Study Design	■ Section 4 of the study plan states that there are three main components in the peatlands study plan: Vegetation and Wildlife Community, Hydrology and Climate Change. It also states "Additional details on each of these components are provided in the individual VC Study Plans." ■ Ideally, information already found in other study plans should not be repeated. For example, the majority of the information provided in Sections 4.2.1, 4.3.1, 5.1 and 6.2.1 of the peatlands study plan is the same as in the vegetation study plan (with the word "wetland" changed to "peatland"). If the methods and approaches to meet the relevant requirements of the Guidelines are the same for both wetlands and peatlands, the information only needs to be provided once, specifying that it will apply to both wetlands and peatlands. ■ The Agency strongly recommends addressing the requirements of the Guidelines related to peatlands within other study plans, particularly within the vegetation study plan. The rationale for this request is that the same federal experts are involved in the review of the vegetation and peatlands study plans and the review is facilitated by having a fulsome presentation of the information in one document. The avoidance of redundancies also reduces the time needed for the FRT's review of the study plans.	■ Required Action #1: Combine the study plans by addressing peatlands-specific requirements within other plans (vegetation, wildlife, surface water or climate change), as appropriate. If there is a reason why this would not be considered an appropriate approach, provide a rationale. ■ Required Action #2: The Agency notes that the following requirements of the Guidelines were not addressed in any of the submitted study plans: effects to wetlands related to wildlife habitat (wetland functions), surface water quality, climate change considerations (such as removal of carbon sinks). Moreover, the study plans should address potential effects on eskers and habitat fragmentation. Update the study plans to provide the information required by the Guidelines.	■ The Peatlands Study Plan remains a separate Study Plan due to the importance of peatlands and the concern expressed by the MECP and the MNRF. We recognize that having information repeated and presented similarly in other study plans makes for redundancies. Therefore, the Peatland Study Plan describes in detail what only pertains to Peatlands and refers to other Study Plans where similar information is needed. Required Guidelines for peatland function, climate change, and habitat fragmentation have been incorporated into the Study Plan.	■ Sections 6 through 11 of the Peatlands Study Plan
PL-03	■ 4.1 Desktop Assessment	■ Section 4.1 of the study plan states "A detailed review of a wide variety of secondary sources will be used to prepare a desktop assessment." The study plan then provides requirements from the Guidelines in paragraph form with a statement that it will be collected/ described / included etc. No information is provided about how the data for each requirement will be collected, or what existing information will be used. ■ Section 7.2 of the Guidelines requires that detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed are provided 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. ■ If using existing data sources, the study plan should provide justification to show that the data sources are relevant in spatial and temporal coverage to the Project.	■ Required Action #3: For any approach related to peatlands that is different from what is described in the vegetation, surface water or climate change study plans, provide detailed descriptions of specific data sources that will be used to identify gaps and inform baseline characterization. Sources should be listed and preferably correlated to the criteria and indicators that they will inform. Provide justifications to demonstrate that each data source is relevant in spatial and temporal coverage to the project.	■ The Desktop Assessment and Field Assessments provide justification that recommended data sources are relevant in spatial and temporal coverage to the Project.	■ Section 7

Comment # / Ref #	Study Plan Section	Comment / Context	Action Item	Final Response	Study Plan Reference
PL-04	■ Section 7 Conformance with Federal and Provincial Guidance	■ There are requirements related to peatlands throughout the Guidelines (Section 8.5, 8.9, 8.11, 14.3, 15.2, 15.3 and 20). For the most part, these requirements are only mentioned in the concordance table at the end of this plan, without providing enough information to be validated by the experts (including but not limited to the assessment of methylmercury from disturbed soils and changes to key habitat).	■ Required Action #4: Provide details, including methods and approaches that demonstrate how each of the requirements in the Guidelines related to peatlands will be met.	■ Requirements listed throughout the TISG (i.e. Section 8.5, 8.9, 8.11, 14.3, 15.2, 15.3 and 20) have been incorporated into Section 6, 7 and 9 of the Peatlands Study Plan. The TISG requirements and responses related to Peatlands can also be found in Table 11-1.	■ Section 6 ■ Section 7 ■ Section 9 ■ Table 11-1

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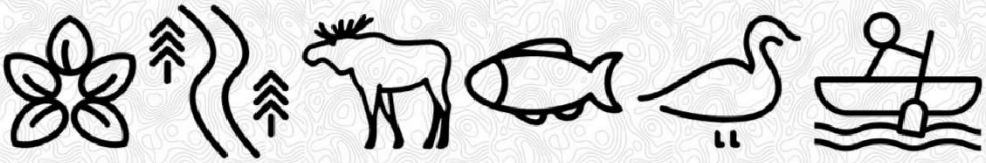

Peatlands Study Plan

Agency Comments on Study Plan

Study Plan Version	Commentor	Comment # / Ref #	Study Plan Section Reference (PDF Page #)	TISG Section	Agency Response (2022)	Required Action	Proponent Response (2022)
Final	Natural Resources and Forestry (NRF)	1	Table 1-2	N/A	Comment not specific to the Peatlands Work Plan: Provincially Significant Wetlands (PSWs) are not identified under Designated Areas in the Valued Components addressed by the Vegetation Study Plan. PSWs, Areas of Natural and Scientific Interests (ANSIs) and Significant Wildlife Habitat (SWH) are mandated natural heritage values of interest for NRF. As such, recognizing and considering these areas in the study plans and future project documentation, where applicable, will allow NRF to provide informed comment regarding potential impacts from the project.	Recommend PSWs (and ANSIs, and SWH) be identified as a designated area in the Valued Components for either "Wetland and Riparian Ecosystems" section or under the "Designated Areas" section of the Vegetation Study Plan.	ANSIs are currently identified under the Designated Areas section of the Vegetation Study Plan. The form and function of SWH will be considered through field data collection for the various Wildlife and Vegetation Valued Components, and SWH will be assessed in an indirect way through characterization of habitats for the various Valued Components. There are no designated PSWs in the study area. Using OWES to evaluate wetlands in northern Ontario, especially in the project study areas of vast peatlands, is not an effective tool to characterize the value of wetlands. However, wetlands are being considered from a functional perspective (including hydryological, ecological, social and traditional values) as well as an ecological viewpoint through the Peatlands and Vegetation Study Plans. The components of what makes a PSW will be covered under the Wetland and Riparian Ecosystems Valued Component.
Final	NRF	2	Table 1-2	N/A	The Vegetation Study Plan lists Species at Risk (SAR) and conservation concern species together in one grouping but they are different categories with different direction in the form of policy and guidelines	Recommend not grouping conservation concern species and SAR but rather address them separately. Some species may fall under both categories, however many do not	Although combined under one Valued Component, SAR and SOCC will each be characterized and discussed separately.
Final	NRF	3	Table 1-2	N/A	Comment not specific to the Peatlands Work Plan: Table 1-2 does not identify trapping. In which In Work Plan(s) is trapping being considered?	Please identify where consideration of trapping is included within the study plans	Alteration/change in or loss of sites and areas used for traditional activities, including trapping, is an indicator for the Indigenous Current Use of Lands and Resources for Traditional Purposes VC and is discussed in the Aboriginal Treaty Rights and Interests Study Plan.
Final	NRF	4	Section 7.1, Page 31	N/A	The text in this section indicates that peatlands have high acidity; however, not all of them do. For instance, fen-water can be circum-neutral (pH 6 to 8).	The description of peatlands should be revised to more accurately reflect characteristics exhibited by peatlands.	A revised description of peatlands will be included in the EA Report / IS that provides the broader range of potential peatland conditions and characteristics.
Final	NRF	5	Section 7.1, Page 32	N/A	This section indicates that methane emissions tend to be lower with higher water tables in peatlands; however, this is not always true. For instance, net primary production can increase where there is a lower water table, with the peatlands being net carbon dioxide sinks. Also, methane emissions tend to be lower, with some peatlands functioning as a net methane sink when the water table is lowered.	Please revise the description of peatland to accurately reflect the relationships that can occur between water table depth and the function of peatlands as a carbon or methane source vs sink.	The description of peatland relationships with water table depth will be expanded in the EA Report / IS to include a greater discussion on the function of the water table on carbon flux in peatland ecosystems.
Final	NRF	6	Page 35, Section 7.2.2	N/A	This section references McLaughlin et al. 2018, as the source for the regression equation to estimate peat carbon storage, however this equation was produced by Packalen et al. (2016).	Consider changing citing to Packalen, M.S., Finkelstein, S.A., and McLaughlin, J.W. (2016). *Climate and peat type in relation to the spatial distribution of the peat carbon mass in the Hudson Bay Lowland, Canada* . J. Geophysical Research – Biogeosciences 121:1104–1117.	Citation will be updated in the EA Report / IS to the correct reference.
Final	NRF	7	Page 35, Section 7.2.2 and Page 40, Section 7.3.2	N/A	Peat depth can exceed 3 meters below the peat surface. Why will sampling only occur to 2 meters? If sampling is limited to 2 meters below the peat surface then carbon storage will likely be underestimated. The equation proposed for use was developed for when the total depth of peat is known. Additionally, in order to understand sampling methods please provide the increments being used to assess peat profiles.	It is recommended that the protocol for assessment of peatlands be modified to allow for determination of total depth of peat. A peat probe could be used for rapid measurement of peat depth to improve the carbon storage estimates. Additionally, it is important to understand the increments being used to assess peat profiles in order to interpret results (e.g. what increments are from above vs below the water table).	Peat probes will be used in the field to determine total depth of peat. Field data collected will indicate depth of water table relative to peat depth, where available.
Final	NRF	8	Page 35, Section 7.2.2	N/A	It is unclear what parameters are being measured in this section, making it difficult to understand and provide comment regarding sampling methodologies.	Please specify what parameters will be measured during assessment of the peatlands.	Carbon flux will be estimated based on existing regional datasets and literature and will be consistent with the approach used in McLaughlin et al. (2018). Peat depth measurements taken during field surveys will be used to more accurately estimate the existing carbon storage of peatland ecosystems within the project LSA.

Peatlands Study Plan

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Study Plan Version	Commentor	Comment # / Ref #	Study Plan Section Reference (PDF Page #)	TISG Section	Agency Response (2022)	Required Action	Proponent Response (2022)
Final	NRF	9	Page 35, Section 7.2.2	N/A	It appears that no greenhouse gas measurements from natural areas are included as part of the peatlands study plan, or in the Atmospheric Environment and Greenhouse Gases (GHG) Study Plan. Peatlands have accumulated carbon for 100s of years, and draining of peatlands can result in increased release of greenhouse gases from these natural areas.	Consider adding carbon dioxide and methane release assessment from reference areas or natural areas to the peatland study plan. Additionally, the eddy covariance tower measurements on carbon dioxide and methane from the Victor Mine and Kinojiie Lake could be considered to inform baseline understanding of releases in the Far North. Information from these sites (and others) in regard to carbon dioxide flux data are available from the Ameriflux network. The following papers could be reviewed to establish emission factors for a regional assessment of carbon dioxide and methane emissions: Helbig et al. (2019). Contrasting temperature sensitivity of CO2 exchange in peatlands of the Hudson Bay Lowlands, Canada. Journal of Geophysical Research Biogeosciences 124, 2126–2143. Humphreys et al. (2014). Two bogs in the Canadian Hudson Bay Lowlands and a temperate bog reveal similar annual net ecosystem exchange of CO2. Arctic, Antarctic, and Alpine Research 46:103–113. Picket-Heaps et al. (2011). Magnitude and seasonality of wetland methane emissions from the Hudson Bay Lowlands (Canada). Atmospheric Chemistry and Physics. 11:3773–3779, 2011 Webster et al. (2018). Spatially-integrated estimates of net ecosystem exchange and methane fluxes from Canadian	The carbon dioxide and methane release from other natural areas will be referenced when assessing the baseline release from Peatland. Additional reference materials will be reviewed and incorporated into the carbon storage and flux assessment.
Final	NRF	10	Page 37, Section 7.3.2	N/A	This section indicates that, "there will be no ground surveys within the broader RSA" to assess for Peatland Composition. However, this study plan does not indicate why this is the case.	It is recommended that ground surveys be conducted during verification of satellite imagery in classifying peatlands (including within the RSA). If ground survey work will not be completed in the RSA, the rationale for this approach should be provided in the study plan. Further, If this is the case, NRF suggests that the MF CAR Project Team consider using information from the ground surveys carried out within the PDA and LSA to inform interpretation of satellite data for those areas, to also support methods used to describe and assess peatland composition in the broader RSA.	The baseline studies proposed for the EA were designed to select an appropriate LSA to represent the RSA, so that data collected within the LSA could be used to extrapolate results to the RSA with relative confidence. Peatland classification will be assessed based on hydrological and ecological characteristics in the LSA and these results applied to the RSA. This extrapolation is rationalized due to the fact that the hydrological regime that is defined at the LSA scale is considered to be consistent with the conditions for the RSA. Also, the spatial extent of the expected effects on peatland hydrology when best management practices for road design are considered (e.g. the use of equalization culverts, roadside ditches, and semi-permeable road materials) mean that any changes/effects to peatland hydrology should be readily contained to the local scale. In other words, downstream flows to the regional system will be maintained, even if it means local-scale changes to drainage patterns, surface water – groundwater interactions, etc., as a result of the road development. Similarly, the study design for peatland ecological form and function, considered the vegetation communities, soils, terrain and physiography in all study areas (PDA, LSA, RSA) in order to select appropriate spatial extents for comparison. In other words, the approach taken to develop study areas was intended to lead to a LSA that represents land covers found within the PDA and an RSA that represents the land cover within both the PDA and LSA (especially rarer habitats), represent the rapid land cover change that occurs along the edges of these features, and represent a portion of the broader landscape matrix. All discipline field work is specific to the LSA. Ground and visual plots will be completed in tandem with the vegetation and physiography study plans. Accuracy of existing PDA and LSA ground surveys will be compared against existing landcover datasets to determine relative accuracy. A description of the baseline study design and methodology for characterizing existing [illegible] will be included in the EA Report [illegible] Additional
Final	NRF	11	Page 38, Section 7.3.2	N/A	Use of the Ontario Wetland Evaluation System for the classification of peatland formations is supported, however, there is no commitment in the study plan regarding the qualifications of individuals who complete peatland classifications for the project. The Ontario Wetland Evaluation System is sufficiently detailed that individuals should be qualified to use this system. They should be trained and have an Ontario Wetland Evaluation System Certificate.	It is recommended that the study plan stipulate that that individuals classifying peatlands using the Ontario Wetland Evaluation System for the project will have sufficient training and will hold an Ontario Wetland Evaluation System Certificate.	The field lead will have sufficient training and will hold an Ontario Wetland Evalution System Certificate.

Peatlands Study Plan

Agency Comments on Study Plan

Study Plan Version	Commentor	Comment # / Ref #	Study Plan Section Reference (PDF Page #)	TISG Section	Agency Response (2022)	Required Action	Proponent Response (2022)
Final	NRF	12	Page 39, Section 7.3.2	N/A	It is noted that a 1 m x 1 m grid will be utilised to measure Sphagnum. This procedure may not be the most time efficient approach to use for estimation of Sphagnum.	Consider using a smaller grid size, such as 0.25 x 0.25 m and additional sampling locations to account for variability and improve estimations of Sphagnum.	Grid size will be revised to a 0.25 x 0.25 m quadrant for Sphagnum cover.
Final	NRF	13	Page 42, Section 8.3	N/A	This section indicates that there will be a mix of qualitative and quantitative data but gives little indication regarding how these data will be handled.	Please describe the methods that will be used to consider both qualitative and quantitative data during this assessment.	Biological and physical characteristics will be used as indicators of wetland health and function. Each indicator will be assessed as either being present or not present. These characteristics will be used as indicators to evaluate the health indication of each wetland. An aggregate indicator value will be derived from individual wetland responses.
Final	NRF	14	Page 44, Table 9-1 Project – Environment Interactions	N/A	This table indicates no interaction between peatlands and construction site restoration even though restoration will be occurring along many project activities listed as having an interaction with peatlands. Is this because restoration of lost/impacted peatland areas will not be attempted? Will peatlands impacted by construction activities not be rehabilitated?	The study plan should explain why there is no interaction noted between peatlands and construction activities. Please clarify if peatland areas impacted by construction activities will be rehabilitated. If no attempt will be made to rehabilitate these peatland areas, then there should be an explanation regarding why this is the case.	Peatland restoration will be undertaken where possible and will be considered as a pathway of effects in the EA/IS.
Final	NRF	15	Page 44, Table 9-1 Project – Environment Interactions	N/A	This table indicates there is no interaction between aggregate pits and quarries and peatlands. Is this based on an assumption that peatlands will not occur where aggregate pits and quarries are to be developed? If so, this assumption should be clearly stated in the study plan.	Revise the study plan to better explain why there is not considered to be an interaction between peatlands, and aggregate pits and quarries.	The initial assumption is that aggregate will be collected from areas outside of peatland ecosystems. If aggregate is identified within peatland ecosystems during project design (i.e., within shallow veneers), the assumption will be revised to assess these potential effects.
Final	NRF	16	Page 46, Table 9-2 Peatland Indicators	N/A	Disturbance to peatland areas in the Far North could potentially impact the permafrost layer, potentially through ponding and increased water/ground temperatures in the area of the project. It is not clear from the study plan how potential impacts to permafrost are being considered, or if active permafrost areas occur within the project footprint.	Please provide a description of how the study plan addresses the identification, and potential impacts of this project on, permafrost in the area. Permafrost should be incorporated into Table 9-2 if active permafrost areas are likely to be encountered.	Areas of permafrost will be identified during physiogprahy, soils, and terrain mapping and field work. Should extensive areas of permafrost be identified, peatland indicators will be revised to include change in permafrost within peatland ecosystems.
Final	NRF	17	Page 48, Table 9-3	N/A	This table indicates that there is no pathway for indirect effects as a result of the Project between peatlands and archaeological and cultural heritage. How was this determination made? Is it possible that there is a risk of changes in surface hydrology or hydrological connections that could dry or flood an area with cultural or archaeological significance?	The study plan should describe how the determination was made that there would be no pathway for indirect effects as a result of the Project between peatlands and archaeological and cultural heritage.	It is possible for indirect effects between peatlands and archaeological and cultural heritage and this will be more clearly indicated in the EA Report / IS.Generally, the archaeological concerns are addressed and mitigated prior to any land alterations. So any indirect impacts would be mitigated beforehand if it was understood how much of the area would be indirectly impacted by drying or flooding of an area as a result of these activities. On the other hand, peatlands do not necessarily retain archaeological potential given that they are typically quite wet and unstable – not an ideal place for human settlement. It would be the areas adjacent to the peatlands that would potentially see these negative effects, again depending on how far the indirect impacts of flooding or drying would extend beyond the direct area of
Final	NRF	18	Page 49, Section 9.4 Methods for Predicting Future Conditions	N/A	This study plan indicates that assessments will consider whether peatlands within the study area are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or are considered ecologically, socially, or economically important to the region. Although it is beneficial to consider the current status of peatlands in relation to other areas of Canada, it is important that reasonable avoidance and/or mitigation strategies be determined for disturbances within the project area during this environmental assessment process. It would be incorrect to assume that suitable habitat is available for disturbed wildlife, or to meet ecological/social/economic functions currently satisfied by the disturbed area simply because there is an abundance of peatland in close proximity to the disturbed area.	The proponent should be able to demonstrate where other suitable peatland is available to satisfy the role of any peatland areas disturbed as a result of the project. For instance, if peatland habitat for wildlife is disturbed by the project, it will be important that the proponent demonstrate where other suitable habitat is located, that wildlife will be able to access it, and that the areas are not at carrying capacity. The study plan should demonstrate how appropriate information/data will be collected to support assessment of the impact of this project on the ecological/social/economic/cultural functions of peatlands. Sufficient information will be needed in both the RSA and LSA/PDA areas to differentiate between when peatland disturbance resulting from the project represents a net negative impact for the area, or if another portion of the peatlands within the RSA or otherwise, will sufficiently compensate for impacted peatland areas lost within the LSA or PDA.	The baseline studies proposed for the EA were designed to select an appropriate LSA to represent the RSA, so that data collected within the LSA could be used to extrapolate results to the RSA with relative confidence. Therefore the effects on peatland as a result of the project can be put into a braoder context of the peatlands available in the RSA. Also, note that the LSAs for wildlife VCs range from 3km to 10km from the PDA and as such this is the area wherein field investigation for these VCs will occur. The wildlife RSAs include vast areas (e.g. multiple ranges for caribou and WMUs for wolverine) in order to consider population level effects. Habitat models will be developed (where applicable) to determine the effects of habitat loss/disturbance on wildlife VCs. These studies will consider habitat availability and distribution and well as population measures of survival and reproductivity for wildlife VCs to address the pathway of peatland habitat loss on wildlife at the various spatial extents. In order to determine the significance of the effects on wildlife, the availability of other suitable habitat beyond those disturbed by the project are considered. Peatland availability and distribution indicators will provide information related to the location of undisturbed peatland ecosystems. Other disciplines will use the peatland availability and distribution data to determine the effects of peatland loss/distrubance on their VCs (e.g. wildlife, vegetation, hydrology, climate change). The functional assessment will incorpoate these various ecological elements. These interconnected components of the assessment will satisfy the requirements to demonstrate the functional role of peatlands as wildlife habitat.

Peatlands Study Plan

Agency Comments on Study Plan

Study Plan Version	Commentor	Comment # / Ref #	Study Plan Section Reference (PDF Page #)	TISG Section	Agency Response (2022)	Required Action	Proponent Response (2022)
Final	NRF	19	Page 51 and 52 Section 9.5.1	N/A	The document indicates that, in relation to wetlands, mitigation measures should be developed in collaboration with federal authorities and included in the Impact Statement. It should also recognize / state that provincial agencies should also be consulted as appropriate.	Include NDMNRF on the list of provincial agencies that should be included in discussions where they may impact our mandated areas of concern such as for offsets for SAR, determination of mitigation and/or avoidance of impacts to peatland or wetland areas.	NDMNRF will be included in any discussions regarding potential offsets, mitigation, and/or avoidance of impacts related to the project.
Final	NRF	20	Page 55 Section 9.9	N/A	NRF supports the development of follow-up monitoring/assessment programs for the study areas impacting our mandate.	Please include NDMNRF in consultation efforts to determine follow-up monitoring and assessment programs e.g. considering offsets on Crown land for SAR; or considering species listed as Special Concern under the Endangered Species Act as related to Significant Wildlife Habitat. (Note: species listed as endangered or threatened under the ESA, and their habitat, are within the mandate of the Ministry of Environment, Conservation and Parks).	NDMNRF will be included in any discussions regarding potential offsets, mitigation, and/or avoidance of impacts related to the project.
Final	NRF	21	Page59 Table 11-1 ID#3 TISG	N/A	This table directs readers to the Wildlife Study Plan for a description of how the project may impact the structure and functioning of biotic and abiotic components of the ecosystem.	To allow for more effective understanding of the works to be undertaken and review of these components, it is recommended the text includes a summary of the referenced study details that relate to peatlands in the Peatlands Study Plan, and directing readers to the applicable section(s) of the Wildlife Study Plan (or other plans as appropriate) for more detailed information.	The reference should include Section 9.2 of the wildlife study plan. The peatland ecosystems assessment will use a coarse-filter and fine-filter approach to evaluating potential Project effects on many biodiversity attributes together, such as wildlife guilds and plant communities dependent on peatland ecosystems. Indicators used during the assessment of Peatland ecosystems will include the availability, distribution, function and composition, carbon staorage and flux, and peatland climate.
Final	NRF	22	Page 59 Table 11-1 ID#6	N/A	When baseline data is extrapolated or otherwise manipulated to depict environmental conditions it is recommended that the models be validated using field data from appropriate local and regional levels.	Recommend including the RSA within field data collection studies to allow for verification of habitat classification efforts at the RSA scale.	All discipline field work is specific to the LSA. Ground and visual plots will be completed in tandem with the vegetation and physiography study plans. Accuracy of existing PDA and LSA ground surveys will be compared against existing landcover datasets to determine relative accuracy. The baseline studies proposed for the EA were designed to select an appropriate LSA to represent the RSA, so that data collected within the LSA could be used to extrapolate results to the RSA with relative confidence. For example, an analysis of vegetation communities was performed to determine an appropriate LSA (see Vegetation Study Plan) Review of background data on peatlands in this area (e.g. peatland of Far north On studies) will also be completed to develop a better understanding of the RSA
Final	NRF	23	Pg.60 Peatlands Table 11-1: ID#12 TISG	N/A	Surveys and analyses should be conducted by qualified experts.	Commitments as to the level of experience or expertise are not always provided (e.g. OWES assessments). Recommend more detail be provided on who will be carrying out specific assessments. For example, OWES training certification should be a requirement for individuals using the protocol to make wetland habitat determinations and delineations.	The field lead will have sufficient training and will hold an Ontario Wetland Evalution System Certificate.
Final	NRF	24	Pg.61 Peatlands Table 11-1: ID#10 and 13 TISG	N/A	These sections refer to information sources and data collection. Another potential source of information would be to connect with forest license holders to obtain information/data that may inform understanding of the project area.	Recommend that the project team consult with forestry licence [(Sustainable Forestry License (SFL), Forest Resource Licensees (FRL)] holders where the study area overlaps with Forest Management Units designated under the Crown Forest Sustainability Act.	As part of the Land and Resource Use Assessment, interviews will be held with Forestry licence [(Sustainable Forestry License (SFL), Forest Resource Licensees (FRL)] holders to obtain information/data to help inform understanding of the project area.
Final	NRF	25	Pg.62 Peatlands Table 11-1: ID#17 TISG	N/A	Factors to be considered.	Reference to Section 9 should also be provided in the far right column of this table.	The comment is acknowledged and will be addressed in the IS / EA Report as applicable.
Final	NRF	26	Pg.65 Peatlands Table 11-1: ID#34, 35 & 36 TISG	N/A	According to this table, contaminants of concern, and hydrological or drainage changes along with their anticipated consequences on peatlands, will be discussed in the Surface Water Study Plan, and the Groundwater and Geochemistry Study Plan.	It is recommended that a summary of these concerns and changes be included in the Peatlands Study Plan. Applicable sections from the specified study plans should be referenced in the Peatlands Study Plan to ensure traceability for readers who require further detail than what is provided in the summary.	Assessment of contaminants of concern, and hydrological or drainage changes along with their anticipated consequences will be captured by the Surface Water Study Plan, and the Groundwater and Geochemistry Study Plan. A specific summary of the pertinent effects related specifically to peatland ecosystems will be provided in the Peatlands section of the EA Report / IS.
Final	NRF	27	Pg.65 Peatlands Table 11-1: ID#37 TISG	N/A	Methodology used to identify effects.	Parameters used to make the effect determination should be described so that the methodologies being utilized by the study plans can be understood by agencies and other parties.	Parameters are outlined in Section 9.6 and include direction, magnitude, geographic extent, duration, frequency, likelihood, and whether effects are reversible or irreversible.

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Final	NRF	28	Pg.77 Peatlands Appendix A	N/A	Baseline Data Methodology	Additional sources recommended for baseline data collection include: Ecoregional Criteria Schedule 3W, if applicable -https://ero.ontario.ca/notice/013-2018 -https://apps.mnr.gov.on.ca/ebr/docs/ecs-3w-draft.pdf GeoHub -https://geohub.lio.gov.on.ca/ Natural Heritage Information Centre (NHIC) data -currently only listed as a wetland database – much broader data is available) -https://www.ontario.ca/page/get-natural-heritage-information -https://www.ontario.ca/page/natural-heritage-information-centre Ontario Wetland Evaluation System (OWES) Northern Manual -OWES is currently listed under wetlands, however the manual to be used is not specified -https://www.ontario.ca/page/wetlands-evaluation -https://files.ontario.ca/environment-and-energy/parks-and-protected-areas/ontario-wetland-evaluation-system-northern-manual-2014.pdf	Additional data sources noted and will be reviewed and referenced as part of the EA/IA.
Final	NRF	29	Pg.84 Peatlands Appendix A	N/A	Mapping	Recommend including: Digital reference to GeoHub -https://geohub.lio.gov.on.ca/ NHIC -https://www.ontario.ca/page/get-natural-heritage-information FMP and AWS maps, where applicable -https://nrip.mnr.gov.on.ca/s/fmp-online?language=en_US EDDMapS Ontario for invasive species along with the Land and Information Ontario (LIO) Species Observation Locally Tracked layer -https://geohub.lio.gov.on.ca/documents/lio::species-observation-locally-tracked/about	Additional data sources noted and will be reviewed and referenced as part of the EA/IA.
Final	NRF	30	Pg.88 Peatlands Appendix A	N/A	Vegetation	Recommend including: NHIC Species Lists -list of all species in the database, including species of conservation concern (tracked species) in Ontario -a list of plant communities, including tracked communities, is available as well -https://www.ontario.ca/page/get-natural-heritage-information	Additional data sources noted and will be reviewed and referenced as part of the EA/IA.
Final	IAAC	PE-01	N/A	Section 8.5 "…The Impact Statement must: - provide pre-project characterization of the shoreline, banks, current and future flood risk areas, wetland catchment boundaries; - provide data files of mapped features depicting natural areas and wildlife presence within, and use of, the study area;…" Section 14.3 "…The Impact Statement must: - describe any changes to permafrost conditions as a result of the Project; - describe any changes to eskers and similar geological features as a result of the Project;…"	There are additional requirements related to riparian and wetland environments found in Sections 8.5 and 14.3 of the Guidelines that do not appear to be discussed anywhere in this study plan. It is unclear in which plan they will be addressed. If details about how these requirements will be met are found in separate study plans, references to that study plans in the peatlands concordance table should be provided.	Confirm where the additional requirements related to riparian and wetland environments found in Sections 8.5 and 14.3 of the Guidelines will be addressed. Provide references to that requirement and relevant study plans in the peatlands concordance table.	Requirements from Section 8.5 - characterization of shoreline, banks, future flood risk area (Surface Water Study Plan) - quantify wetland/peatland habitat (Peatlands Study Plan) - Description of watersheads (Surface Water Study Plan) - Description of Ecozones/region (Peatlands, Vegetation Study Plans) - Maps of natural areas and wildlife features (Vegetation, Wildlife Study Plans) - map of wetlands (Peatlands Study Plan) - Geographic area of degradation (Peatlands, Vegetation Study Plans) - wetland capabilities to perform hydrological and wate quality functions (Functional Assessment, Wildlife, Surface Water Study Plans) - Functional assessment (Peatlands, Vegetation Study Plans) - Data collection covering space and time (Peatlands, Vegetation Study Plans). - SAR surveys (wildlife, vegetation Study Plans) - Location and description of potentiall effected wetlands (Peatlands Study Plan) - Data submission (Physiography, Terrain and Soils, Vegetation,Wildlife Study Plans) - Identification of RSA (Peatlands, Physiography, Terrain and Soils, Surface Water, Vegetation Study Plans) Requirements from Section 14.3 - describe any changes to permafrost conditions as a result of the Project (Physiography, Terrain and Soils Study Plan);-

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Final	IAAC	PE-02	Table 4-1: Identified Neighbouring Indigenous Communities, including their Provincial Territorial Organizations and / or Tribal Council Affiliations "Long Lake #58 First Nation** Animbiigoo Zaagi'igan Anishinaabek First Nation* * Indigenous communities or organizations identified by the MECP who should be consulted on the basis that they may be interested in the Community Access Road. ** The MECP indicated in a letter to MFFN that Long Lake #58 First Nation was moved from interest-based to rights-based."	Section 6 "…The Agency requires the proponent to engage with, at a minimum, the communities listed in the Indigenous Engagement and Partnership Plan…"	Animbiigoo Zaagi'igan Anishinaabek First Nation and Long Lake #58 First Nation are included in the Indigenous Engagement and Partnership Plan as Indigenous groups identified by the Agency for consultation, on the basis that the Project may adversely impact the exercise of Aboriginal and Treaty rights.	For the federal impact assessment process, Animbiigoo Zaagi'igan Anishinaabek First Nation and Long Lake #58 First Nation must be equitably engaged as per the requirements of Section 6 of the Guidelines.	MFCAR is providing consultation and engagement opportunities to all neighbouring Indiigenous communitiies identified in Table 4-1 of the study plan, including Animbiigoo Zaagi'igan Anishinaabek First Nation and Long Lake #58 First Nation. It is noted , however, that the level of interest of a given community will determine in part the full extent of engagement that occurs.
Final	IAAC	PE-03	Marten Falls First Nation Community Access Road Project – General Comments from the Agency on Draft Study Plans "The proposed discipline-specific study areas are preliminary. The proposed study areas will be consulted and engaged on early in the IA / EA process. In addition, the Indigenous Knowledge Program provides additional opportunities for community knowledge and Indigenous Knowledge, current or traditional land and resource use by Indigenous communities, and the exercise of Aboriginal and Treaty Rights of Indigenous peoples to be shared in greater detail." Table 6-1 Peatlands Study Areas "Borders of overlapping quaternary watershed boundaries (may be refined following desktop analysis and input from other VCs that may indirectly affect Peatlands)"	Section 7.4 "…The proponent should engage with Indigenous groups when defining spatial and temporal boundaries for valued components, especially for those that are identified by Indigenous groups..."	As stated in comment GC-04 above, the peatlands study plan does not provide information on how Indigenous knowledge; current and traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; physical, ecological, technical, social, health, economic and cultural considerations were/will be taken into account when defining the spatial boundaries. Attawapiskat First Nation submitted comments on January 29, 2020 that indicated they want to be involved inidentifying a regional study area of sufficient size to capture effects to wetlands4. It is unclear if this comment has been actioned by the proponent or if Attawapiskat First Nation has been involved in defining the wetlands study area boundary. Since Attawapiskat First Nation has specifically indicated a desire to be involved in defining the spatial boundaries for wetlands, the Agency recommends proactively engaging with Attawapiskat First Nation on this topic.	Engage Attawapiskat First Nation, as well as the other Indigenous groups identified in the Indigenous Engagement and Partnership Plan, on the wetlands study area boundaries and demonstrate in the Impact Statement and as per Section 7.4 of the Guidelines, how their concerns were addressed.	Indigenous communities identified in the Indigenous Engagement and Partnership Plan, including Attawapiskat First Nation, will be provided an opportunity to be consulted/ engaged on study areas as part of the Effects Assessment Consultation Milestone. In addition, Indigenous communities have been provided with Discussion Guides related to study plans for valued components to both inform and seek feedback. Monthly emails, distributed to key stakeholders and subscribers to the website, provide updates on the planned and in-progress field studies and encourage readers to view the valued components educational videos. Posting of new videos, and reminders of existing videos, are also advertised via the Project facebook site.
Final	IAAC	PE-04	Section 7.2.1 "Classification of the RSA will remain consistent with the approach suggested by related disciplines (e.g., vegetation). The level of existing information on vegetation and peatland communities within the RSA (Far North Land Cover) is considered adequate to support an assessment of indirect effects on Peatland VCs within the RSA. No additional desktop delineation or classification in the RSA will occur."	Section 7.1 "…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..." Section 14.3 "…The Impact Statement must: - describe direct, incidental and cumulative predicted positive and/or adverse effects to riparian, wetland (including separate description relevant to peatlands)…"	It is unclear how it was determined that the existing information on vegetation and peatland communities within the RSA is considered adequate to support an effects assessment. Additionally, Section 7.2.1 of the study plan states that the available information is considered adequate to assess indirect effects on peatlands. However, the study plan does not demonstrate that the information available will be sufficient to assess cumulative effects.	Provide details to demonstrate how it was determined that the existing information on vegetation and peatland communities within the RSA is considered adequate to support an assessment of indirect effects on peatlands. Demonstrate that the information available will be sufficient to assess cumulative effects. Provide details about the approach and methods that will be used to conduct the effects assessment and the assessment of cumulative effects.	The baseline studies proposed for the EA were designed to select an appropriate LSA to represent the RSA, so that data collected within the LSA could be used to extrapolate results to the RSA with relative confidence. Therefore, the effects on peatland as a result of the project can be put into a broader context of the peatlands available in the RSA. Also, note that the LSAs for wildlife VCs range from 3km to 10km from the PDA and as such this is the area wherein field investigation for these VCs will occur. The wildlife RSAs include vast areas (e.g., multiple ranges for caribou and WMUs for wolverine) in order to consider population level effects. Habitat models will be developed (where applicable) to determine the effects of habitat loss/disturbance on wildlife VCs. These studies will consider habitat availability and distribution and well as population measures of survival and reproductivity for wildlife VCs to address the pathway of peatland habitat loss on wildlife at the various spatial extents. In order to determine the significance of the effects on wildlife, the availability of other suitable habitat beyond those disturbed by the project are considered. Peatland availability and distribution indicators will provide information related to the location of undisturbed peatland ecosystems. Other disciplines will use the peatland availability and distribution data to determine the effects of peatland loss/disturbance on their VCs (e.g., wildlife, vegetation, hydrology, climate change). The functional assessment will incorporate these various ecological elements. These interconnected components of the assessment

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Final	IAAC	PE-05	Section 7.3.2 Peatland Composition "There will be no ground surveys within the broader RSA." Section 7.3.3 Peatland Function "Peatland composition information collected during the vegetation and physiography, terrain and soils field components (Section 7.3.2) will be used to assess the habitat and hydrological function of the peatland ecosystems. Habitat suitability, and wildlife observations captured as described in the Bird, Ungulates and Wildlife Study Plans will also be incorporated into the functional	Section 8.5 "…complete this assessment prior to the start of Project construction for a representative selection of wetlands that the Project would directly impact **and for a representative selection of wetland(s) that are hydrologically connected.**" [reviewer emphasis]	Section 8.5 of the Guidelines requires a wetland functions assessment for a representative selection of wetlands (which includes peatlands) that are hydrologically connected to wetlands expected to be directly impacted by the Project. However, none of the sampling programs that feed into the functions assessment occurs in the peatland RSA, where such peatlands would be located.	Ensure that the Impact Statement includes a wetland functions assessment of a representative selection of peatlands in the RSA. Sampling programs that feed into the wetland functions assessment should capture wetlands (including peatlands) that are connected hydrologically to wetlands expected to be impacted by the Project.	Functional assessments of peatlands will be completed within the Project LSA on hydrologically connected wetland ecosystems representative of the RSA. Biological and physical characteristics will be used as indicators of wetland health and function. Each indicator will be assessed as either being present or not present. These characteristics used as indicators to evaluate the health indication of each wetland. An aggregate indicator value will be derived from individual wetland responses.
Final	IAAC	PE-06	Sections 4.1 and 4.2 "The study plans have recognized Indigenous community input received on the Project to date." "The study plans have recognized public and agency input received on the Project to date." Section 9.2 "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 Peatlands."	Section 5 "…The proponent must engage with the public and provide timely notification of proposed engagement activities to seek community knowledge and views on: - baseline conditions; - valued components and indicators, taking into consideration the requirements under section 25 of this document; - effects assessment and the assessment of the Project's contribution to sustainability; - mitigation and follow-up measures; and - conclusions…" Section 6 "…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; - inform the effects assessment and review its conclusions; and - inform the development of mitigation measures and follow-up programs…"	The study plan states that "inputs received to date from Indigenous groups and interested persons…. have informed the selection of VCs and indicators for peatlands". It is not clear what input has been received to date and how it was used to inform the peatlands study plan. More detail is needed about who has provided input related to peatlands, what the input was and how input received to date has informed the selection of VCs and indicators specifically for peatlands. It is also unclear what is meant by "the study plans have recognized Indigenous community / public and agency input received on the Project to date."	As required in Sections 5 and 6 of the Guidelines, ensure that the Impact Statement provides more detail about who from the public or Indigenous groups has provided input related to peatlands, what the input was and how input received to date has informed the selection of VCs and indicators specifically for peatlands. If information is considered sensitive or confidential, provide the information in a way that does not breach confidentiality but still allows the individual that provided the input to see the information reflected in the Impact Statement. The following statements are not sufficient to demonstrate that input was taken into account therefore additional information should be provided: - "The study plans have recognized Indigenous community input received on the Project to date." - "The study plans have recognized public and agency input received on the Project to date."	The EA Report / IS will provide further detail on who from the public or Indigenous groups has provided input related to peatlands, what the input was and how input received to date has informed the selection of VCs and indicators specifically for peatlands.
Final	IAAC	PE-07	Section 9.3 Potential Effects, Table 9-3 "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 Peatlands may result in indirect effects to other environmental disciplines."	Section 8.5 "…The Impact Statement must: - quantify, delineate and describe wetlands (fens, marshes, peat lands, bogs, etc.) within the local study area potentially directly, indirectly and/or cumulatively effected by the Project…" Section 14.3 "…The Impact Statement must: - describe direct, incidental and cumulative predicted positive and/or adverse effects to riparian, wetland (including separate description relevant to peatlands) and terrestrial biodiversity metrics…"	Section 9.3 of the study plan indicates that Table 9-3 provides a preliminary identification of how changes to peatlands may cause indirect effects to other disciplines. However, it appears that table 9.3 does not indicate how changes to peatlands may result in indirect effects to other environmental disciplines, but rather whether those interactions may occur. The more relevant consideration for this study plan is whether changes to other environmental disciplines/VCs may result in indirect effects to peatlands.	Ensure that potential interactions that may result in indirect effects to peatlands are identified. Clarify that Table 9-3 indicates not how but whether indirect effects may occur.	Potential interactions that may result in Indirect effects to peatlands will be described in the IS / EA Report. Table 9-3 summarizes whether there is a potential for indirect effects to occur.
Final	IAAC	PE-08	Section 9.4 Methods for Predicting Future Conditions (Entire section)	Section 13.1 "…The assessment of the effects of each of the project components and physical activities, in all phases, must be based upon a comparison of baseline environmental, health, social and economic conditions and the predicted future conditions with the Project and the predicted future conditions without the Project. Predictions must be made on clearly stated assumptions and the Impact Statement must clearly describe how it has tested each assumption…"	It is not clear from Sections 9.3 Potential Effects or 9.4 Methods for Predicting Future Conditions whether the predicted future conditions with and without the Project for each indicator in Table 9.2 will be compared to the baseline conditions as described by the data outlined in sections 7.2 and 7.3 for those indicators.	Clarify that predicted future conditions with and without the Project for each indicator in Table 9-2 will be compared to the baseline conditions for those indicators.	The potential effects of the Project will be assessed against each indicator in Table 9-2 for both route alternatives, which will include a comparison of the **predicted** conditions with the Project and the existing conditions for those indicators. The residual effects of the preferred route will be compared against the existing conditions without the Project, also referred to as "no-action" or "do-nothing" alternative. The analysis of the advantages and disadvantages of the preferred alternative against the "no-action" alternative will focus on the valued components and indicators determined to have residual effects from the Project.

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Final	IAAC	PE-09	Table 9-4: Peatlands Magnitude Definition "A **small** variation predicted in the peatland measurement indicators. Effects will be assessed through a qualitative narrative or numeric quantification support by a reasoned narrative. A **moderate** variation predicted in the peatland measurement indicators. Effects will be assessed through a qualitative narrative or numeric quantification support by a reasoned narrative. A **large** variation predicted in the peatland measurement indicators. Effects will be assessed through a qualitative narrative or numeric quantification support by a reasoned narrative."	Section 13.1 "…Severity, defined as, within the scope, the level of damage to the valued component from the effect that can reasonably be expected; typically measured as the degree of destruction or degradation within the scope or the degree of reduction of the population within the scope. Characterize the severity of each predicted adverse effect on each valued component as follows: extreme: within the scope, the effect is likely to destroy or eliminate the valued component or reduce its population by 71-100% within ten years or three generations; serious: within the scope, the effect is likely to seriously degrade/reduce the valued component or reduce its population by 31-70% within ten years or three generations; moderate: within the scope, the effect is likely to moderately degrade/reduce the valued component or reduce its population by 11-30% within ten years or three generations; and slight: within the scope, the effect is likely to only slightly degrade/reduce the valued component or reduce its population by 1-10% within ten years or three generations…"	As per the guidance in Section 13.1 of the Guidelines, the terms used to describe effects (i.e., small, moderate, large from Table 9-4 of the study plan) must be defined before the effects assessment is conducted.	Define what is considered small vs moderate vs large variation prior to conducting the effects assessment. The guidance in Section 13.1 of the Guidelines provides internationally accepted methodology for this. Include in the Impact Statement the definitions used to describe the effects in the effects assessment.	The residual effects characteristics that are not-discipline specific will be defined in the EA Methodology Document, which will be provided to the Agency for review prior to the IS / EA Report. The magnitude definitions for peatlands will be updated, providing the clarity requested, prior to the effects assessment being conducted.
Final	IAAC	PE-10	Section 9.6 Residual Effects "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. *Footnote - 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 sections.*"	Section 13.1 "…The effects to each valued component outlined in sub-sections 14.3, 15.2, 15.3, 15.4 must be described using the following criteria…"	The criteria described in Section 13.1 on page 81 of the Guidelines should be used to describe effects to valued components outlined in the Guidelines, Section 14.3 Changes to riparian, wetland and terrestrial environments. Peatlands encompass two types of wetlands – bogs and fens. Use these criteria for peatlands.	Use the criteria outlined in Section 13.1 of the Guidelines to describe effects to peatlands.	The criteria described in Section 13.1 on page 81 of the Guidelines will be used to describe the effects to peatland valued components, including changes applicable to peatland environments outlined in Section 14.3.
Final	IAAC	PE-11	Table 11-1: Study Plan Federal Concordance – Conformance with Requirements, #1 "The potential effects of the environment on the project will be assessed in accordance with applicable standards and guidance." "Section 9.1"	Section 1.1 "…) any change to the designated project that may be caused by the environment;…"	Section 9.1 of the study plan outlines project components that may impact peatlands, not how the peatland environment may impact the Project. The intent of this factor is to consider how environmental conditions could affect the Project. In relation to peatlands, this might include effects of climate change on the Project (e.g., will the climate conditions for which the road is designed change over the lifespan of the road and what impact would that have on the Project). Other common, potentially relevant ways that wetlands/ peatlands may impact road projects include flooding, compromised bearing capacity, road settlement, ponding on the road, saturation of road base, rutting,	Include consideration of any change to the Project that may be caused by the environment, including effects of climate change.	Changes to the Project as result of the environment is will be considered in the IA / EA. Details on the assessment of potential environmental effects on the project are described in the Climate Adaptation and Resiliency Study Plan
Final	IAAC	PE-12	Table 11-1: Study Plan Federal Concordance – Conformance with Requirements, # 24 "Wetlands that are considered socially, ecologically or economically important to the region will be discussed in the IS / EA Report."	Section 8.5 "…The Impact Statement must: - determine whether these wetlands are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or considered ecologically or socially or economically important to a region;…"	It is unclear how it will be determined if wetlands are socially, ecologically or economically important to the region.	Provide detail to demonstrate how it will be determined if wetlands there are socially, ecologically or economically important to the region. Include details about the approach and methods that will be used to make this determination.	The approach and methods that will be used to assess Project effects to wetland and riparian ecosystems both locally and regionally are presented in Sections 7, 8 and 9 of the vegetation study plan. The cultural significance of wetlands will be assessed as part of the assessment of the ATRI Indigenous Current Use of Lands and Resources for Traditional Purposes VC, which includes several potentially applicable indicators including: - Alteration / change in or loss of sites and areas used for traditional activities (e.g., hunting, trapping, fishing, gathering) - Changes in the availability or quantity of resources (e.g., wildlife, fish, vegetation) for traditional activities (e.g., harvesting and gathering). - Changes in the quality or perceived quality of resources for traditional activities. - Changes in access to sites and areas used for traditional activities. An economic assessment of the impact of the Project on wetlands is not standard for an EA, and is not part of the MFCAR EA/IA scope. A TISG deviation will be requested.

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Final	IAAC	PE-13	Table 11-1: Study Plan Federal Concordance – Conformance with Requirements, #12 "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." Table 11-1: Study Plan Federal Concordance – Conformance with Requirements, #27 "Data will be collected in ways that enable reliable extrapolations in space and in time. Surveys will be designed to represent the spatial and temporal targets of extrapolations."	Section 7.2 "…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…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…" Section 8.5 "…Collect data from representative wetlands in a manner that enables reliable extrapolations in space (i.e., at minimum to Project, local and regional study areas) and in time (i.e., across years): • design surveys so that they represent the spatial and temporal targets of modeling and extrapolations, and to produce scientifically defensible predictions of impacts and estimates of mitigation effectiveness. Survey designs should be sensitive enough to detect and quantify the impacts at the spatial and temporal scales identified above (i.e., project study area, local study area, and regional study area), any departures from predictions, and the effectiveness of mitigations. Justify the selection of modeling techniques based on current and recent scientific literature; • survey protocol planning for representative wetlands should include modeling and simulations to estimate sampling requirements, and analysis to evaluate resulting design options; and sample size must be planned to support evaluation of the project study area within the context of the local study area and regional study area. Appropriate design of surveys will need to consider multiple survey locations in order to represent the wetland heterogeneity of the regional study area	More detail is required to assess whether the requirements of Section 7.2 of the Guidelines will be met. The study plan does not contain adequate detail to show the Impact Statement will have sufficient samples and an appropriate survey design to allow for reliable extrapolations. It is unclear, based on the information provided in the concordance table and study plan, if multiple sampling locations and multiple visits to each location are planned. More detail about the proposed sampling design are needed to determine if this requirement will be met. The peatland study plan indicates that field sampling methods and design will be outlined in four other study plans: - Groundwater and Geochemistry - Surface Water - Physiography, Terrain, and Soils - Vegetation In addition, data from the Wildlife Study Plan will be used to inform wetland habitat function. As previously commented on the Vegetation Study Plan in June 2020: "Not enough information has been provided about the 2019 vegetation surveys or the planned future surveys to assess whether they meet the requirements in the Guidelines. Detailed information is needed on the areal coverage of the habitat classes, and the numbers of samples intended for each habitat class under the selected sampling design."	Provide detail to demonstrate that sampling designs are appropriate for producing reliable and sufficient data. Provide the requested information in the work plan, or include a plan to obtain it, to demonstrate (i.e., substantiate the claim) that survey sampling designs meet the requirements in the Guidelines (as per previous comment on the Vegetation Study Plan in June 2020). Provide a workplan for all future surveys to be conducted that outlines how the data will be collected, such as information on location, scheduling, sequencing (i.e., how to action the study plan).	A Workplan was provided to the Agency describing all future surveys to be conducted that outlines how the data will be collected, such as information on location, scheduling, sequencing.
Final	IAAC	PE-14	Table 11-1: Study Plan Federal Concordance – Conformance with Requirements, #27 "Data will be collected in ways that enable reliable extrapolations in space and in time. Surveys will be designed to represent the spatial and temporal targets of extrapolations."	Section 7.4 "…The spatial and temporal boundaries to be used in the impact assessment are outlined and discussed through the tailoring process, and include comments and input from federal and provincial government departments and agencies, local government, Indigenous groups, the public and other interested parties…" Section 8.5 "…The Impact Statement must: – Collect data from representative wetlands in a manner that enables reliable extrapolations in space (i.e., at minimum to Project, local and regional study areas) and in time (i.e., across years): • design surveys so that they represent the spatial and temporal targets of modeling and extrapolations, and to produce scientifically defensible predictions of impacts and estimates of mitigation effectiveness. Survey designs should be sensitive enough to detect and quantify the impacts at the spatial and temporal scales identified above (i.e., project study area, local study area, and regional study area), any departures from predictions, and the effectiveness of mitigations. Justify the selection of modeling techniques based on current and recent scientific literature; • survey protocol planning for representative wetlands should include modeling and simulations to estimate sampling requirements, and analysis to evaluate resulting design options; and • sample size must be planned to support evaluation of the project study area within the context of the local study area and regional study area. Appropriate design of surveys will need to consider multiple survey locations in order to represent the wetland heterogeneity of the	Section 8.5 of the Guidelines requires data be collected from representative wetlands in a manner that enables reliable extrapolations in time. It is predicted that the effects of climate change will be especially severe in the north. That includes degradation of permafrost and the effects of the latter on peatland structure and functions, including carbon storage. As such, climate change should be part of the temporal considerations.	Consider climate change as part of temporal modeling and extrapolations for wetlands, as well as in the potential changes in natural disturbance regimens.	The Peatlands and Wetlands disciplines will receive climate data analytics developed by the Climate Resilience discipline describing the historical baseline climate conditions and the projected future climate conditions for the Study Area. The baseline and projected climate datasets will be applied by the Peatland, Wetlands disciplines in their assessment of potential impacts.
Final	IAAC	PE-15	Table 11-2: Study Plan Provincial Concordance – Conformance with Requirements "The EA will assess direct effects of the alternative routes on wetlands (Section 7.2.6), and the indirect effects on wildlife habitat (Section 7.2.7) and climate change (Section 7.2 and Section 7.2.1) from changes to wetlands and / or peatlands."	Section 14.3 "…The Impact Statement must: - Describe direct, incidental and cumulative predicted positive and/or adverse effects to riparian, wetland (including separate description relevant to peatlands) and terrestrial biodiversity metrics, effects of fragmentation, changes to regional biodiversity that could be caused by all project activities, including but not limited to effects to wetland ecological functions, including effects that may alter the wetland's capacity to perform hydrological, biogeochemical cycling, habitat, and climate functions..."	Natural Resources Canada suggests the Proponent consult the guides developed by Ducks Unlimited when developing the effects assessment, including: - Partington, M., Gillies, C., Gingras, B., Smith, C., and J. Morissette. 2016. Resource Roads and Wetlands: A Guide for Planning, Construction, and Maintenance. FPInnovations. (Special Publication SP-530E). Point-Claire, QC.-FPInnovations; and - Osko, T., Gillies, C., and Pyper, M. 2018. COSIA In-situ oil sands shared practices for working in and around wetlands. Available from https://www.cosia.ca/sites/default/files/attachments/COSIA-WetlandSharedPracticesReport-2018-02-27.pdf In addition, Natural Resources Canada suggests the Proponent consult the following reference when developing the climate change assessment for the Project: Cherie J. Westbrook (2014) Wetlands of the Hudson Bay Lowland: An Ontario Overview, Canadian Water Resources Journal / Revue canadienne des ressources hydriques, 39:1, 83-83, DOI: 10.1080/07011784.2013.872874			Additional data sources noted and will be reviewed and referenced as part of the IS / EA Report

Peatlands Study Plan

Agency Comments on Study Plan

Study Plan Version	Commentor	Comment # / Ref #	Study Plan Section Reference (PDF Page #)	TISG Section	Agency Response (2022)	Required Action	Proponent Response (2022)
Final	IAAC	PE-16	Table 11-3: Study Plan Federal and Provincial Concordance – Requirement Deviations		Proposed amendments and/or deviations from the Guidelines will not be reviewed or approved during the study plans review process. The Agency will provide guidance on the process to propose amendments and/or deviations to the Guidelines to the project team.		Acknowledged.
Final	IAAC	N/A	Section 6.2.1 "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" Section 6.2.2 "Using the methods outlined above it was found that the LSA boundary should extend to 2.8 km from the limits of the PDA. We have rounded the LSA to 3 km on either side of centreline to capture the 100 m PDA."	Study Plan Spatial Boundaries	As required in Section 7 of the Guidelines, demonstrate how a Local Study Area of approximately three kilometres from the centerline would be appropriate to assess effects on peatlands. As required in Section 7 of the Guidelines, provide details to demonstrate that the Regional Study Area (2) encompasses the anticipated boundaries of the Project's effects, including all potentially impacted local communities, municipalities and all Indigenous groups listed in the Indigenous Engagement and Partnership Plan. Note that the Regional Study Area must encompass the spatial boundary of cumulative effects. As required in Section 7.4.1 of the Guidelines, provide information regarding how the following were/will be taken into account in defining the spatial boundaries: community knowledge and Indigenous knowledge; current and traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights, including cultural and spiritual practices; physical, ecological, technical, social, health, economic and cultural considerations; and the size, nature and location of past, present and reasonably foreseeable future projects and activities. Provide the above information in a way that allows those who provided the knowledge to the proponent and the Agency to see their input reflected in the Impact Statement. It is not sufficient to state that "input from participants will be/was taken into account". 2. For a definition of the Regional Study Area please see: https://iaac-aeic.gc.ca/default.asp?lang=En&n=43952694-1&toc=show&offset=11		The text included in the Column B Section 6.2.2 is not from the Peatlands Study Plan. Section 6.2.2 of the Peatlands Study Plan, specifically Table 6-1, indicates the preliminary LSA for the peatlands discipeline is a "2.5 km buffer surrounding the PDA." Table 6-1 also indicates that the LSA "may be refined following desktop analysis and input from other VCs that may indirectly affect Peatlands." *Section 6.2.2 of the Peatlands Study Plan provides initial rationale for the selection of the RSA. As noted in Section 6.2.1 of the Peatlands Study Plan, "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."* The IS/EA will include detail about who from the public or Indigenous groups has provided input related to peatlands, what the input was and how input received to date has informed the selection of peatlands study areas.
Final	MECP - Species at Risk Branch	1	Pg. 29 – 30 / section 7.3.3 – Peatland Function And Pg. 32 / section 8.3 – Peatland Functional Assessment	It is unclear how, specifically, species at risk presence and habitat will be used to inform the functional assessment. Section 7.3.3 indicates that habitat suitability, and wildlife observations captured as described in the Bird, Ungulates and Wildlife Study Plans will be incorporated into the functional assessment. Section 8.3 indicates that "Biodiversity, presence of sensitive species or species of cultural importance and habitat suitability" will be considered when determining a ranking of peatland function (i.e., high, moderate, low). However, no further detail is provided (e.g., which species and/or species habitat will be considered 'sensitive' and therefore included in the functional assessment). It is strongly recommended that the Peatland Functional Assessment includes consideration	It is unclear how, specifically, species at risk presence and habitat will be used to inform the functional assessment. Section 7.3.3 indicates that habitat suitability, and wildlife observations captured as described in the Bird, Ungulates and Wildlife Study Plans will be incorporated into the functional assessment. Section 8.3 indicates that "Biodiversity, presence of sensitive species or species of cultural importance and habitat suitability" will be considered when determining a ranking of peatland function (i.e., high, moderate, low). However, no further detail is provided (e.g., which species and/or species habitat will be considered 'sensitive' and therefore included in the functional assessment). It is strongly recommended that the Peatland Functional Assessment includes consideration of all species at risk which rely on wetland ecosystems in this region and associated habitat (e.g., Caribou, etc.); and the Project Team is encouraged to provide additional details on which species and species habitat will be used in the assessment and determination of function ranking. It should be noted, the presence of sensitive species and habitat suitability should consider past and present presence, and current	Update the Peatlands Study Plan to provide additional detail on the species and associated habitat that will be used in the Peatland Functional Assessment.	The IS / EA Report will provide detail on the species and associated habitat that will be used in the Peatland Function Assessment

Attachment B – Peatlands Technical Support Document

MARTEN FALLS FIRST NATION
COMMUNITY ACCESS ROAD

Attachment B: Peatlands Technical Support Document

Version #1

February 2026

Disclaimer: WSP Canada Inc.

WSP Canada Inc. 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 Canada Inc. at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP Canada Inc. 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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In preparing this report, WSP Canada Inc. has relied in good faith on information provided by others, as noted in the report. WSP Canada Inc. has reasonably assumed that the information provided is correct and WSP Canada Inc. is not responsible for the accuracy or completeness of such information.

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.

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1. Introduction and Objectives

Marten Falls First Nation is a remote First Nation community in northern Ontario, approximately 430 kilometres (km) from Thunder Bay, Ontario, located at the junction of the Albany and Ogoki rivers. The Marten Falls First Nation community is proposing a Community Access Road (the Project) that will connect the Marten Falls First Nation community to the Ontario provincial highway network (**Figure** 1-1). The Project includes construction and operation of a multi-purpose Community Access Road consisting of:

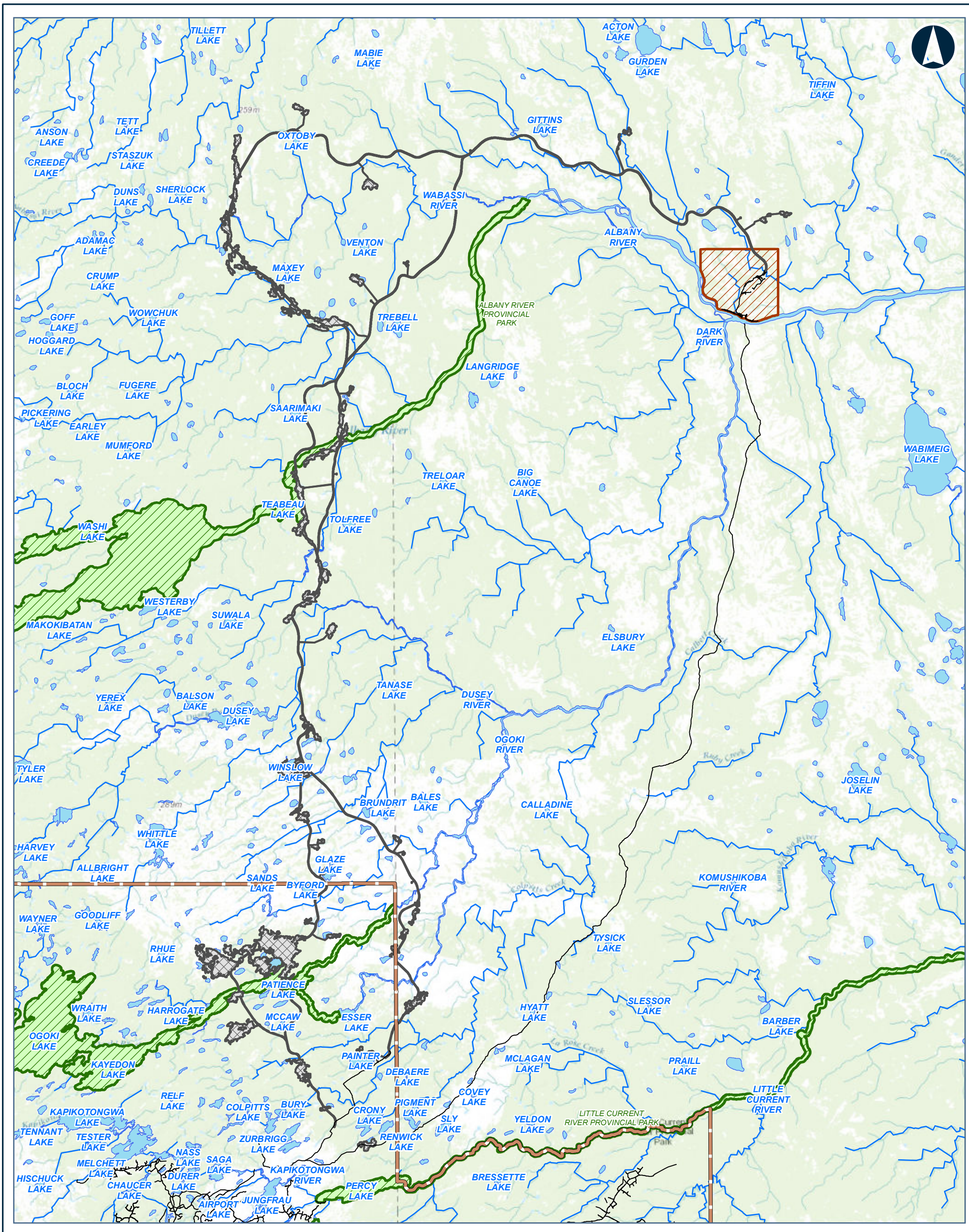
- Approximately 190 to 230 km (depending on the chosen route) of two-lane gravel all-season road on a new right-of-way;
- Approximately 100 metre (m) wide right-of-way cleared to a width of 60 m; and
- Proposed designated speed limit of 80 km per hour.

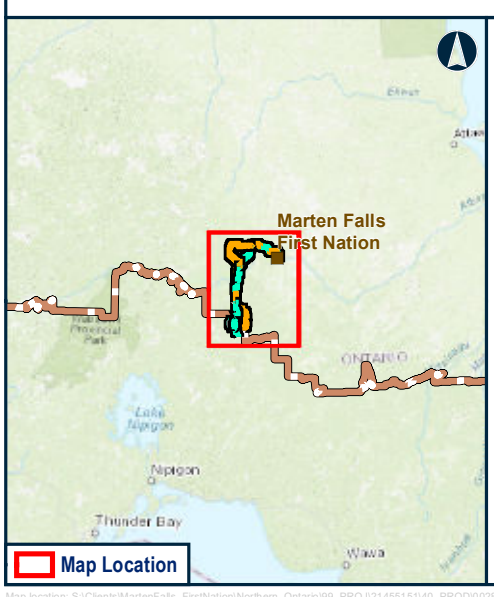
The Marten Falls First Nation community is currently accessible year-round by air transportation out of Thunder Bay and Nakina and by a winter access road constructed yearly, if conditions permit. Since the 1990s, Marten Falls First Nation has received provincial funding to maintain 140 km of winter road to the community. However, the North[1] is noted as vulnerable to the effects of climate change in *Building Better Lives: Ontario's Long-term Infrastructure Plan* (MOI, 2018). Therefore, interests and concerns of the Marten Falls First Nation community have identified a desire for all-season community access to the provincial highway network in the south, near Painter Lake.

Marten Falls First Nation has retained a Consultant Project Team consisting of AECOM Canada Ltd., Dillon Consulting, WSP Canada Inc., KGS Group Consulting Engineers, KBM Resources Group, GreenForest Management Inc., and CE Strategies to provide Environmental Assessment and preliminary design services for the Project. As part of these services, WSP Canada Inc. is undertaking studies to characterize the existing peatlands environment.

This report has been prepared to further describe the methods and results of the desktop review and field investigations that were undertaken to characterize peatlands within the study areas. Data are presented to the ecosite level in this technical support document. However, for the *Peatland Existing Conditions and Effects Assessment Report,* the ecosite information has been rolled up into eight peatland groupings to inform the peatland Valued Components Effects Assessment. The information presented here is discussed in the context of the peatlands Valued Components in the *Peatland Existing Conditions and Effects Assessment Report* as part of the *Impact Statement / Environmental Assessment Report.*

[1] Northern Ontario is a geographic and administrative region of Ontario referred to as "the North."





Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA - 100M

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

PROJECT LOCATION

0 5 10 20
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Jan, 2026	1:450,000 * when printed 11"x17"
Rev:0	

Figure 1-1

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\0028_Peatland_TSD_Reporting\21455151-0028-RT-0001-1.mxd
Date Saved: 1/27/2026 3:16:56 PM User Name: gld_rduval

2. Methods

This section describes the methods used to complete the desktop peatlands mapping, and field surveys in detail. Refer to **Section 4** of the *Peatland Existing Conditions and Effects Assessment Report* for a summary of the Study Methods and Assessment Scope.

2.1 Peatlands Mapping

Final mapping of peatland distribution and classification was based on an iterative mapping process to update and refine mapping with the most recent and accurate desktop resources (e.g., light detection and ranging), and field survey data, where available. This section provides the details of the peatlands distribution and classification mapping process.

Two primary mapping sources were used to determine the distribution and classification of peatlands within the Construction Disturbance Area and Local Study Area: soils and terrain, and vegetation. Each mapping source underwent separate updating and refinement processes before being combined into the peatlands layer. Details on analysis and iterative refinement of soils and terrain, and vegetation mapping can be found in the technical support documents for those disciplines. It should be noted that higher resolution light detection and ranging data were used to refine the soils and terrain mapping in the Construction Disturbance Area and lands in proximity compared to the lower resolution light detection and ranging imagery that was initially used for the entirety of the Local Study Area.

To create the preliminary peatlands mapping layer in the Construction Disturbance Area and Local Study Area, the vegetation layer was overlaid on the soils and terrain layer. The vegetation ecosites were separated into “upland” and “wetland” ecosites, where wetlands included all “permanently flooded or hydric” ecosites. This category includes all types of:

- Bog;
- Fen;
- Swamp; and
- Marsh.

The wetland ecosites were then separated into mineral and organic ecosites. Ecosite classification can be further refined by including more detailed classification information including moisture regime, vegetation cover class, and soil chemistry; however, for the purpose of the peatland’s classification, only the ecosite level was considered.

A concordance exercise was then undertaken to identify any discrepancies between the soils and terrain layer and the vegetation layer. Polygons identified as *both* organic surficial material *and* as an organic wetland ecosite, were automatically classified as peatlands in the new peatlands mapping layer (i.e., peatland = YES). Where there was discrepancy between the soils and terrain organic layer and the vegetation layer (i.e., the ecosite was not an organic wetland ecosite), the polygon was labelled as peatland = UNKNOWN. Likewise, where the vegetation layer was identified as an organic wetland ecosite but not organic soils in the soils and terrain layer, the polygon was labelled as peatland = UNKNOWN.

For the UNKNOWN polygons, a set of rules were developed to determine which layer should override the other. Note that some soils and terrain polygon boundaries were modified by WSP Canada Inc. during the soils and terrain mapping refinement process, therefore some portions of the soils and terrain polygons may show discrepancies between the boundaries of the vegetation layer. No vegetation polygon boundaries have been modified. The peatlands mapping rules that were developed to address discrepancies between the two mapping layers are outlined below:

- If either the soils and terrain or vegetation mapping layer had been confirmed or updated based on field data, that layer was taken as correct. Field data could include soils and terrain visual or ground survey sites, vegetation visual or ground survey sites, boreholes from previous studies (KGS Group Consulting Engineers, Golder Associates Ltd.), or information from boreholes / monitoring wells from current hydrogeological drilling sites (WSP Canada Inc.). For example:
  - If the vegetation layer identified a polygon as a mineral ecosite but the soils and terrain layer was identified as organic and found to be correct through field surveys, the soils and terrain layer overrode the vegetation layer, and the polygon was classified as peatland.
  - If the vegetation layer had a visual or ground survey site that assigned an organic wetland ecosite to the polygon, but the soils and terrain mapping indicated mineral surficial material, the field verification of the vegetation layer overrode the soils and terrain layer, and the polygon was classified as peatland.
  - Where conflicting survey information existed in a polygon between a vegetation ground survey and soils and terrain survey site, or a visual vegetation survey site and a soils and terrain survey site, the soils and terrain survey results were applied.
- For polygons identified as an organic wetland ecosite (i.e., bog, fen, swamp, or marsh), but *not* as organic surficial material in the soils and terrain layer and *without field data*, the following rules applied:
  - For wetlands classified as bog or fen, the vegetation layer overrode the mineral surficial material from the soils and terrain layer and the polygon was classified as peatland. This is because wetlands classified as bog or fen are defined based on

organic layers of >40 centimetres (cm) of peat (National Wetlands Working Group, 1997). Therefore, these community types would be expected to be situated within areas of organic surficial material. Furthermore, in the soils and terrain mapping refinement exercise, surficial material was predominantly corrected *to* organic (i.e., soils were more likely to be erroneously classified as mineral than as organic).

- Wetlands classified as swamp or marsh have the potential to be either peatlands or mineral wetland ecosites that lack any peat accumulation (National Wetlands Working Group, 1997). As such, where there was a discrepancy between the soils and terrain layer and the vegetation layer, the soils and terrain layer organic or mineral classification overrode the vegetation layer. Swamp or marsh ecosites that overlapped with organic substrates were included in the peatlands layer (i.e., mineral swamp ecosites were not included as potential peatlands). If a vegetation polygon lacking field data was identified as an organic swamp or organic marsh ecosite but did *not* overlap organic surficial material from the soils and terrain mapping, the soils and terrain mapping was taken as correct, and the vegetation community was switched to its mineral counterpart and removed from the peatlands mapping. Light detection and ranging data utilized by WSP Canada Inc. for refinements to the soils and terrain mapping, including the highly refined light detection and ranging data available within the Construction Disturbance Area and in proximity, made it possible to identify sections of the Local Study Area that had little to no slope where peat accumulation would be likely. The original vegetation mapping developed by KBM Resources Group (2021) relied on older aerial imagery and did not include a review of light detection and ranging data.

- For polygons within the vegetation layer that overlap *both* organic and mineral surficial material due to polygon boundary modifications in the soils and terrain layer, polygons were classified as peatland if the organic surficial material occupied >50% of the vegetation polygon.

In addition to the above set of rules, where polygons were changed from non-peatland to peatland or peatland to non-peatland, the associated ecosite in the vegetation layer was updated. These polygons were evaluated to determine the organic or mineral ecosite equivalents (i.e., the ecosite with the most similar characteristics) based on guidance in the *Ecosites of Ontario* (operational draft) (Banton et al., 2009) and updated in the vegetation and peatlands layer. For example, a Mineral Poor Conifer Swamp (B222) would be classified as an Organic Poor Conifer Swamp (B127) if the substrate changed from mineral to organic. In some instances, an appropriate ecosite could not be determined based on the absence of field data (e.g., when an upland forest community was changed to an organic swamp and it could not be determined if it should be considered a poor, moderate or rich organic swamp through the available imagery and information). In cases such as this, a higher-level vegetation classification was provided (i.e., conifer swamp) and ecosite code of Unknown was applied.

In certain scenarios, updates to the peatlands layer based on the steps listed above were automated by the geographic information system technician following input from an ecologist. Polygons were automatically updated if they fell within the following parameters:

- Polygons were automatically classified as *non-peatlands* where:
  - The soils and terrain layer was mineral and the vegetation layer was classified as a mineral wetland ecosite. In this case, although the vegetation ecosite was a wetland, there was concordance between the two layers in terms of substrates (i.e., both are mineral substrates).
  - The soils and terrain layer was mineral, the vegetation layer was an organic swamp, no vegetation visual or ground survey site was present within the polygon, and no outstanding comments were present in the soils and terrain mapping. In this case there was a discrepancy between the two layers, but without field data, the soils and terrain layer overrode the vegetation layer.
  - The soils and terrain layer was mineral, the vegetation layer was an organic swamp, a terrain field site or borehole was situated within the polygon, and no outstanding comments were present in the soils and terrain mapping. In this case there was a discrepancy between the two layers, but the soils and terrain layer supported by a terrain field site or borehole site overrode the vegetation layer.
- Polygons were automatically classified as *peatlands* where:
  - The soils and terrain layer was mineral, the vegetation layer was classified as a fen or a bog, no vegetation visual or ground survey site was present within the polygon, no terrain site or borehole site was situated within the polygon, and no outstanding comments were present in the soils and terrain mapping. In this case there was a discrepancy between the two layers, but in this case the vegetation layer overrode the soils and terrain layer.
  - The soils and terrain layer was organic, the vegetation layer was classified as an upland coniferous forest or deciduous forest community, no vegetation visual or ground survey site was present within the polygon, no terrain site or borehole site was situated within the polygon, and no outstanding comments were present in the soils and terrain mapping. In this case there was a discrepancy between the two layers, but the soils and terrain layer overrode the vegetation layer.

Wetland communities within the Regional Study Area were identified using a combination of the delineated peatland communities completed for the Project within the Local Study Area and the *Ontario Land Cover Compilation Version 2.0* (Government of Ontario, 2020) mapping for areas beyond the limits of the Local Study Area. The Ontario Land Cover Compilation layer is a compilation of *Far North Land Cover version 1.4*, *Southern Ontario Land Resource Information System version 1.2*, and *Provincial Land Cover 2000 Edition*.

2.2 Field Investigations Methodology

2.2.1 2019 Field Methodology

Preliminary field studies were conducted in 2019 prior to the finalization of the *Peatlands Study Plan* (AECOM, 2021a). These surveys consisted of high-level rapid plant community assessments in conjunction with wildlife survey locations (refer to the *Wildlife Study Plan* [AECOM, 2021b] and the *Bird Study Plan* [AECOM, 2021c]). Stations were selected to provide broad coverage of the vegetation (and peatland) Local Study Area (which at the time was considered to be 2.5 km buffer around the centreline of the Community Access Road route alternatives), as well as to include a diversity of vegetation communities including peatland / wetlands.

Vegetation surveys in 2019 were conducted within the Ogoki River Provincial Park as well as the Albany River Provincial Park following previous Ministry of Natural Resources and Forestry recommendations on the Project (MNRF, 2017). A Research Authorization to conduct surveys within provincial parks was obtained from the Ministry of the Environment, Conservation and Parks for this study.

Vegetation surveys included documentation of dominant plant species and a high-level assessment of plant community type. Information on invasive or rare species was also noted. Field notes, incidental wildlife observations, and representative photographs were documented and used to provide an overall characterization of the vegetation communities, including peatlands.

The 2019 field program informed the development of the *Peatland Study Plan* (AECOM, 2021). At the time of the 2019 field work, the Local Study Area was smaller (i.e., 2.5 km buffer) than the final Local Study Area (i.e., 3 km buffer). The subsequent field programs and assessment therefore supersede this analysis.

2.2.2 2021-2023 Field Methodology

Field investigations to inform the peatland characterisation were completed as part of the vegetation field program, supplemented with data collected as part of the soils and terrain field program. The investigations in 2021 through 2023 were completed to assess a subset of the pre-typed[2] ecosites and to collect soil and botanical data. Field surveys were conducted during the appropriate season (i.e., leaf-on season which typically occurs from June through September). Field sites were located within the Construction Disturbance

[2] **Pre-typed ecosites** refer to the ecosites assigned by KBM Resources Group (2021) to each of the desktop-delineated polygons.

Area and the Local Study Area. No field investigations were completed within the Regional Study Area.

2.2.2.1 Site Selection

Field verification survey plot site selection considered both access (i.e., proximity to existing helipad locations) and the objective to survey all peatland ecosite types present within the Local Study Area, based on the pre-typed ecosite mapping. Peatland site selection was made in tandem with the selection of vegetation survey sites. The following sections describe the process for selecting sites for the vegetation field surveys, ensuring coverage in both the Construction Disturbance Area and the Local Study Area.

The field study design for the Local Study Area generally followed the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (Ecosystems Working Group, 1998). Although these guidelines originate in British Columbia, a similar guideline to provide consistency across projects has not been developed for Ontario and therefore is considered to be an acceptable approach. Establishing the field survey intensity varies depending on the purpose of the surveys, size of the Study Area, project objectives, and funding; the British Columbia standards describe six survey intensity levels (Ecosystems Working Group, 1998). Based on the size of the peatland and vegetation Local Study Area (197,960 hectares [ha]), the survey intensity for the Project falls within the “reconnaissance level” intensity range with the percentage of polygon inspections falling between 0% and 4%, and a ground inspection to visual check ratio of 25:75 (Ecosystems Working Group, 1998).

Although every effort was made to adhere to this sampling intensity, the Project is located in a remote part of Canada with limited access. Access to vast portions of the Local Study Area was only available by air, therefore survey locations were limited to within 1 km of where a helicopter was capable of landing (e.g., cut helicopter landing pads, open grassy riparian areas). Considering that not all randomly selected points were accessible, a number of oversample sites were also selected. The intent was to provide the best chance of obtaining a robust sample size but also with the objective of visiting a sub-set of each pre-typed peatland ecosite.

As outlined in the *Vegetation Study Plan* (AECOM, 2021d), vegetation field surveys were selected to be most intensive within the Construction Disturbance Area (approximately 60% of the survey locations), with a reduced level of effort within the Local Study Area (approximately 40% of the survey locations). No field surveys were completed within the Regional Study Area.

Field sites were also divided between upland, wetland, and riparian ecosystems. While all ecosites were mapped as either a wetland or upland ecosite, those that were within 30 m of a watercourse were also identified as riparian ecosystems. Riparian communities were identified by buffering all watercourses and waterbodies by 30 m.

2.2.2.2 Vegetation / Peatland Field Surveys

Two types of field surveys were conducted as part of the vegetation / peatland field program: ground inspections and visual checks. Each survey type is described in more detail below.

- **Ground Inspections**–Ground inspections consisted of a point sample at a representative location within a desktop delineated and classified vegetation community polygon. The purpose of ground inspections was to confirm or correct the desktop ecosite classification and to collect data to inform the peatland functional assessments. Ground inspection methodologies for wetland ecosystems are described in more detail below; and
- **Visual Checks**–Visual checks consisted of an assessment from helicopter as well as assessments of representative photographs taken during other field programs (e.g., bird surveys). Visual checks were also completed on the ground, where possible (e.g., while walking from one ground plot to another). The purpose of visual checks was to assess whether the desktop ecosite mapping was accurate or needed to be revised to the proper classification.

Where visual checks were completed by helicopter, the data collected consisted of (where possible): location (Universal Transverse Mercator coordinates), photos, dominant species (those that could be identified from air), estimate of community relative age (i.e., mature, semi-mature, immature, or recent burn), and stand composition.

Where visual checks were completed by photo interpretation, surveyors photographically documented the vegetation community with 13 photos. At each cardinal direction: one photo at shoulder height with arm and camera extended parallel to ground, one photo with arm at 45 degrees (from body position) pointing down, and one photo with arm extended at 135 degrees (from body position) pointing up, and one photo with arm extended straight up (i.e., vertically). The photos were interpreted (where possible) to confirm the pre-typed vegetation community, estimate of community age and stand composition, and estimate of soil moisture regime.

Peatland Composition

Peatland composition was assessed through the field studies completed for the *Vegetation Study Plan* (AECOM, 2021) and the *Soils and Terrain Study Plan* (AECOM, 2021e). The ground survey sites included a sample of each peatland ecosite type, as outlined in the Site Selection section (**Section 2.2.2.12.2.2.1**).

The data collection protocol for peatland communities was developed in accordance with the *Ontario Peatland Inventory: Field Work Methods* (Riley and Michaud, 1994), the *Ontario Wetland Evaluation System Northern Manual* (MNRF, 2014), as well as the

Canadian Wetlands Classification System (National Wetlands Working Group, 1997). The following data were collected at each ground investigation site:

- Universal Transverse Mercator Coordinates;
- Representative photographs;
- Classification according to the *Ecosites of Ontario* (Banton et al., 2009);
- **Sphagnum spp. Identification**–Sphagnum mosses were identified to species level by qualified field staff who had knowledge and experience or had been trained to identify Sphagnum to species. Where required, field samples were collected and submitted to a taxonomic expert for identification;
- **Surface Wetness**–This is a general characterization and relative estimate of wetness of the top 20 cm of peat. This was categorized into the following:
  - 1 – Dry.
  - 2 – Moist.
  - 3 – Wet (i.e., water table at 10 to 25 cm below the surface).
  - 4 – Very Wet.
  - 5 – Water above Surface.
- **Hummock-hollow topography and average depth to water**–Microtopographic variability of hummocks consisting of Sphagnum spp. and hollows (pools of wetter graminoid or forb vegetation) were recorded as a cover percentage within the 5 m radius of the sample point. The general height of the hummock was recorded;
- **Peat decomposition depth and stratification**–Peat type and decomposition using the von Post scale (Ekono, 1981) as well as noting capillary characteristics, noting that peat will be sampled in the field to a depth of 2 m;
- **Basal sediment**–Where encountered, identification of basal sediment (rock, gravel, sand, silt, clay, till) will be made from a relatively small amount of sample taken from the bottom of the soil auger / peat probe;
- **Canopy height**–The height of the canopy will be estimated;
- **Vascular plant density / cover percentages**–The cover percentages of different structural strata of vegetation (e.g., tree cover, tall shrub, low shrub, graminoid and herbaceous, and moss and lichen species) will be obtained within 5 m of the plot radius; and
- **Geomorphology and Hydrology**–Several considerations were documented including: geomorphology of the peatland (e.g., depressional, riverine, lake fringe, extensive peatland); presence of surface water, flow patterns, connectivity, inputs, outputs, water depth, and evidence of groundwater influence; and existing hydrology alterations (e.g., ditching, beaver activity) will be documented.

Additional Studies

Applicable results of the *Surface Water, Groundwater and Geochemistry, Soils and Terrain, Atmospheric*, and *Carbon Flux Existing Conditions and Effects Assessment* reports will be incorporated into the *Peatlands Existing Conditions and Effects Assessment* reporting.

2.3 Data Management and Analysis Approach

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

2.3.1 Field Investigations

To maintain consistency and for quality assurance / quality control of the data collected, standardized datasheets paired with mapping software was used in the field. Field studies followed technical protocols that outlined specific work instructions that were developed for the Project. Completeness and accuracy of field data were verified daily during field verification, and field photos and coordinate information were backed up daily. Field datasheets were scanned and filed digitally in the appropriate Project folder.

2.3.2 Data Management

Field data were manually entered into excel spreadsheets for future collation and analysis. When the data analysis and reporting was undertaken, any data anomalies were cross-checked back with the field datasheets and / or field mapping to correct the anomaly. Pre-typed ecosites that were determined to be a different ecosite during the field verification process were updated in the digital mapping.

3. Results

3.1 Peatland Field Investigation Distribution and Coverage

Peatland field investigations were carried out in tandem with the vegetation field investigations in the Local Study Area and Construction Disturbance Area in four separate field programs from 2021 through 2023, as outlined in **Table 3-1** and Error! Reference source not found. These tables provide the level of effort for peatland ecosite verification at wetland and riparian ground inspection sites, visual checks completed during aerial (helicopter) surveys, and visual checks completed through photo interpretation from site photos taken during wildlife surveys. Detailed survey results are included in **Annex A – Results of Ground Surveys – Wetland and Riparian Survey Sites** and **Annex B – Results of Visual Survey Sites (Aerial)**. Peatland survey sites were as follows:

- Of the 52 wetland and 20 riparian ground inspection sites completed, 60 were completed in peatland communities (**Annex A**). An additional 12 ground inspection sites were completed in upland environments;
- Of the 315 visual checks (aerial surveys) completed, 196 visual checks were completed in peatland communities (**Annex B**); and
- Of the 75 sites where photo interpretation from site photos was completed, 38 communities were identified as peatland communities.

Table 3-1: Peatland Field Investigations – Ground Inspections

Year	Field Dates	Wetland	Riparian	Total
2021	September 19, 21-29 (10 days)	7	4	**11**
2022	July 13-18 and 22 (7 days)	12	9	**21**
2023	June 15, 17 and 18 (3 days)	10	0	**10**
2023	August 3-5 (3 days)	18	0	**18**
	Total	**47**	**13**	**60**

Table 3-2: Peatland Field Investigations – Visual Checks (Aerial)

Year	Field Dates	Total
2021	September 19, 21-29 (10 days)	**56**
2022	July 13-18 and 22 (7 days)	**57**
2023	June 15, 17 and 18 (3 days)	**55**
2023	August 3-5 (3 days)	**28**
	Total	**196**

Of the 84 ground inspections (72 wetland and riparian sites and 12 upland sites), 390 visual checks completed and 75 photo interpretation sites, 294 sites were identified as peatland communities. Therefore, peatlands communities were identified at 62% of the total survey sites.

Of the 474 visual (aerial), photo interpretation, and ground inspection sites combined, 325 sites (69%) were found to be consistent with the desktop vegetation mapping initially established by KBM Resources Group (2021). A total of 18 (4%) of the remaining sites changed from upland to wetland, five sites (1%) changed from wetland to upland, 14 sites (3%) changed from peatland to non-peatland sites, and 26 sites (5%) changed from non-peatland to peatland sites. Peatland field sites are mapped on **Figure 3-2**. Peatland communities are further described in **Section 3.3.1**.

3.2 Desktop Peatland Community Mapping

The desktop vegetation community mapping prepared by KBM Resources Group (2021), in association with the WSP Canada Inc. soils and terrain specialists produced a digital peatlands map for Project use. The full Local Study Area was delineated to ecosite level, with a total of 9,844 polygons delineated and classified to an initial peatlands ecosite (see **Section 3.3.1** for a list of peatland ecosites). Upon completion of the full peatlands mapping exercise outlined in **Section 2.1**, and the incorporation of the field results, the refined vegetation mapping included a total of 8,707 peatland ecosite polygons. During the refinement process 324 (3%) upland vegetation communities and 351(4%) mineral wetland communities were updated to peatland vegetation communities. Five polygons were updated from peatland to upland vegetation communities, and 1,810 polygons (18%) were updated to mineral wetland vegetation communities from an initial organic (peatland) classification. A detailed summary of the refinements to the peatlands layer is provided in **Table 3-3.**

A limited number of instances were recorded where conflicting field information between the soils and terrain survey results and vegetation survey results meant that the results of a ground or visual vegetation survey site did not always align with the final classification for that vegetation polygon in the peatland mapping. This occurred for a total of eight visual vegetation sites. The results of the visual vegetation sites where switched from organic to mineral community types three times, and from mineral to organic community types five times, based on the contradicting soils and terrain field results (borehole investigations). Similarly, the results of one ground vegetation survey site was switched from an organic community type to a mineral community type based on the soils and terrain survey results in the same polygon and the ruleset outlined in **Section 2.1.**

Table 3-3: Summary of Refinements to Peatland Mapping

Refinement to Vegetation Communities	Transition To:	Rule Applied	Total Polygons Updated	Area (ha)
Upland to Organic Wetland Site	Organic Swamp	Community 100% organic (soils and terrain mapping)	248	3,680.8
		Community >50% organic (soils and terrain mapping)	29	1,080.2
		Terrain ground site	40	551.4
		Vegetation ground site	2	45.6
		Vegetation visual site	7	337
		Total	**326**	**5,695**
Mineral Wetland to Organic Wetland	Marsh	Community 100% organic (soils and terrain mapping)	334	2,043.9
		Community >50% organic (soils and terrain mapping)	0	0
		Terrain ground site	2	12.3
		Vegetation ground site	1	41.4
		Vegetation visual site	0	0
		Total	**337**	**2,097.6**
	Swamp	Community 100% organic (soils and terrain mapping)	5	47.5
		Community >50% organic (soils and terrain mapping)	0	0
		Terrain ground site	1	18.6
		Vegetation ground site	0	0
		Vegetation visual site	2	16.7
		Total	**8**	**82.8**
	Fen	Community 100% organic (soils and terrain mapping)	0	0
		Community >50% organic (soils and terrain mapping)	0	0
		Terrain ground site	0	0
		Vegetation ground site	3	63.5
		Vegetation visual site	3	37.7
		Total	**6**	**101.2**
	Total		**351**	**2,281.6**

Refinement to Vegetation Communities	Transition To:	Rule Applied	Total Polygons Updated	Area (ha)
Organic Wetland to Mineral Wetland or Upland	Swamp	Community 100% mineral (soils and terrain mapping)	1,738	17,568.4
		Community >50% mineral (soils and terrain mapping)	50	1,554.9
		Terrain ground site	16	256.5
		Vegetation ground site	1	0.4
		Vegetation visual site	1	6.7
		Total	**1,806**	**19,386.9**
	Marsh	Community 100% mineral (soils and terrain mapping)	0	0
		Community >50% mineral (soils and terrain mapping)	0	0
		Terrain ground site	2	3.4
		Vegetation ground site	1	5.2
		Vegetation visual site	1	2.3
		Total	**4**	**10.9**
	Coniferous Forest	Community 100% mineral (soils and terrain mapping)	1	4.8
		Community >50% mineral (soils and terrain mapping)	0	0
		Terrain ground site	0	0
		Vegetation ground site	0	0
		Vegetation visual site	4	165.3
		Total	**5**	**170.1**
	Total		**605**	**19,567.9**

> = greater than; % = percent; ha = hectare.

WINDSOR LAKE
NORTH CHANNEL
OTOSKWIN-ATTAWAPISKAT RIVER PROVINCIAL PARK
ATTAWAPISKAT RIVER
STREATFEILD LAKE
BETEAU LAKE
SEBERT LAKE
STARK LAKE
TIFFIN LAKE
GIFFORD LAKE
CALAMITY LAKE
TIDY LAKE
ALBANY RIVER
MCINTYRE LAKE
EABAMET LAKE
ALBANY RIVER PROVINCIAL PARK
WABIMEIG LAKE
TEABEAU LAKE
WASHI LAKE
MAKOKIBATAN LAKE
DUSEY LAKE
OGOKI RIVER
WHITEFISH LAKE
JOSELIN LAKE
WHITTLE LAKE
HARVEY LAKE
LITTLE CURRENT RIVER
OGOKI LAKE
KAYEDON LAKE
RECKETT LAKE
BURY LAKE
CRONY LAKE
KAPIKOTONGWA LAKE
TENNANT LAKE
LITTLE CURRENT RIVER PROVINCIAL PARK
MELCHETT LAKE
PERCY LAKE
STEWART LAKE
JUNGFRAU LAKE
STONE LAKE
ARA LAKE
META LAKE
ABAMASAGI LAKE
SUPERB LAKE
O'SULLIVAN LAKE
MARSHALL LAKE

Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

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

Peatland Local and Regional Study Area

0 5 10 20
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Jan 2026	1:600,000 * when printed 11"x17"
Rev:0	

Figure 3-1

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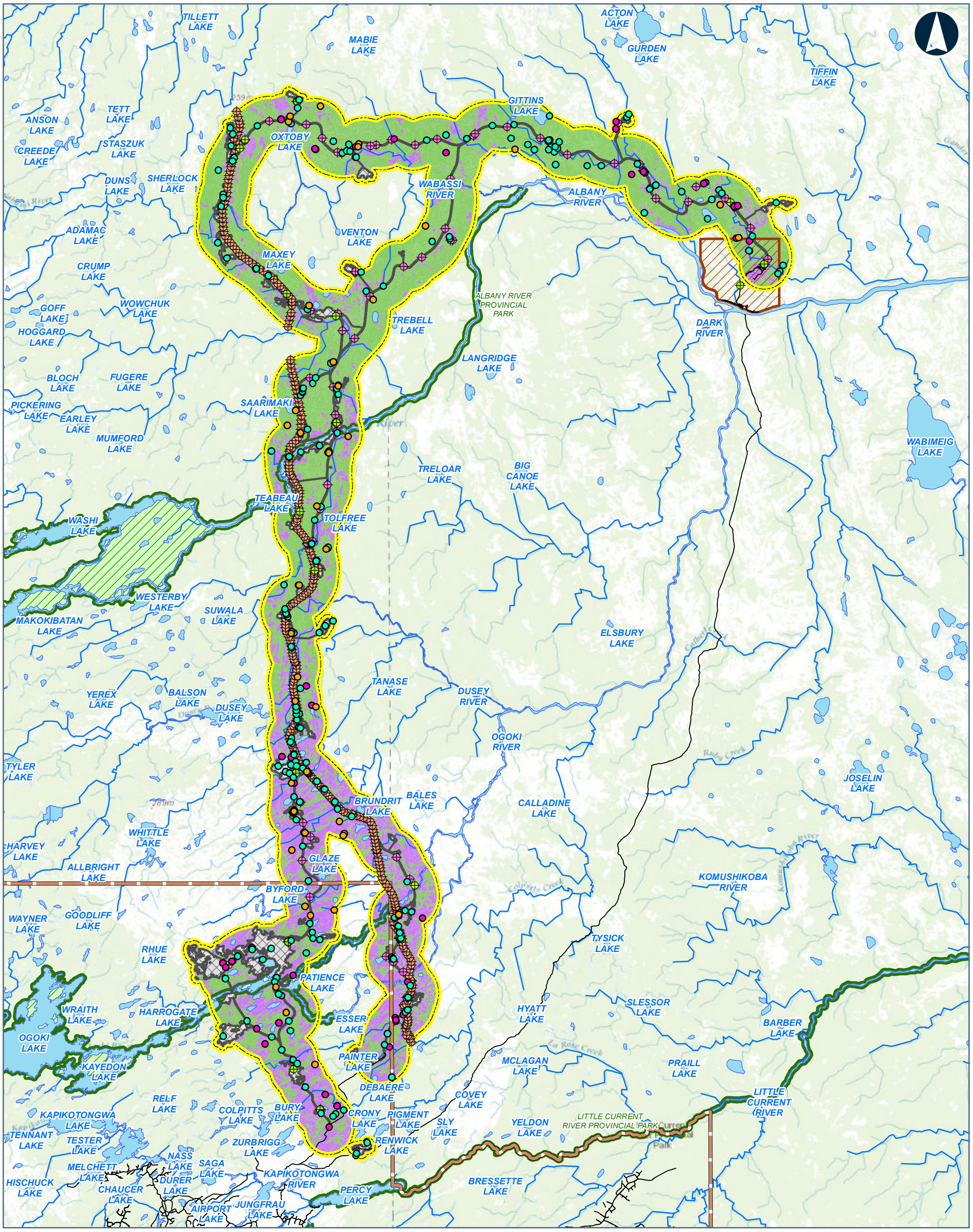
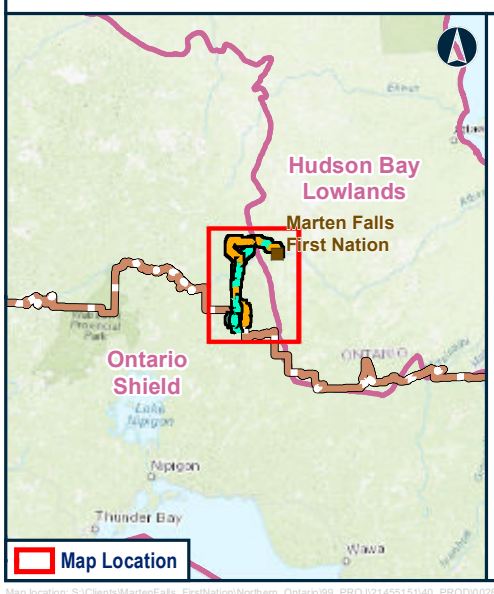
Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0028_Peatland_TSD_Reporting\21455151-0028-RT-0003-1.mxd
Date Saved: 1/27/2026 3:14:53 PM User Name: gld_rduval





Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA - 100M
- LOCAL STUDY AREA (3 KM)
- GROUND INSPECTION SITE
- VISUAL INSPECTION SITE
- PHOTO INTERPRETATION SITE
- WETLAND - PEATLAND
- WETLAND - NON-PEATLAND, UPLAND, WATER
- BOREHOLE LOCATION (WSP 2023)
- BOREHOLE LOCATION (KGS 2019)
- BOREHOLE LOCATION (GOLDER 2010)

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

Peatland Field Sites 2021-2023

0 5 10 20
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

Jan, 2026	1:450,000 * when printed 11"x17"
Rev:0	

Figure 3-2

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Date Saved: 1/27/2026 3:16:17 PM User Name: gld_rduval

3.3 Peatland Composition

It is important to understand the types of peatlands that may be affected by the Project, given that the various peatland types, or subforms, react differently to environmental and anthropogenic influences (Sims and Baldwin, 1996). Data obtained through the implementation of the *Vegetation Study Plan* (AECOM, 2021) and *Terrain and Soils Study Plan* (AECOM, 2021) were used by the Peatlands team to describe the general composition of representative peatland communities within the Construction Disturbance Area and Local Study Area.

3.3.1 Peatland Communities

Through the desktop ecosite mapping and field verification, a total of 15 peatland ecosite types were identified within the Local Study Area. These ecosites are presented in **Table 3-3** and **Figure 3-3**. Given the scale of the Project and the limitations identified in the desktop mapping exercise, for mapping and analyses purposes, ecosites have been rolled up into four wetland types in the Regional Study Area and the following eight peatland vegetation community groupings in the Local Study Area. The rolled-up peatland vegetation groupings are presented in **Figure 3-4** and **Table 3-3**:

- Sparse Treed Fen (B136Tl / B136Tt);
- Open Fens (B139N / B139S, B140N / B140S, B141N / B141S);
- Shore Fens (B146N / B146S, B147N / B147S);
- Treed Bogs (B126Tl / B126Tt, B137Tl / B137Tt);
- Open Bogs (B138N);
- Organic Conifer Swamps (B127Tl / B127Tt, B128Tl / B128Tt, B129Tl / B129Tt);
- Organic Thicket Swamps (B135S); and
- Organic Marshes (B144N, B149N).

As detailed in **Table 3-3**, the greatest proportion of the peatland ecosites within the Local Study Area are composed of fen and swamp communities, and specifically, treed fen and organic conifer swamp ecosites. The following is a summary of the peatland ecosystems within the Local Study Area:

- 62.6% of the Local Study Area is composed of peatlands;
- Fen ecosites comprise 73,917 ha or 37.4% of the Local Study Area which represents 51% of the peatland ecosystems:
    - The majority of the fen ecosites are mapped as Sparse Treed Fen (B136Tl / B136Tt), representing 34.1% of the Local Study Area.

- The second most common fen ecosites are Open Fens, including Poor Fen (B139N / B139S), Open Moderately Rich Fen (B140N / B140S), and Open Extremely Rich Fen (B141N / B141S) together representing 3.1% of the Local Study Area.
- The third most common fen ecosites are Shore Fens, including Open Shore Fen (B146N / B146S) and Shrub Shore Fen (B147S), together representing 0.2% of the Local Study Area.

- Organic Swamp ecosites comprise 45,386.6 ha or 23% of the Local Study Area which represents 31.3% of the peatland ecosystems:
  - The majority of the organic swamp ecosites are mapped as Organic Conifer Swamps, including Organic Poor Conifer Swamp (B127Tl / B127Tt), Organic Intermediate Conifer Swamp (B128Tl / B128Tt), and Organic Rich Conifer Swamp (B129Tl / B129Tt), together representing 22.7% of the Local Study Area.
  - The second most common organic swamp ecosites are mapped as Organic Thicket Swamp (B135S), representing only 0.2% of the Local Study Area.
- Organic Marsh ecosites mapped as Organic Meadow Marsh (B144N) and Organic Shallow Marsh (B149N), together represent 1.2% of the Local Study Area which represents 1.7% of the peatland ecosystems; and
- Bog ecosites comprise only 1.1% of the Local Study Area which represents 1.6% of the wetland ecosystems.
  - Treed Bog (B126Tl / B126 Tt and B137Tl / B137Tt) are the most common bog ecosites, representing 1% of the Local Study Area.
  - Open Bog (B138N) represents 0.01% of the Local Study Area.

Table 3-3 also provides an overview of the wetland types in the Regional Study Area. Differences were observed when comparing the distribution of wetland types between the Local Study Area (Project desktop analysis) and Regional Study Area (Project desktop analysis and *Ontario Land Cover Compilation Version 2.0*). The Regional Study Area was notably found to be composed of a higher percentage of bog communities with a lower coverage of fen communities. The precent cover of marsh communities in the Local Study Area was higher than the Regional Study Area and the overall percent cover of swamp communities was lower in the Local Study Area. The noted differences may be a result of serval different factors including the Project's desktop mapping exercise and those completing the analysis having a bias for one type of community classification (i.e., bog versus fen communities), bias towards the soils and terrain layer compared to the initial vegetation layer provided by KBM Resources Group (2021) as outlined in **Section 2.1**, smaller vegetation communities being combined with lager wetland polygons, differences in the natural variation in the topographic landscape between the extents of the two Study Areas, and the use of updated and higher resolution imagery allowing for refined mapping in some locations (i.e., allowing for narrow marsh communities to be identified along the

outer edges of watercourses or the presence of indicator species for certain wetland types). Additionally, the Ontario Land Cover Compilation does not separate out organic and mineral swamp and marsh communities which likely attributes to the higher percent cover of swamp communities in the Regional Study Area.

The 15 peatland ecosites mapped within the Local Study Area are described generally in the following sections, based on typical ecosite characteristics outlined in the Ecosites of Ontario (Banton et al., 2009), supplemented by field data gathered during the 2021-2023 field programs. The Ecosites discussed include all bog, fen, swamp, and marsh types with organic substrates that were identified within the Local Study Area. Additional information on ecosite characteristics and classification can be found in the *Ecosites of Ontario* manual.

Table 3-3: Peatland Ecosystems in the Local and Regional Study Areas

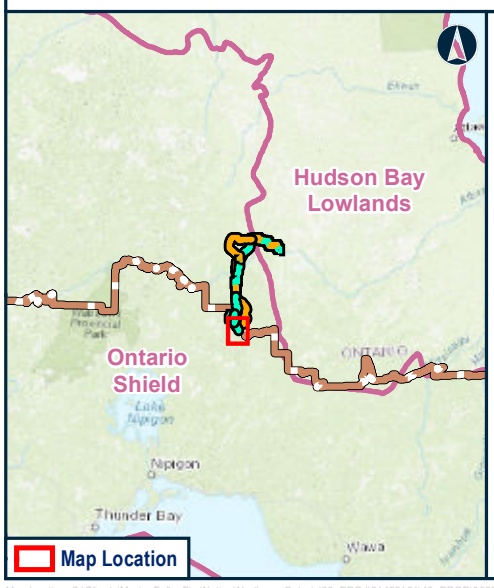
Ecosite	Ecosite Name	Area (ha)	% Local Study Area	Peatland Community	Area (ha) in the Local Study Area	% Wetlands	% Local Study Area	Wetlands	Area (ha) in the Regional Study Area	% Regional Study Area[a]
B126	Treed Bog	477.1	0.2%	Treed Bog	2,046.6	1.4%	1.0%	Bog	184,580.7	17%
B137	Sparse Treed Bog	1,569.5	0.8%							
B138	Open Bog	231	0.1%	Open Bog	231	0.2%	0.1%			
B136	Sparse Treed Fen	67,477	34.1%	Sparse Treed Fen	67,477	46.5%	34.1%	Fen	244,992.8	22%
B139	Poor Fen	315.4	0.2%	Open Fen	6,066.7	4.2%	3.1%			
B140	Open Moderately Rich Fen	2,955.5	1.5%							
B141	Open Extremely Rich Fen	2,795.8	1.4%							
B146	Open Shore Fen	342.6	0.2%	Shore Fen	373.5	0.3%	0.2%			
B147	Shrub Shore Fen	30.9	0.0%							
B144	Organic Meadow Marsh	2,287.7	1.2%	Organic Marsh	2,407.1	1.7%	1.2%	Marsh	3,927.4	<1%
B149	Organic Shallow Marsh	119.4	0.1%							
B127	Organic Poor Conifer Swamp	3,531.1	1.8%	Organic Conifer Swamp	45,022.5	31%	22.7%	Swamp	280,044.6	25%
B128	Organic Intermediate Conifer Swamp	35,446.4	17.9%							
B129	Organic Rich Conifer Swamp	895.6	0.5%							
UNK (Unknown)	Organic Conifer Swamp	5,149.4	2.6%							
B135	Organic Thicket Swamp	364.1	0.2%	Organic Thicket Swamp	364.1	0.3%	0.2%			
Peatland Community Summary		**124,026.5**	**62.6%**		**124,026.5**	**85.4%**	**62.6%**		**713,545.5**	**64%**

Notes:

(a) Wetland area values within the Regional Study Area represent a combination of area values from delineated peatland communities completed for the Project within the Local Study Area, and *Ontario Land Cover Compilation Version 2.0* (Government of Ontario, 2020) mapping for areas beyond the limits of the Local Study Area. The *Ontario Land Cover Compilation* layer is a is a compilation of *Far North Land Cover version 1.4*, *Southern Ontario Land Resource Information System version 1.2*, and *Provincial Land Cover 2000 Edition*. The Ontario Land Cover mapping does not differentiate between organic and mineral wetland communities.

ha = hectare; % = percent; < = less than.

HARROGATE LAKE
MCCAW LAKE
OGOKI RIVER
ESSER LAKE
PAINTER LAKE
DEBAERE LAKE
ORVISS LAKE
COLPITTS LAKE
BURY LAKE
ZURBRIGG LAKE
BURNABY LAKE
CRONY LAKE
RENWICK LAKE
PIGMENT LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
JUNGFRAU LAKE
PERCY LAKE
LITTLE CURRENT RIVER
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE



Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B137 - SPARSE TREED BOG
- B136 - SPARSE TREED FEN
- B139 - POOR FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B146 - OPEN SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B129 - ORGANIC RICH CONIFER SWAMP
- B135 - ORGANIC THICKET SWAMP

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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

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

Jan 2026	1:100,000 * when printed 11"x17"
Rev:0	

Figure 3-3.1

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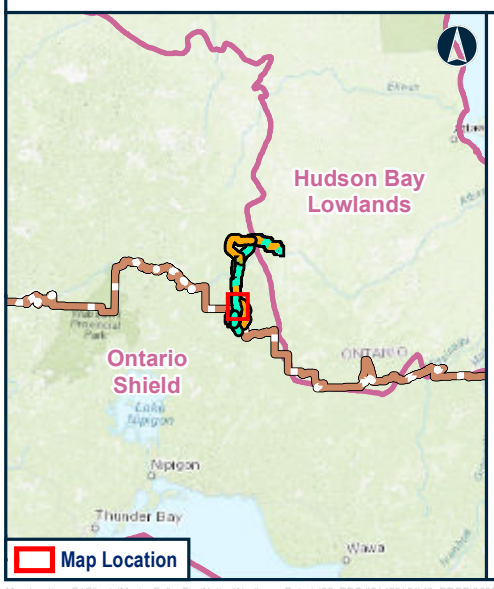
Date Saved: 1/27/2026 3:18:01 PM User Name: gld_rduval

DUSEY LAKE
WINSLOW LAKE
BALES LAKE
BRUNDRIT LAKE
GLAZE LAKE
SANDS LAKE
BYFORD LAKE
PATIENCE LAKE
OGOKI RIVER



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B137 - SPARSE TREED BOG
- B138 - OPEN BOG
- B136 - SPARSE TREED FEN
- B139 - POOR FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B146 - OPEN SHORE FEN
- B147 - SHRUB SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B149 - ORGANIC SHALLOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B129 - ORGANIC RICH CONIFER SWAMP
- B135 - ORGANIC THICKET SWAMP

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Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-3.2

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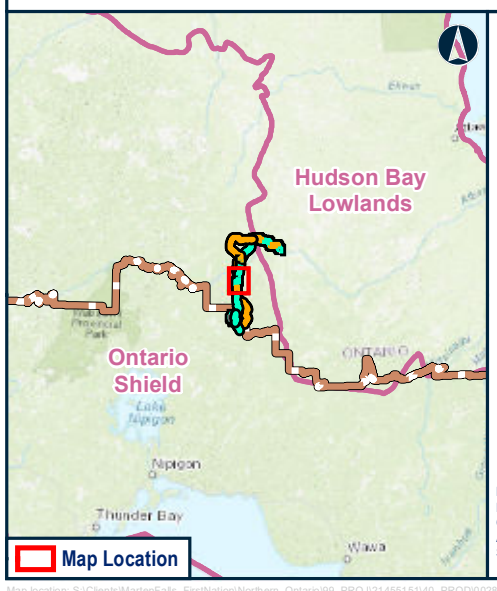
Date Saved: 1/27/2026 3:18:01 PM User Name: gld_rduval

TEABEAU LAKE
TOLFREE LAKE
ALBANY RIVER
SUWALA LAKE
DUSEY RIVER
TANASE LAKE
DUSEY LAKE



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B137 - SPARSE TREED BOG
- B136 - SPARSE TREED FEN
- B139 - POOR FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B147 - SHRUB SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B129 - ORGANIC RICH CONIFER SWAMP
- B135 - ORGANIC THICKET SWAMP

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-3.3

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Date Saved: 1/27/2026 3:18:01 PM User Name: gld_rduval

WABASSI RIVER

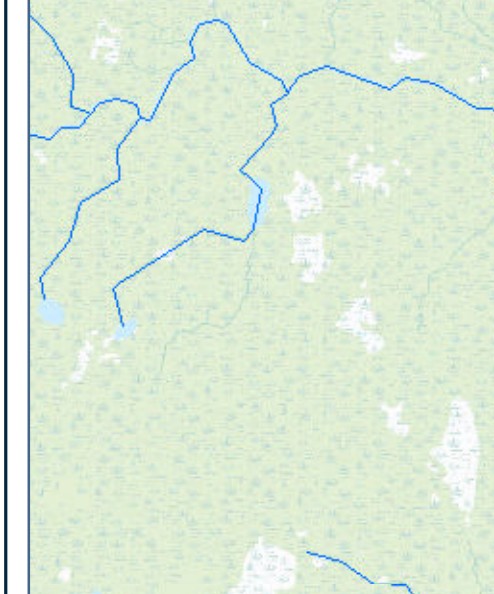
VENTON LAKE

MAXEY LAKE

TREBELL LAKE

ALBANY RIVER

SAARIMAKI LAKE



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B137 - SPARSE TREED BOG
- B136 - SPARSE TREED FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B146 - OPEN SHORE FEN
- B147 - SHRUB SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B149 - ORGANIC SHALLOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B129 - ORGANIC RICH CONIFER SWAMP
- B135 - ORGANIC THICKET SWAMP

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-3.4

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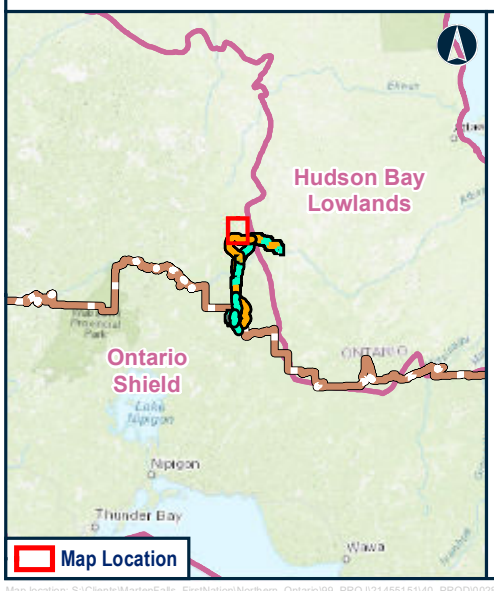
GARVEY LAKE

SLADE LAKE

MABIE LAKE

OXTOBY LAKE



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B137 - SPARSE TREED BOG
- B136 - SPARSE TREED FEN
- B139 - POOR FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B147 - SHRUB SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B129 - ORGANIC RICH CONIFER SWAMP

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-3.5

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Map location: S:\Clients\MartenFalls_FirstNation\Northern_Ontario\99_PROJ\21455151\40_PROD\0028_Peatland_TSD_Reporting\21455151-0028-RT-0003-3.mxd
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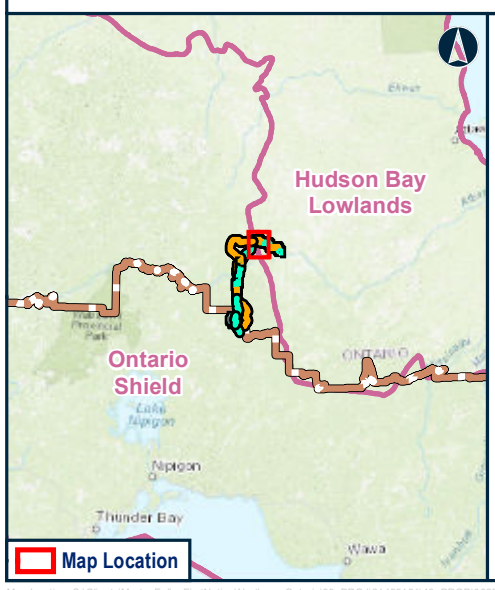
GURDEN LAKE

GITTINS LAKE

WABASSI RIVER

ALBANY RIVER



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B137 - SPARSE TREED BOG
- B138 - OPEN BOG
- B136 - SPARSE TREED FEN
- B139 - POOR FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B146 - OPEN SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B129 - ORGANIC RICH CONIFER SWAMP
- B135 - ORGANIC THICKET SWAMP

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-3.6

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SEBERT LAKE

GURDEN LAKE

TIFFIN LAKE

ALBANY RIVER

Hudson Bay Lowlands

Ontario Shield

Map Location

Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

PEATLAND CLASSIFICATION

- B126 - TREED BOG
- B138 - OPEN BOG
- B136 - SPARSE TREED FEN
- B140 - OPEN MODERATELY RICH FEN
- B141 - OPEN EXTREMELY RICH FEN
- B146 - OPEN SHORE FEN
- B144 - ORGANIC MEADOW MARSH
- B127 - ORGANIC POOR CONIFER SWAMP
- B128 - ORGANIC INTERMEDIATE CONIFER SWAMP
- B135 - ORGANIC THICKET SWAMP

Data Source:
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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

Peatland Classification

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Rev:0	

Figure 3-3.7

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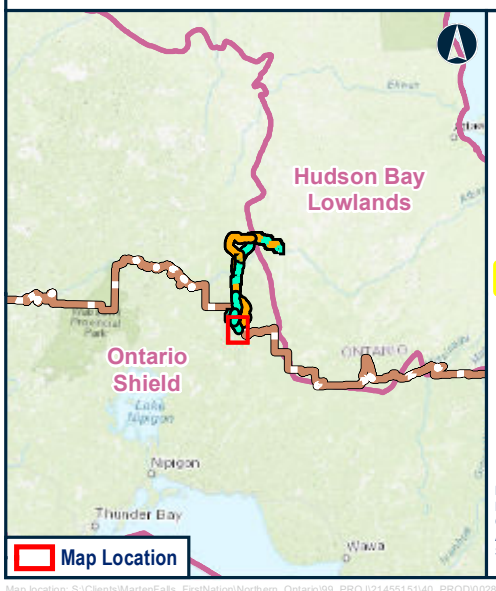
Date Saved: 1/27/2026 3:18:01 PM User Name: gld_rduval

HARROGATE LAKE
MCCAW LAKE
OGOKI RIVER
ESSER LAKE
PAINTER LAKE
DEBAERE LAKE
ORVISS LAKE
COLPITTS LAKE
BURY LAKE
ZURBRIGG LAKE
BURNABY LAKE
CRONY LAKE
RENWICK LAKE
PIGMENT LAKE
SAGA LAKE
KAPIKOTONGWA RIVER
JUNGFRAU LAKE
PERCY LAKE
LITTLE CURRENT RIVER
LITTLE JUNGFRAU LAKE
FARRELL LAKE
MURIEL RIVER
RUNWAY LAKE



Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- ORGANIC CONIFER SWAMP
- ORGANIC THICKET SWAMP
- ORGANIC MARSH

Data Source:
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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

Peatland Communities Overview

0 — 2.25 — 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

Jan, 2026	1:100,000 * when printed 11"x17"
Rev:0	

Figure 3-4.1

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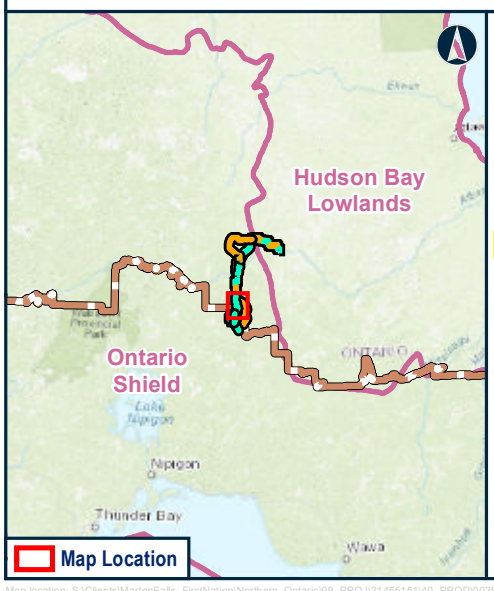
Date Saved: 1/27/2026 3:20:34 PM User Name: gld_rduval

DUSEY LAKE
WINSLOW LAKE
BALES LAKE
BRUNDRIT LAKE
GLAZE LAKE
SANDS LAKE
BYFORD LAKE
PATIENCE LAKE
OGOKI RIVER



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- OPEN BOG
- ORGANIC CONIFER SWAMP
- ORGANIC THICKET SWAMP
- ORGANIC MARSH

Data Source:
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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

Peatland Communities Overview

0 — 2.25 — 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

Jan, 2026	1:100,000 * when printed 11"x17"
Rev:0	

Figure 3-4.2

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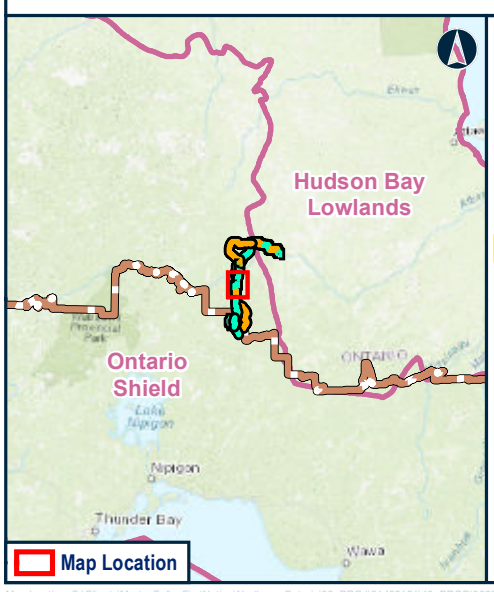
TEABEAU LAKE
TOLFREE LAKE
ALBANY RIVER
SUWALA LAKE
DUSEY RIVER
TANASE LAKE
DUSEY LAKE



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- ORGANIC CONIFER SWAMP
- ORGANIC THICKET SWAMP
- ORGANIC MARSH

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Communities Overview

0 2.25 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

Jan, 2026	1:100,000 * when printed 11"x17"
Rev:0	

Figure 3-4.3

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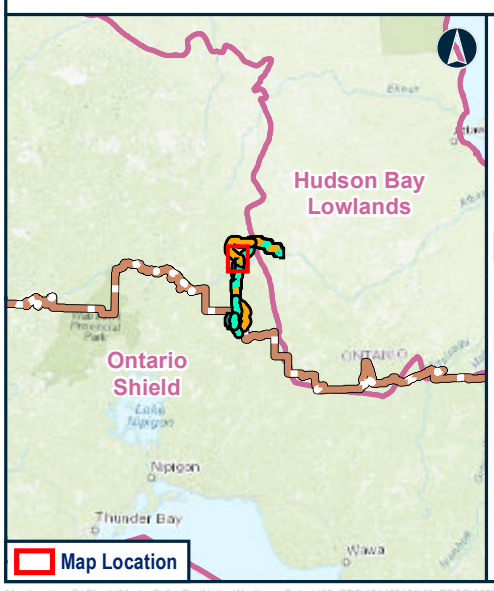
WABASSI RIVER
VENTON LAKE
MAXEY LAKE
TREBELL LAKE
ALBANY RIVER
SAARIMAKI LAKE



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- ORGANIC CONIFER SWAMP
- ORGANIC THICKET SWAMP
- ORGANIC MARSH

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Communities Overview

0 — 2.25 — 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-4.4

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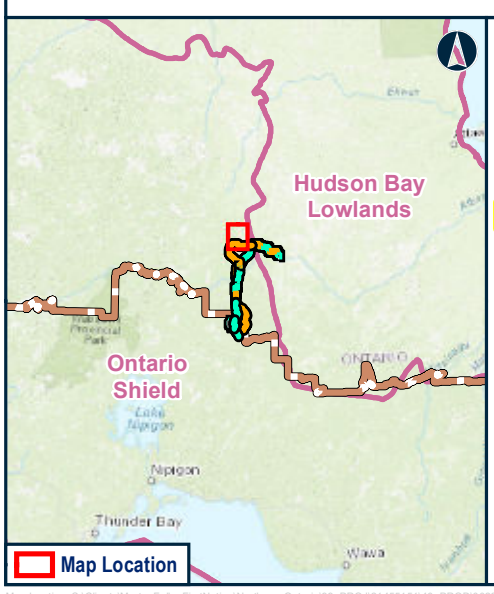
GARVEY LAKE

SLADE LAKE

MABIE LAKE

OXTOBY LAKE



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- ORGANIC CONIFER SWAMP
- ORGANIC MARSH

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Communities Overview

0 2.25 4.5
Kilometres
Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-4.5

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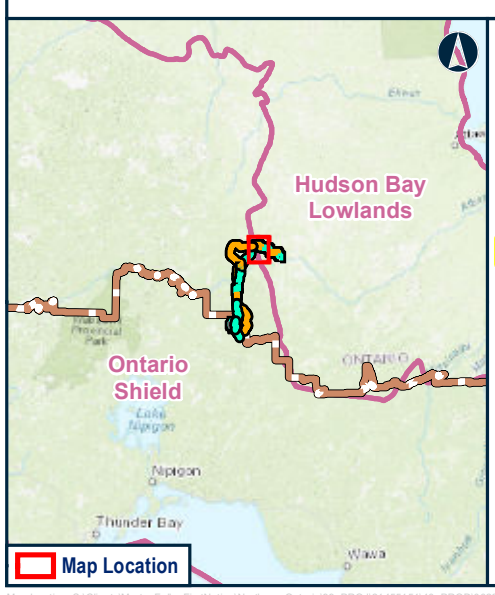
GURDEN LAKE

GITTINS LAKE

WABASSI RIVER

ALBANY RIVER



Legend

- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- PROVINCIAL PARK
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- OPEN BOG
- ORGANIC CONIFER SWAMP
- ORGANIC THICKET SWAMP
- ORGANIC MARSH

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MARTEN FALLS FIRST NATION COMMUNITY ACCESS ROAD

Peatland Communities Overview

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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Figure 3-4.6

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SEBERT LAKE

GURDEN LAKE

TIFFIN LAKE

ALBANY RIVER

Legend

- ROAD
- WATERBODY
- WATERCOURSE
- FAR NORTH BOUNDARY
- FIRST NATION COMMUNITY
- PROPOSED DEVELOPMENT AREA
- LOCAL STUDY AREA (3 KM)

PEATLAND COMMUNITY

- SPARSE TREED FEN
- OPEN FEN
- SHORE FEN
- TREED BOG
- OPEN BOG
- ORGANIC CONIFER SWAMP
- ORGANIC THICKET SWAMP
- ORGANIC MARSH

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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

Peatland Communities Overview

0 2.25 4.5
Kilometres

Datum: NAD 1983 CSRS UTM Zone 16N

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3.3.1.1 Fen Ecosites

Sparse Treed Fen (B136Tt / B136Tl)

As the most abundant peatland ecosite, this ecosite represents 34.1% of the Local Study Area, including both tall treed and low treed ecosites. The occurrence of Sparse Treed Fen polygons increases in the central and northern portions of the Local Study Area where the topographical conditions provide more opportunity for permanently saturated conditions to occur.

B136 is a treed fen community with a canopy consisting mostly of Black Spruce (Oji-Cree translation, *shikobaatik) (Picea mariana*) (>50% cover of canopy species) and Tamarack (Oji-Cree translation, *maaskigwatik / wakinagan*) (*Larix laricina*) (≥10% cover of conifer species). Understory trees include Black Spruce and Tamarack and the ecosite is typically shrub, herb, and moss moderately rich. The ground surface is mostly moss with standing water and conifer litter. Understory vegetation includes Labrador-tea (Oji-Cree translation, *kakikebak*) (*Rhododendron groenlandicum)*, Creeping Snowberry (Oji-Cree translation, *wabiminaan*) (*Gaultheria hispidula*), Speckled Alder (Oji-Cree translation, *wadopatik*) (*Alnus incana)*, Three-leaved Solomon's Seal (Oji-Cree translation, *sanamaan ihbaag*) (*Maianthemum trifolium)*, Bunchberry (Oji-Cree translation, *shashakominaan*) (*Cornus canadensis)*, Naked Mitrewort (*Mitella nuda*), graminoids, sphagnum (Oji-Cree translation, *maashkigwakamik*), and feathermoss (Oji-Cree translation, *wasekamik*) (*Hypnales*).

A total of nine Sparse Treed Fen communities were identified during wetland and riparian vegetation ground investigations (eight wetland sites and one riparian site). The following general characteristics were observed:

- A total of seven species of Sphagnum Mosses were observed between the nine sites: Fine Bogmoss (*Sphagnum angustifolium*, three sites), Northern Peat Moss (*S. capillifolium*, one site), Central Peat Moss (*S. centrale*, one site), Rusty Bogmoss (*S. fuscum*, five sites), Magellan's Peat Moss (*S. divinum / S. medium* complex [previously classified as *S. magellanicum*], four sites), Rigid Peat Moss (*S. teres*, one site), and Warnstorf's Peat Moss (*S. warnstorfii*, one site). Sphagnum Mosses were not observed at one of the nine Sparse Treed Fen sites and were only identified to genus at another one of the nine Spare Treed Fen site;
- Of the nine Sparse Treed Fen ground investigation sites, six sites were classified as palustrine communities, two sites were classified as lacustrine communities, and one site was classified as a riverine community;
- Where recorded, peat depth ranged from 152 to 450 cm. Peat depth could not be measured at one site due to a lack of an established peat layer (floating mat). Peat could only be measured to a certain depth at one site (i.e., peat depth >X cm) due to necessary equipment not being available at the time of survey;

- Average recorded surface wetness[3] was 2.5 with a range of 2 to 4 indicating that Sparse Treed Fen sites were generally found to be moist to wet within the first 20 cm of peat. Conditions at two sites were found to be very wet (4). Surface wetness was not recorded at the riparian ground survey sites;
- An average hummock height of 34.5 cm (20 to 50 cm range) and an average depth to water of 27.4 cm (range of 10 to 45 cm) was recorded where present. The average depth to water was not collected at three sites due to a slack of standing water in the hollow topography. Average hummock height and average depth to water was not recoded at the riparian ground survey sites;
- Average recorded peat decomposition between sites was classified as a 4 (plant material disintegrating) on the Von Post scale, with the decomposition class ranging between 2 (plant material is dead; floating mat) and 6 (half of the plant material is unstructured);
- Open water was generally absent within the surveyed communities ranging between 1% and 2% where observed (five wetland communities). Percent of open water was not recorded at the riparian ground survey sites; and
- An old trapline was noted in one of the communities. No other alterations were observed in the surveyed Sparse Treed Fen sites.

Open Fens (B139S / B139N, B140N / B140S, B141N / B141S)

As the second most common group of fen ecosites, open fen ecosites together represent 3.1% of the Local Study Area. Present throughout the Local Study Area, Open Fens communities increased in abundance and in area in the northern sections of the Local Study Area.

B139, B140, and B141 are all open fen communities with a tree cover of ≤10%. When present, trees are stunted Black Spruce and Tamarack, with cedar trees also sometimes present in extremely rich fens. These ecosites include both shrub (S) and non-woody (N) communities. When shrubs are present, they are typically ericaceous species. The ground surface is typically dominated by sedge species, sphagnum, and deciduous litter, with poor fen ecosites more sphagnum dominated and extremely rich fens more sedge and brown moss-dominated. Herbaceous species are less common in poor fens and more common in moderately and extremely rich fens. Common shrub species found in these ecosites include Leatherleaf (*Chamaedaphne calyculata*), Bog Rosemary (*Andromeda polifolia*),

[3] Surface wetness expands on the moisture regime descriptions provided for each community in Ecological Land Classification system by further characterizing the conditions of the peat layer in the initial 20 cm of peat. Given the presence of a peat layer greater than 40 cm on-site or the presence of a floating mat all peatland sites would be considered wet through the Ecological Land Classification System (7 to moderately moist to 9 – very wet, or saturated based on the type of peat present and the depth of each type).

Pale Bog Laurel (Oji-Cree translation, *wiisakibag*) (*Kalmia polifolia)*, Small Cranberry (Oji-Cree translation, *mashkikominan*) (*Vaccinium oxycoccos*), Dwarf Birch (*Betula pumila*), and Shrubby Cinquefoil (*Dasiphora fruticosa*). Common herbaceous species found in these ecosites include Slender Sedge (*Carex lasiocarpa*), Pitcher Plant (Oji-Cree translation, *aniigihjaash*) (*Sarracenia purpurea*), Few-seeded Sedge (*C. oligosperma*), White Beakrush (*Rhychospora alba*), Buckbean (*Menyanthes trifoliata*), Flatleaf Bladderwort (*Utricularia intermedia*), and Livid Sedge (*C. livida*). Bryophyte species in poor fen ecosites include Magellan's Peat Moss, and Girgensohn's Peat Moss (S*. girgensohnii*), with moderately and extremely rich fens dominated by peat mosses and Scorpion's Tail (*Scorpidium scorpoides*). Substrates are organic with a moisture regime of 6 to 9 (i.e., very moist to wet) or "s" (i.e., saturated) (Banton et al., 2009).

Poor fens ecosites (B139) are weakly minerotrophic peatlands that occasionally flood or have low groundwater movement and a rooting zone in contact with minerotrophic groundwater. Moderately rich open fen ecosites (B140) have moderate nutrient availability, with periodic flooding, groundwater movement, and rooting zone in contact with mineral-rich groundwater. Extremely rich open fen ecosites (B141) have high nutrient availability and are subject to periodic flooding and groundwater movement and a rooting zone in contact with mineral-rich groundwater. Extremely rich open fen ecosites are often patterned with alternating raised ridges (strings) and depressions (flarks) that form perpendicular to the flow of water. The ridges (strings) are typically dominated by sedges, shrubs, and stunted trees, while the depressions (flarks) typically represented by saturated to inundated open areas composed of brown mosses, sedges, and rushes (Banton et al., 2009).

A total of seven Open Fen communities were identified during wetland and riparian vegetation ground investigations (five wetland sites and two riparian sites). The following general characteristics were observed:

- A total of four species of Sphagnum Mosses were observed between the seven sites: Fine Bogmoss (one site), Rusty Bogmoss (two sites), Girgenshon's Peat Moss (one site), and Magellan's Peat Moss (two sites). Sphagnum Mosses were not observed at one of the seven Open Fen sites and were only identified to genus at three sites;
- Of the five Open Fen ground investigation sites, four sites were classified as palustrine and three sites were classified as riverine communities;
- Where recorded, peat depth ranged from 160 to 430 cm. Peat could only be measured to a certain depth at two sites (i.e., peat depth >X cm) due to necessary equipment not being available at the time of survey;
- Average recorded surface wetness was 3 with a range of 2 to 4 indicating that Open Fen sites were generally found to be wet within the first 20 cm of peat. Conditions at one site were found to be very wet (4). Surface wetness was not recorded at the riparian ground survey sites;

- An average hummock height of 29.5 cm (range of 15 to 43 cm) and an average depth to water of 18.3 cm (range of 10 to 25 cm) was recorded where present. The average depth to water was not collected at one site due to a lack of standing water in the hollow topography. Additionally, hummock and hollow topography were not observed at the riverine wetland ground survey site. Average hummock height and average depth to water was not recoded at the riparian ground survey sites;
- Average recorded peat decomposition between sites was classified as a 6 (half of the plant material is unstructured) on the Von Post scale, with the decomposition class ranging between 4 (plant material disintegrating) and 7 (plant material practically indistinguishable);
- Open water was generally absent within the surveyed communities with a value of 5% being observed where present (two wetland communities). Percent of open water was not recorded at the riparian ground survey sites; and
- No man-made alterations to Open Fen wetland communities were observed during site investigations. Past beaver activity was noted in one of the riparian ground survey sites.

Shore Fens (B146N, B147N / B147S)

Shore fens were mapped infrequently in both the northern and southern portions of the Local Study Area, representing less than 0.3% of the Local Study Area. As shore fen communities are typically narrow communities adjacent to open water, they may be underrepresented in the mapping (i.e., they may have sometimes been lumped into the larger adjacent communities).

B146 and B147 are both shore fen communities that have moderate nutrient availability from contact with a pond, lake, or stream and are subject to low wave or current action. They typically do not support tree growth; however, if present, trees include stunted Tamarack and Black Spruce. These ecosites include both shrub (S) and non-woody (N) communities.

Open Shore Fens (B146) are typically dominated by graminoids on floating mats, usually of sedge origin. These communities are moderately herb poor, tree poor, and may have permanent surface pools and small hummocks with sphagnum and ericaceous shrubs. The ground surface is mostly sedge litter, water, bare peat, and sphagnum mosses. The ecosite may be dominated by one species or have a variable composition with shrubs such as Sweet Gale (*Myrica gale*) and Leatherleaf and herbaceous species such as Slender Sedge, Marsh Cinquefoil (*Comarum palustre*), Buckbean, and Canada Blue-joint (*Calamagrostis canadensis*). Bryophytes are dominated by sphagnum. Substrates are floating organic with a moisture regime of 9 (i.e., very wet) (Banton et al., 2009).

Shrub Shore Fens (B147) are low shrub dominated ecosites on floating mats of sedge or sphagnum origin. These communities are tree poor with a ground surface of leaf and sedge litter. The ecosite may be dominated by a single species or have a variable composition with shrubs such as Leatherleaf, Sweet Gale, Speckled Alder, and Dwarf Birch and herbaceous species such as Marsh Cinquefoil, Slender Sedge, and Beaked Sedge (*C. rostrata*). Bryophytes are dominated by sphagnum. Substrates are floating organic with a moisture regime of 9 (i.e., very wet) (Banton et al., 2009).

A total of five Shore Fen communities were identified during wetland and riparian vegetation ground investigations (three wetland sites and two riparian sites). The following general characteristics were observed:

- A total of five species of Sphagnum Mosses were observed between the five sites: Fine Bogmoss (one site), Northern Peat Moss (one site), Rusty Bog Moss (one site), Magellan's Peat Moss (two sites), and Wulf's Peat Moss (*S. wulfianum*, one site). Sphagnum Mosses were not observed at two of the five Shore Fen sites and were only identified to genus at one site;
  - Of the five Shore Fen sites, three sites were classified as riverine communities and two sites were classified as lacustrine communities;
  - Where recorded, peat depth ranged from 75 to 360 cm. Peat depth could not be measured at both riparian sites due to a lack of an established peat layer (floating mat);
- Average recorded surface wetness was 4.5 with a range of 4 to 5 indicating that Shore Fen sites were generally found to be very wet within the first 20 cm of peat or had standing water at or above the surface. Surface wetness was not recorded at the riparian ground survey sites;
- Hummock and hollow topography was not observed at any of the Shore Fen sites. Average hummock height and average depth to water was not recoded at the riparian ground survey sites;
- Average recorded peat decomposition between sites was classified as a 5 (some unstructured material is present) on the Von Post scale with the noted decomposition class ranging between 2 (plant material is dead; floating mat) and 9 (homogeneous amorphous);
- Open water was generally absent within the surveyed communities, ranging between 2% and <5% where observed (all wetland communities). Percent of open water was not recorded at the riparian ground survey sites; and
- No man-made alterations to Shore Fen wetland communities were observed during site investigations.

3.3.1.2 Swamp Ecosites

Organic Conifer Swamps (B127Tt / B127Tl, B128Tt / B128Tl, B129Tt, B129Tl)

Organic Conifer Swamps, including Organic Poor Conifer Swamp (B127Tl / B127Tt), Organic Intermediate Conifer Swamp (B128Tl / B128Tt), and Organic Rich Conifer Swamp (B129Tl / B129Tt), together represent 22.7% of the Local Study Area. Organic Conifer Swamp communities were found throughout the northern and southern portions of the Local Study Area with B128 being the most common swamp community encountered (17.9%) followed by B127 (1.8%), and B129 (0.5%). A total of 2.6% of Organic Conifer Swamps were not classified beyond the general community type as a result of the desktop mapping exercise outlined in **Section 2.1**. Organic Conifer Swamp communities are found in areas that experience periodic flooding or increased ground water inputs that provide varying levels of nutrient availability while allowing for the accumulation of organic material (Banton et al., 2009).

B127, B128, and B129 differ primarily in their nutrient availability which influences their vegetation composition. Regardless, they are all dominated by Black Spruce, with small amounts of other tree species and greater diversity in organic intermediate (B128) and organic rich conifer swamps (B129). Other canopy species that may be present in these communities include Tamarack, Speckled Alder, and Eastern White Cedar (Oji-Cree translation, *giishkaatig*) (*Thuja occidentalis*) (B129 only). Understory shrub vegetation that may be present include Labrador-tea, Creeping Snowberry, Bunchberry, Velvet-leaf Blueberry (*Vaccinium myrtilloides*), and Speckled Alder. Poor organic conifer swamps are herb poor, with increasing herb richness in intermediate and rich conifer swamps. Herbaceous species typically include, Three-leaved Solomon's Seal, Three-seeded Sedge (*C. trisperma*), Wood Horsetail (*Equisetum sylvaticum*), Goldthread (*Coptis trifolia*), Naked Mitrewort, graminoids, sphagnum, and feathermoss. Rich swamps also include rich swamp indicators such as Eastern White Cedar, Red-osier Dogwood (Oji-Cree translation, *wabiminaatik*) (*Cornus sericea*), currant / gooseberry species (Oji-Cree translation, *oshabomin*) (*Ribes* sp.), Wood Anemone (*Anemone quinqufolia*), and Oak Fern (*Gymnocarpium dryopteris*). Substrates are organic, mostly deep, and with a moisture regime of 7 or 8 (i.e., wet) or "s" (i.e., saturated) (Banton et al., 2009).

A total of 17 Organic Conifer Swamp communities were identified during wetland and riparian vegetation ground investigations (16 wetland sites and one riparian site). The following general characteristics were observed:

- A total of six species of Sphagnum Mosses were observed between the 17 sites: Fine Bogmoss (11 sites), Rusty Bog Moss (three sites), Girgensohn's Peat Moss (five sites), Magellan's Peat Moss (five sites), Shaggy Peat Moss (*S. squarrosum*, two sites) and Wulf's Peat Moss (six sites). Sphagnum Mosses were not observed at one of the 17 Organic Conifer Swamp sites and were only identified to genus at two sites;

- Of the 17 Organic Conifer Swamp wetland sites, 14 sites were classified as palustrine communities, one site was classified as a lacustrine community, one site was classified as a riverine community, and one site was classified as an isolated community;
- Where recorded, peat depth ranged from 35 to 211 cm. Peat could only be measured to a certain depth at six sites (i.e., peat depth >X cm) and was not measured at one site due to necessary equipment not being available at the time of survey;
- Average recorded surface wetness was 2 with a range of 1 to 4 indicating that Organic Conifer Swamp sites were generally found to be moist within the first 20 cm of peat. Conditions were found to be very wet (4) at one site and dry (1) at one site. Surface wetness was not recorded at the riparian ground survey sites;
- An average hummock height of 29.8 cm (range of 15 to 50 cm) and an average depth to water of 35 cm (range of 10 to 130 cm) was recorded where present. The average depth to water was not collected at seven sites due to a lack of standing water in the hollow topography. Average hummock height and average depth to water was not recoded at the riparian ground survey sites;
- Average recorded peat decomposition between sites was classified as a 5 (some unstructured material is present) on the Von Post scale with the noted decomposition class ranging between 2 (plant material is dead; floating mat) and 7 (plant material practically indistinguishable);
- Open water was generally absent within the surveyed communities generally ranging between 1% and 5% where observed (four wetland communities). Open water was recorded at 20% at an additional two survey sites. Percent of open water was not recorded at the riparian ground survey sites; and
- A cut survey line / road was observed in one of the communities. No other alterations were observed in the surveyed Organic Conifer Swamp sites.

Organic Thicket Swamp (B135S)

Organic Thicket Swamps (B135S) are typically a tall shrub community with few trees (≤10%) and a moderately rich herbaceous layer. The ground surface is mostly broadleaf litter, dead wood, and sphagnum, with evidence of vernal pooling or standing water. Shrub species include Speckled Alder, Red-osier Dogwood, Sweet Gale and Dwarf Birch. Herbaceous species include Canada blue-joint, horsetails (*Equisetum* sp.), sedges (*Carex* sp.) and violets (*Viola* sp.) with a variety of bryophytes. Substrates are organic, mostly deep, with a moisture regime of 7 to 9 (i.e., wet) or “s” (i.e., saturated) (Banton et al., 2009).

Organic Thicket Swamp (B135S) represents only 0.2% of the Local Study Area, located in both the northern and southern portions of the Local Study Area. Within the Local Study Area these communities were typically located adjacent to watercourses, waterbodies or along the outer edges of larger peatland systems where inputs from adjacent waterways

and upland environments provide moderate nutrient and good moisture conditions for species growth while only temporary flooding allows for the accumulation of organics (Banton et al., 2009).

A total of four Organic Thicket Swamp communities were identified during wetland vegetation ground investigations (all wetland sites and no riparian sites). The following general characteristics were observed:

- One species of Sphagnum Moss was observed between the four sites: Warnstorf's Peat Moss (one site). Sphagnum Mosses were not observed at two of the four Organic Thicket Swamp sites and only identified to genus at one site;
- Of the Organic Thicket Swamp wetland sites, two sites were classified as riverine communities, one site was classified as a palustrine community and one site was classified as a lacustrine community;
- Where recorded, peat depth ranged from 48 to 390 cm. Peat could only be measured to a certain depth at one site (i.e., peat depth >X cm) due to necessary equipment not being available at the time of survey;
- Average recorded surface wetness was 2.5 with a range of 1 to 5 indicating that Organic Thicket Swamp sites were generally found to be dry to moist within the first 20 cm of peat. Standing water was found to be at the surface (5) at one site;
- An average hummock height of 43.3 cm (range of 10 to 90 cm) and an average depth to water of 30 cm (range of 10 to 50 cm) was recorded where present. The average depth to water was not collected at one site due to a lack of standing water in the hollow topography. Additionally, hummock and hollow topography was not observed at an additional survey site;
- Average recorded peat decomposition between sites was classified as a 3 (plant material very easily distinguishable) on the Von Post scale with the noted decomposition class ranging between 2 (plant material is dead; floating mat) and 5 (some unstructured material is present);
- Open water within the surveyed communities ranged between 10% and 60% where observed (three wetland communities); and
- Evidence of past beaver activity was observed in one of the communities. No other alterations were observed in the surveyed Organic Thicket Swamp sites.

3.3.1.3 Marsh Ecosites

Organic Marsh (B144N, B149N)

Organic Meadow Marsh (B144N) and Organic Shallow Marsh (B149N), together represent 1.2% of the Local Study Area. Within the Local Study Area, Organic Marshes are generally long and narrow features associated and located along the outer edges of watercourses and waterbodies and have been mapped throughout the Local Study Area.

Organic Meadow Marsh (B144N) is most often a graminoid-dominated community, typically dominated by sedges and grasses, with high nutrient availability, and often situated adjacent to a lake or stream. Tall shrub cover is ≤ 25% and tree cover is ≤ 10%. The ground surface is mostly sedge litter. The ecosite may be dominated by one species or have a more variable composition. Shrub species may include willows, Speckled Alder, or Sweet Gale, with herbaceous species such as Canada Blue-joint, Marsh Cinquefoil, Broad-leaved Cattail (Oji-Cree translation, *paskakannoog*) (*Typha latifolia*), Wool-grass (*Scirpus cyperinus*), and sedges. Substrates are organic, mostly deep, and with a moisture regime of 7 to 9 (i.e., wet) or “s” (i.e., saturated) (Banton et al., 2009).

Organic Shallow Marsh (B149N) communities are composed of emergent or floating-leaved herbaceous species, typically dominated by grasses, rushes, sedges, and occasionally forbs and horsetails. Water is normally above the substrate surface. Substrates are organic, mostly deep, and saturated.

A total of 11 Organic Marsh communities were identified during wetland and riparian vegetation ground investigations (four wetland sites and seven riparian sites). The following general characteristics were observed:

- A total of two species of Sphagnum Mosses were observed between the 11 sites: Fine Bogmoss (2 sites) and Magellan’s Peat Moss (3 sites). Sphagnum Mosses were not observed at eight of the 11 Organic Marsh sites;
- Of the 11 Organic Marsh wetland sites, all sites were classified as riverine communities;
- Where recorded, peat depth ranged from 75 to >120 cm. Peat could only be measured to a certain depth at four sites (i.e., peat depth >X cm) due to necessary equipment not being available at the time of survey. Peat depth could not be measured at three sites due to a lack of an established peat layer (floating mat). Peat depth was not recorded at one additional site;
- The recorded surface wetness at all sites was 2 indicating that Organic Marsh sites were generally found to be moist within the first 20 cm of peat. Surface wetness was not recorded at the riparian ground survey sites;

- An average hummock height of 45 (range of 30 to 60 cm) was recorded. Average depth to water of 25 cm was recorded at one site. The average depth to water was not collected at the remaining three wetland sites due to a lack of standing water in the hollow topography. Average hummock height and average depth to water was not recoded at the riparian ground survey sites;
- Average recorded peat decomposition between sites was classified as a 5 (some unstructured material is present) on the Von Post scale with the noted decomposition class ranging between 2 (plant material is dead; floating mat) and 9 (homogeneous amorphous);
- Open water within the surveyed Organic Marsh communities ranged between <5% and 25% where observed (three wetland communities). Percent of open water was not recorded at the riparian ground survey sites; and
- Evidence of past beaver activity was observed in or adjacent to two of the communities. No other alterations were observed in the surveyed Organic Marsh sites.

3.3.1.4 Bog Ecosites

Treed Bog (B126Tt / B126Tl, B137Tt / B137Tl)

Together, Treed Bog (B126) and Sparse Treed Bog (B137) represent 1% of the Local Study Area. The presence of Treed Bog communities increases in the northern portion of the Local Study Area. These communities are associated with larger peatland systems or isolated depressions where they are isolated from adjacent nutrient sources and plant growth is limited by excess moisture and lack of nutrient availability (Banton et al., 2009).

Treed Bog and Sparse Treed Bogs are dominated by Black Spruce, with ≤ 10% other tree species, and are often pure conifer. Treed Bogs have abundant ericaceous shrubs, are herb poor, and have a ground surface of mostly moss with conifer litter. Common understory species include Leatherleaf, Labrador-tea, Creeping Snowberry, Small Cranberry, Large Cranberry (Oji-Cree translation, *aniibiminaatik*) (*Vaccinium macrocarpon*), Pale Bog Laurel, Sheathed Cotton-grass (*Eriophorum vaginatum*), sedges, Three-leaved Solomon's Seal, and sphagnum. Bogs are hydrologically isolated, nourished only by rain. Substrates are organic, mostly deep, and with a moisture regime of 7 to 9 (i.e., wet) or "s" (i.e., saturated) (Banton et al., 2009).

A total of four Treed Bog communities were identified during wetland vegetation ground investigations (all wetland sites and no riparian sites). The following general characteristics were observed:

- A total of six species of Sphagnum Mosses were observed between the four sites: Fine Bogmoss (three sites), Northern Peat Moss (two sites), Rusty Bog Moss (one site), Magellan's Peat Moss (one site), Warnstorf's Peat Moss (one site), and Wulf's Peat Moss (one site). Sphagnum Mosses were only identified to genus at one site;

- Of the four Treed Bog wetland sites, three sites were classified as palustrine communities, and one site was classified as an isolated community;
- Where recorded, peat depth ranged from 149 to 175 cm. Peat could only be measured to a certain depth at one site (i.e., peat depth >X cm) due to necessary equipment not being available at the time of survey;
- Average recorded surface wetness was 2 with a range of 2 to 3 indicating that Treed Bog sites were generally found to be moist within the first 20 cm of peat;
- An average hummock height of 33.3 cm (range of 25 to 40 cm) and an average depth to water of 25 cm (range of 20 to 30 cm) was recorded where present. The average depth to water was not collected at two sites due to a lack of standing water in the hollow topography;
- Average recorded peat decomposition between sites was classified as a 4 (plant material disintegrating) on the Von Post scale with the noted decomposition class ranging between 2 (plant material is dead) and 5 (some unstructured material is present);
- Open water was generally absent within the surveyed communities, with open water only being noted within one community at 1% cover; and
- No site alterations were observed in the surveyed Treed Bog sites.

Open Bog (B138N)

Open Bog (B138N) represents 0.1% of the Local Study Area, with only four polygons mapped as this ecosite, one of which was mapped during the initial desktop-typing, two were identified through ground-based field verification, and the fourth was identified through the site photo interpretation. This ecosite is typically widespread and common across the boreal but may be under-represented in the Local Study Area mapping due to their sometimes-small size (e.g., found within small, filled in kettles), or association with larger peatland systems (e.g., raised dome or openings in trees, bogs, or fens) (Banton et al., 2009). Therefore, these ecosites may often be lumped within the dominant surrounding ecosite.

Open Bogs are characterized by low shrub, bryophyte, or graminoid dominated systems with ≤ 10% tree cover. When present, shrubs are ericaceous. The ground surface is mostly sphagnum and deciduous litter. Fen indicators are mostly absent. Common shrubs include Leatherleaf, Pale Bog Laurel, Bog Rosemary, and Labrador-tea. Herbaceous plants include Pitcher Plant, Round-leaved Sundew (*Drosera rotundifolia*), dense Cotton-grasses, and Few-seeded Sedge. Open bogs are hydrologically isolated, extremely low in nutrients, with acidic conditions that limit plant growth. Substrates are organic, mostly deep, and with a moisture regime of 7 to 9 (i.e., wet) (Banton et al., 2009).

A total of two Open Bog communities were identified during wetland vegetation ground investigations (all wetland sites and no riparian sites). The following general characteristics were observed:

- A total of three species of Sphagnum Mosses were observed between the two sites: Fine Bogmoss (one site), Rusty Bog Moss (one site), and Magellan's Peat Moss (one site);
- Of the Open Bog sites, both sites were classified as palustrine communities;
- Peat depth ranged from 270 to 620 cm;
- Surface wetness was only recorded at one of the two sites where a surface wetness of 3 (wet) was noted;
- An average hummock height of 40 cm (range of 35 to 45 cm) and an average depth to water of 15 cm (range of 10 to 20 cm) was recorded;
- Average recorded peat decomposition between sites was classified as a 4 (plant material disintegrating) on the Von Post scale with the noted decomposition class ranging between 3 (plant material very easily distinguishable) and 5 (some unstructured material is present);
- Open water was generally absent within the surveyed communities, with open water only being noted within one community at 1% cover; and
- No site alterations were observed in the surveyed Open Bog sites.

4. Summary

Peatlands were found to comprise 62.6% of the Local Study Area. Peatlands were identified throughout the Local Study Area during the field investigations conducted between 2021 and 2023, with the ratio of peatlands to upland communities and mineral wetlands increasing in the northern portion of the Local Study Area. Through the ground investigations, visual investigations (aerial and photo interpretation) and the desktop mapping exercise, Sparse Treed Fens (34.1%) and Organic Intermediate Conifer Swamps (17.9%) were noted as being the most abundant peatland communities observed covering a combined 52% of the Local Study Area.

The results presented in this Technical Supporting Document along with other applicable studies will be incorporated into the *Peatlands Existing Conditions and Effects Assessment* report. The existing conditions components of that report will incorporate data from other disciplines, including Atmospheric Environment, Climate Adaptation and Resiliency, Surface Water, and Groundwater and Geochemistry, to document the complexity of Peatland Ecosystems and their associated functions. That report will also discuss potential effects on peatland ecosystems and will recommend appropriate mitigation and offsetting measures as they relate to the Project.

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Annex A – Results of Ground Surveys – Wetland and Riparian Survey Sites

Annex A
Results of Ground Surveys – Wetland and Riparian Survey Sites

Station #	Ecosite (field)	Site Type	Survey Date	Location									Hummock/Hollow		Community Information															
				Zone	Easting	Northing	Type of Organics	Peat Decomposition (von Post)[1]	Depth of peat (cm)	Open Water (%)	External Site Alterations	Moisture Regime (von Post)	Surface Wetness[2]	Hummock Height (cm)	Avg depth to water (cm)	Wetland Type	Peatland Type	Site type	Vegetation Cover (Cover Code)[3,4]												
																		h	c	dh, dc	ts	ls	ds	gc	m	re	ne	be	f	ff	su
Veg004	B136Tt	Wetland	2021-09-19	16U	573860	5732660	Mesic	H4	152	1	None		2	25	32	Fen	Treed Fen	Palustrine	-	4	<1	6	6	<1	3	1	-	1	-	-	-	-
Veg005A	B135S	Wetland	2021-09-19	16U	573763	5732780	Fibric	H3	60-65	60	None		5	10	10	Swamp	Organic Thicket Swamp	Riverine	-	3	<1	6	3	<1	2	2	-	5	-	-	-	-
Veg026	B127Tt	Wetland	2022-07-16	16U	532350	563318	Mesic	H4	90	0	None		2	40	n/a	Swamp	Organic Conifer Swamp	Palustrine	-	5	-	5	6	-	4	7	-	-	-	-	-	-
Veg027	B136TlD n	Wetland	2022-07-16	16U	532262	5633371	Mesic	H5	>60	2	None		2	20	10	Fen	Treed Fen	Palustrine	-	5	-	4	6	5	-	-	-	-	-	-	-	-
Veg030	B135S	Wetland	2021-09-27	16U	524185	5620012	Mesic	H3	48	10	beaver activity		1	90	50	Swamp	Organic Thicket Swamp	Riverine	-	2	-	4	2	-	3	2	1	6	1	-	-	-
Veg034	B129Tl	Wetland	2022-07-17	16U	5111909	5640097	Mesic	H5	90	0	None		2	30	n/a	Swamp	Organic Conifer Swamp	Isolated	-	6	-	4	6	-	4	7	-	-	-	-	-	-
Veg036	B149N	Wetland	2021-09-27	16U	521090	5656015	Mesic	H3	n/a	25	beaver activity; damming in creek, some lodges		2	30	25	Marsh	Organic Marsh	Riverine	-	3	2	1	4	-	1	-	-	6	-	-	-	-
Veg039	B138N	Wetland	2022-07-14	16U	551234	5740890	Mesic	H5	270	1	None			40	20	Fen	Organic Marsh	Palustrine	4	3	1	-	-	-	-	-	-	-	-	-	-	-
Veg046	B126Tt	Wetland	2022-07-14	16U	532160	5741017	Mesic	H5	>100	0	fibre optic cabile line ~ 100 m away		2	25	0	Bog	Treed Bog	Palustrine	-	5	-	-	6	-	4	7	-	-	-	-	-	-
Veg048	B128Tt	Wetland	2022-07-13	16U	518275	5743385	Peat	H5	>80	1	none		2	30-40	30	Swamp	Organic Conifer Swamp	Palustrine	-	6	1	2	3	-	4	8	-	-	-	-	-	-
Veg063	B127TtD n	Wetland	2022-07-18	16U	533803	5637746	Mesic	H4	>90	0	none		2	20	0	Swamp	Organic Conifer Swamp	Palustrine	-	5	-	2	6	-	4	4	-	-	-	-	-	-
Veg096	B126Tt	Wetland	2021-09-23	16U	562823	5736901	Mesic	H4	149	1	none		2	40	30	Bog	Treed Bog	Palustrine	-	5	1	-	4	-	4	7	-	-	-	-	-	-
Veg097	B136Tt	Wetland	2021-09-23	16U	562682	5737001	Mesic	H4	450	0	none		2	30	n/a	Fen	Treed Fen	Palustrine	-	4	1	3	4	1	2	7	-	-	-	-	-	-
Veg112	B135S	Wetland	2022-07-15	16U	524177	5703655	Mesic	H5	>60	50	none				0	Swamp	Organic Thicket Swamp	Palustrine	-	3	-		-	-	-	-	-	5	-	-	-	-
Veg113	B129Tl	Wetland	2022-07-15	16U	524030	5702617	Mesic	H5	>60	20	none		2	30	20	Swamp	Organic Conifer Swamp	Palustrine	-	6	-	6	-	-	-	-	-	-	-	-	-	-
Veg122	B129Tt	Wetland	2022-07-14	16U	522071	5691787	Mesic	H5	>60	20	none		2	30	20	Swamp	Organic Conifer Swamp	Palustrine	-	6	-	6	-	-	4	7	-	-	2	-	-	-
Veg256A	B136Tt	Wetland	2021-09-19	16U	574185	5732863	Fibric/Mesic	H4	209	1	none		2	49	45	Fen	Treed Fen	Palustrine	-	4	<1	5	6	<1	4	7	-	<1	-	-	-	-
Veg317A	B129Tt	Wetland	2022-07-18	16U	533274	5633737	Mesic	H5	>60	5	none		3	20	15	Swamp	Organic Conifer Swamp	Palustrine	-	6	-	6	4	-	3	5	-	-	-	-	-	-
Veg321A	B127Tt	Wetland	2022-07-16	16U	515296	5362024	Mesic	H5	211	5	none		2	30	10	Swamp	Organic Conifer Swamp	Palustrine	-	-	-	-	4	4	-	6	-	-	-	-	-	-
Veg347	B129Tt	Wetland	2023-06-15	16U	507418	5641785	Peat	H5	>100	2	none		1	20	20	Swamp	Organic Conifer Swamp	Palustrine	-	5	-	5	2	-	2	4	-	-	-	-	-	-
Veg352A	B128Tt	Wetland	2023-06-18	16U	527869	5617476	Mesic	N/A	65	0	cut survey line/ road through community		1-2	30	n/a	Swamp	Organic Conifer Swamp	Palustrine	-	6	-	4	4	-	4	4	-	-	-	-	-	-
Veg355	B146S	Wetland	2023-06-17	16U	529374	5625840	Humic	H9	75	2	none		5	n/a	n/a	Fen	Shore Fen	Lacustrine	-	-	-	-	5	-	-	-	-	7	1	-	-	-
Veg359	B136Tl	Wetland	2023-06-17	16U	580114	5733282	Mesic	H6	450	2	none		2	50	40	Fen	Treed Fen	Lacustrine	-	4	-	6	-	-	2	5	-	4	-	-	-	-
Veg361	B136Tl	Wetland	2023-06-17	16U	552634	5739375	Peat	H6	180	<1	none		2	30	n/a	Fen	Treed Fen	Palustrine	-	4	-	-	5	-	-	7	4	-	-	-	-	-
Veg375	B141S	Wetland	2023-06-15	16U	525927	5739727	Peat	H7	280	5	none		2	20	20	Fen	Open Fen	Palustrine	-	4	-	3	2	-	6	-	-	-	-	1	-	-
Veg389	B146N	Wetland	2023-06-18	16U	527760	5724650	Fibric	H2	80	2	none		4-5	n/a	n/a	Fen	Shore Fen	Riverine	-	-	-	3	-	-	4	1	-	7	-	-	-	-
Veg442	B126Tl	Wetland	2023-08-04	16U	522534	5739757	Humic	H3	150	0	none		3	38	20	Bog	Treed Bog	Palustrine	-	2	-	-	-	-	2	3	-	-	-	-	-	-
Veg443	B141N	Wetland	2023-08-04	18T	519943	5662106	Mesic	H7	200	0	none		4	40	10	Fen	Open Fen	Palustrine	-	3	-	-	3	-	5	4	-	5	-	-	-	-
Veg446	B127Tl	Wetland	2023-08-03	16U	518415	5665331	Fibric	H2	180	0	none		2	25	130	swamp	Organic Conifer Swamp	Palustrine	-	5	-	-	7	-	2	7	-	<1	-	-	-	-
Veg449	B128Tl	Wetland	2023-08-04	16U	540316	5735653	Mesic	H5	210	0	none		4	25	n/a	Swamp	Organic Conifer Swamp	Lacustrine	-	6	-	-	6	-	-	-	-	-	-	-	-	-
Veg450	B136Tl	Wetland	2023-08-04	16U	570057	5735566	Mesic	H4	430	0	old trapline nearby		4	35	n/a	Fen	Treed Fen	Lacustrine	-	4	-	-	3	-	4	8	-	5	-	-	-	-
Veg451	B137Tl	Wetland	2023-08-03	16U	521374	5674007	Fibric	H2	175	0	none		2	30	n/a	Bog	Treed Bog	Isolated	-	5	-	-	5	-	3	8	-	5	-	-	-	-
Veg455	B140Tl	Wetland	2023-08-04	16U	438491	5739328	Mesic	H5	430	0	none		3	43	n/a	Fen	Open Fen	Palustrine	-	4	-	-	5	-	3	8	-	4	-	-	-	-
Veg456	B139S	Wetland	2023-08-04	16U	559276	4742264	Mesic/Fibric	H4	180	<5	none		3	15	25	Fen	Open Fen	Palustrine	-	2	-	-	2	-	2	3	-	2	-	-	-	-
Veg457	B140S	Wetland	2023-08-04	16U	559347	5743144	Humic	H7	160	0	none		3	n/a	n/a	Fen	Open Fen	Riverine	-	-	-	2	2	-	2	-	7	-	-	-	-	-
Veg461	B144N	Wetland	2023-08-03	16U	523714	5623976	Humic	H7	80	5	none		2	50	n/a	Marsh	Organic Marsh	Riverine	<1	-	-	4	-	-	1	-	7	-	-	-	-	-
Veg462	B144N	Wetland	2023-08-03	16U	525164	5622572	Mesic	H5	75-80	<5%	stream dammed nearby		2	60	n/a	Marsh	Organic Marsh	Riverine	-	<1	-	5	-	-	<1	-	-	8	-	-	-	-
Veg469	B146N	Wetland	2023-08-05	16U	518032	5632766	Mesic/Humic	H7	360	<5%	none		4	n/a	n/a	Fen	Shore Fen	Lacustrine	-	2	-	-	4	-	<1	<1	-	7	-	-	-	-
Veg475	B128Tt	Wetland	2023-08-05	16U	511506	5639561	Mesic/Humic	H5-H6	50	0	None		2	15-20	n/a	Swamp	Organic Conifer Swamp	Palustrine	2	6	-	3	6	-	4	6	-	3	-	-	-	-
Veg476	B127Tl	Wetland	2023-08-05	16U	512247	5640289	Humic	H6-7	60	0	none		3	45	n/a	Swamp	Organic Conifer Swamp	Palustrine	-	6	-	3	7	-	4	8	-	-	-	-	-	-
Veg481	B144N	Wetland	2023-08-03	16U	519943	5662106	humic	H5	90	0	none		2	40	n/a	Marsh	Organic Marsh	Riverine	-	-	-	5	-	-	2	-	-	8	-	-	-	-
Veg515	B136Tl	Wetland	2023-08-04	16U	574050	5728826	Mesic	H4-H5	410	0	none		4	37	10	Fen	Treed Fen	Palustrine	-	2	-	-	4	-	-	8	-	5	-	-	-	-
Veg516	B138N	Wetland	2023-08-04	16U	561240	5736642	Fibric	H3	620	0	none		3	35-45	10	Bog	Organic Marsh	Palustrine	-	3	-	-	4	-	<1	8	-	4	-	-	-	-
Veg600A	B128Tt	Wetland	2023-06-17	16U	552558	5739241	Peat	n/a	n/a	0	none		2	50	n/a	Swamp	Organic Conifer Swamp	Palustrine	-	5	-	4	6	-	4	6	-	-	-	-	-	-

Annex A
Results of Ground Surveys – Wetland and Riparian Survey Sites

Station #	Ecosite (field)	Site Type	Survey Date	Location										Hummock/Hollow		Community Information			Vegetation Cover (Cover Code)[3,4]												
				Zone	Easting	Northing	Type of Organics	Peat Decomposition (von Post)[1]	Depth of peat (cm)	Open Water (%)	External Site Alterations	Moisture Regime (von Post)	Surface Wetness[2]	Hummock Height (cm)	Avg depth to water (cm)	Wetland Type	Peatland Type	Site type	h	c	dh, dc	ts	ls	ds	gc	m	re	ne	be	f	ff	su
Veg601A	B135S	Wetland	2023-06-17	16U	529252	5625665	Fibric	H2	390	0	none		1-2	30	n/a	Swamp	Organic Thicket Swamp	Lacustrine	-	3	-	7	-	-	2	4	-	-	-	-	-	-
Veg602A	B127Tt	Wetland	2023-06-18	16U	527740	5724586	Mesic	H5	130	0	none		1-2	30	n/a	Swamp	Organic Conifer Swamp	Palustrine	-	5	-	3	7	-	3	-	-	-	-	-	-	-
Veg025	B127Tt	Riparian	2022-07-16	16U	5632985	5632985	Peat	H2	35	-	none		-	-	-	Swamp	Organic Conifer Swamp	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg035	B149N	Riparian	2021-09-27	16U	521106	5656072	Peat	H2	n/a	-	none		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg037	B139S	Riparian	2022-07-14	16U	551037	5740732	Peat	H5	>60	-	none		-	-	-	Fen	Open Fen	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg047	B144N	Riparian	2022-07-13	16U	518253	5743478	Peat	H5	>60	-	none		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg129	B136Tl	Riparian	2021-09-25	16U	522659	5689415	Peat	H2	n/a	-	none		-	-	-	Fen	Treed Fen	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg156	B146N	Riparian	2021-09-26	16U	519529	5665276	Peat	H2	n/a	-	none		-	-	-	Fen	Shore Fen	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg253	B144N	Riparian	2021-09-19	16U	575655	5727286	Peat	n/a	n/a	-	none		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg303	B144N	Riparian	2022-07-18	16U	531538	5629775	Peat	H5	n/a	-	none		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg304A	B144N	Riparian	2022-07-17	16U	519764	5638568	Peat	H9	>120	-	none		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg315	B144N	Riparian	2022-07-13	16U	527758	5740224	Peat	H6	>60	-	none		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg327	B146S	Riparian	2022-07-16	16U	516334	5630193	Peat	H5	n/a	-	Beaver activity noted in area		-	-	-	Fen	Shore Fen	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg328	B139S	Riparian	2022-07-16	16U	535626	5645586	Peat	H5	>60	-	Beaver activity noted in area		-	-	-	Fen	Open Fen	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veg329	B144N	Riparian	2022-07-13	16U	522063	5671653	Peat	H6	>100	-	Beaver lodge present		-	-	-	Marsh	Organic Marsh	Riverine	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes :

[1] Von Post Scale: H2 - Plant material is dead, H3 - Plant Material Very Easily Distinguishable, H4 - Plant Material Disintergrating, H5 - Some unstructed material is present, H6 - Half of the material is unstructured, H7 - Plant material practically indistinguishable, H9 - Homogeneous amorphous

[2] Surface Wetness: 1 - Dry, 2 - Moist, 3 - Wet, 4 - Very wet, 5 - Water above surface

[3] Vegetation Codes: h - Deciduous Trees, c - Coniferous Trees, dh/dc - Dead Trees, ts - Tall Shrub, ls - Low Shrub, ne - Narrow-leaved Emergents, be - Broad-leaved Emergents, re - Robust Emergents, ff - Free-floating Plants, f - Floating Plants, su - Submerged Plants

[4] Cover Code: 1 - 1-2%, 2 - 2-5%, 3 - 5-10%, 4 - 10-25%, 5 - 25-50%, 6 - 50-75%, 7 - 75-95%, 8 - 95-100%

Annex B – Results of Visual Survey Sites (Aerial)

Annex B
Results of Visual Survey Sites (Aerial)

Station #	Ecosite (field)	Survey Date	Location			Wetland Type	Peatland Type
			Zone	Easting	Northing		
M22SAD6	B144N/B012Tt	2022-07-17	16U	521573	5663366	Marsh	Organic Marsh
Veg016	B128Tt	2021-09-25	16U	522418	5694316	Swamp	Organic Conifer Swamp
Veg022	B128TtD n	2022-07-17	16U	517762	5638286	Swamp	Organic Conifer Swamp
Veg038	B127TtD n	2022-07-14	16U	551062	5740832	Swamp	Organic Conifer Swamp
Veg043	B128Tt	2021-09-25	16U	522028	5691348	Swamp	Organic Conifer Swamp
Veg053	B135S	2022-07-14	16U	546833	5742737	Swamp	Organic Thicket Swamp
Veg058	B128Tt	2021-09-24	16U	510982	5732781	Swamp	Organic Conifer Swamp
Veg061	B128Tt	2021-09-27	16U	519771	5628159	Swamp	Organic Conifer Swamp
Veg064	B128Tt	2021-09-29	16U	532597	5644580	Swamp	Organic Conifer Swamp
Veg069	B144N	2021-09-26	16U	519091	5682495	Marsh	Organic Marsh
Veg070	B128Tt	2021-09-22	16U	519270	5702075	Swamp	Organic Conifer Swamp
Veg071	B144N	2021-09-27	16U	526939	5658023	Marsh	Organic Marsh
Veg072	B128Tl	2022-07-13	16U	522686	5662346	Swamp	Organic Conifer Swamp
Veg075	B135S	2022-07-16	16U	517155	5631015	Swamp	Organic Thicket Swamp
Veg077	B135S	2021-09-27	16U	525227	5658947	Swamp	Organic Thicket Swamp
Veg078	B146N	2021-09-27	16U	519664	5666971	Fen	Shore Fen
Veg079	B135S	2022-07-15	16U	530815	5722980	Swamp	Organic Thicket Swamp
Veg082	B136Tt	2021-09-25	16U	523186	5695942	Fen	Sparse Treed Fen
Veg083	B144N	2021-09-27	16U	519700	5658544	Marsh	Organic Marsh
Veg084	B137Tl	2021-09-27	16U	519814	5658513	Bog	Treed Bog
Veg085	B135S	2022-07-17	16U	520948	5654392	Swamp	Organic Thicket Swamp
Veg088	B135S	2022-07-15	16U	516716	5724286	Swamp	Organic Thicket Swamp
Veg092	B128TtD n	2022-07-15	16U	521542	5720126	Swamp	Organic Conifer Swamp
Veg094	B149N	2021-09-24	16U	511216	5734199	Marsh	Organic Marsh
Veg101	B137Tt	2022-07-13	16U	520508	5670569	Bog	Treed Bog
Veg108	B128Tt	2021-09-22	16U	525185	5705025	Swamp	Organic Conifer Swamp
Veg114	B128Tt	2022-07-15	16U	524144	5702787	Swamp	Organic Conifer Swamp
Veg121	B128Tt	2021-09-25	16U	522072	5691431	Swamp	Organic Conifer Swamp
Veg128	B128Tl	2021-09-25	16U	522611	5689315	Swamp	Organic Conifer Swamp
Veg138	B128Tt	2021-09-26	16U	518971	5682727	Swamp	Organic Conifer Swamp
Veg139	B128Tt	2021-09-26	16U	518908	5682882	Swamp	Organic Conifer Swamp
Veg141	B137Tl	2021-09-25	16U	518785	5683433	Bog	Treed Bog
Veg142	B128Tt	2021-09-26	16U	519609	5678631	Swamp	Organic Conifer Swamp

Annex B
Results of Visual Survey Sites (Aerial)

Station #	Ecosite (field)	Survey Date	Location			Wetland Type	Peatland Type
			Zone	Easting	Northing		
Veg143	B127Tl	2021-09-26	16U	519563	5678858	Swamp	Organic Conifer Swamp
Veg149	B147S	2021-09-26	16U	520445	5668921	Fen	Shore Fen
Veg150	B137Tt	2021-09-26	16U	520638	5668845	Bog	Treed Bog
Veg153	B137Tt	2021-09-26	16U	519855	5665692	Bog	Treed Bog
Veg154	B128Tt	2021-09-26	16U	519882	5665565	Swamp	Organic Conifer Swamp
Veg160	B146N	2021-09-27	16U	520557	5659818	Fen	Shore Fen
Veg162	B128Tt	2021-09-27	16U	520162	5657625	Swamp	Organic Conifer Swamp
Veg164	B136Tl	2022-07-17	16U	521624	5650126	Fen	Sparse Treed Fen
Veg167	B128Tt	2021-09-28	16U	517537	5637770	Swamp	Organic Conifer Swamp
Veg168	B136TlD n	2022-07-16	16U	518378	5629442	Fen	Sparse Treed Fen
Veg170	B128Tt	2021-09-27	16U	519788	5628245	Swamp	Organic Conifer Swamp
Veg173	B136TlD n	2022-07-16	16U	520256	5627782	Fen	Sparse Treed Fen
Veg177	B129Tt	2022-07-16	16U	521277	5624881	Swamp	Organic Conifer Swamp
Veg181	B129Tt	2021-09-27	16U	523220	5621658	Swamp	Organic Conifer Swamp
Veg183	B128TtD n	2022-07-18	16U	530984	5630074	Swamp	Organic Conifer Swamp
Veg184	B128TtD n	2022-07-18	16U	531306	5631449	Swamp	Organic Conifer Swamp
Veg187	B128TtD n	2022-07-18	16U	533539	5634075	Swamp	Organic Conifer Swamp
Veg189	B135S	2022-07-18	16U	533801	5634318	Swamp	Organic Thicket Swamp
Veg190	B128Tt	2021-09-29	16U	534098	5637326	Swamp	Organic Conifer Swamp
Veg194	B128TtD n	2022-07-16	16U	531800	5640814	Swamp	Organic Conifer Swamp
Veg195	B129Tt	2022-07-16	16U	531910	5640601	Swamp	Organic Conifer Swamp
Veg196	B140S	2022-07-16	16U	532003	5640668	Fen	Open Fen
Veg197	B146N	2022-07-16	16U	532085	5640584	Fen	Shore Fen
Veg200	B136TlD n	2022-07-15	16U	532853	5642984	Fen	Sparse Treed Fen
Veg201	B128TtD n	2022-07-16	16U	532962	5643098	Swamp	Organic Conifer Swamp
Veg203	B128TtD n	2022-07-16	16U	532801	5643786	Swamp	Organic Conifer Swamp
Veg205	B128Tt	2021-09-29	16U	532667	5644560	Swamp	Organic Conifer Swamp
Veg208	B128Tt	2021-09-29	16U	532209	5645662	Swamp	Organic Conifer Swamp
Veg223	B128Tl	2021-09-27	16U	523545	5661433	Swamp	Organic Conifer Swamp
Veg224	B128Tt	2021-09-29	16U	523628	5661336	Swamp	Organic Conifer Swamp
Veg225	B128TtD n	2022-07-15	16U	539000	5728766	Swamp	Organic Conifer Swamp
Veg226	B137Tl	2022-07-15	16U	538903	5729019	Bog	Treed Bog
Veg231	B127Tt	2022-07-13	16U	527401	5738797	Swamp	Organic Conifer Swamp

Annex B
Results of Visual Survey Sites (Aerial)

Station #	Ecosite (field)	Survey Date	Location			Wetland Type	Peatland Type
			Zone	Easting	Northing		
Veg232	B127Tt	2022-07-13	16U	527493	5738794	Swamp	Organic Conifer Swamp
Veg233	B137Tl	2022-07-15	16U	536801	5728449	Bog	Treed Bog
Veg234	B127Tl	2022-07-13	16U	524698	5740730	Swamp	Organic Conifer Swamp
Veg235	B140S	2022-07-15	16U	538499	5741483	Fen	Open Fen
Veg236	B128TtD n	2022-07-14	16U	551188	5743812	Swamp	Organic Conifer Swamp
Veg238	B139N	2021-09-21	16U	520666	5673722	Fen	Open Fen
Veg239	B140N	2021-09-25	16U	520412	5686352	Fen	Open Fen
Veg240	B136Tl	2022-07-14	16U	523961	5690864	Fen	Sparse Treed Fen
Veg241	B140N	2021-09-25	16U	524013	5690950	Fen	Open Fen
Veg242	B136Tl	2022-07-14	16U	524084	5691012	Fen	Sparse Treed Fen
Veg244	B128Tt	2021-09-23	16U	564170	5735350	Swamp	Organic Conifer Swamp
Veg245	B136Tl	2021-09-19	16U	576020	5729092	Fen	Sparse Treed Fen
Veg250A	B126Tt	2021-09-23	16U	561921	5737937	Bog	Treed Bog
Veg252	B144N	2021-09-19	16U	575558	5727311	Marsh	Organic Marsh
Veg255	B129TlD n	2022-07-13	16U	526580	5740348	Swamp	Organic Conifer Swamp
Veg257	B127Tt	2022-07-14	16U	541030	5741025	Swamp	Organic Conifer Swamp
Veg262	B128Tl	2021-09-29	16U	533718	5650043	Swamp	Organic Conifer Swamp
Veg264	B135S	2022-07-18	16U	533841	5635848	Swamp	Organic Thicket Swamp
Veg266	B136Tt	2022-07-18	16U	514137	5632987	Fen	Sparse Treed Fen
Veg270	B137Tl	2022-07-18	16U	516041	5640484	Bog	Treed Bog
Veg271	B128Tt	2021-09-24	16U	512518	5738702	Swamp	Organic Conifer Swamp
Veg272	B136Tt	2022-07-18	16U	514757	5641960	Fen	Sparse Treed Fen
Veg273	B136TlD n	2022-07-18	16U	514753	5641743	Fen	Sparse Treed Fen
Veg274	B128Tt	2022-07-15	16U	528712	5722351	Swamp	Organic Conifer Swamp
Veg276	B128Tt	2022-07-17	16U	522153	5643812	Swamp	Organic Conifer Swamp
Veg277	B146N	2021-09-23	16U	562768	5731963	Fen	Shore Fen
Veg278	B127Tl	2021-09-23	16U	570532	5731238	Swamp	Organic Conifer Swamp
Veg279	B127Tt	2021-09-23	16U	571929	5734737	Swamp	Organic Conifer Swamp
Veg280	B128Tl	2021-09-23	16U	567348	5734565	Swamp	Organic Conifer Swamp
Veg283	B127Tl	2021-09-24	16U	519499	5742881	Swamp	Organic Conifer Swamp
Veg284	B147S	2021-09-24	16U	510611	5737186	Fen	Shore Fen
Veg286	B128Tt	2021-09-24	16U	510552	5728299	Swamp	Organic Conifer Swamp
Veg287	B140N	2021-09-24	16U	511667	5726399	Fen	Open Fen

Annex B
Results of Visual Survey Sites (Aerial)

Station #	Ecosite (field)	Survey Date	Location			Wetland Type	Peatland Type
			Zone	Easting	Northing		
Veg288	B135S	2022-07-15	16U	515207	5725100	Swamp	Organic Thicket Swamp
Veg289	B128	2022-07-15	16U	515287	5725128	Swamp	Organic Conifer Swamp
Veg298	B128Tt	2022-07-14	16U	518654	5686400	Swamp	Organic Conifer Swamp
Veg305	B136Tl	2022-07-17	16U	519552	5642844	Fen	Sparse Treed Fen
Veg306	B137Tl	2022-07-17	16U	517079	5641862	Bog	Treed Bog
Veg308	B136TlD n	2022-07-14	16U	544166	5742646	Fen	Sparse Treed Fen
Veg309	B128TtD n	2022-07-14	16U	536120	5740835	Swamp	Organic Conifer Swamp
Veg310	B128Tt	2022-07-13	16U	525782	5739275	Swamp	Organic Conifer Swamp
Veg311	B137Tt	2021-09-24	16U	511212	5733831	Bog	Treed Bog
Veg331	B127TtD n	2022-07-13	16U	515399	5742613	Swamp	Organic Conifer Swamp
Veg332	B137Tl	2022-07-17	16U	518334	5636070	Bog	Treed Bog
Veg334	B128Tt	2022-07-22	16U	519230	5633011	Swamp	Organic Conifer Swamp
Veg337	B128Tt	2021-09-24	16U	512338	5738297	Swamp	Organic Conifer Swamp
Veg338	B128Tt	2021-09-23	16U	563466	5734875	Swamp	Organic Conifer Swamp
Veg340	B129Tt	2023-06-17	16U	560631	5743652	Swamp	Organic Conifer Swamp
Veg343	B128Tt	2023-06-17	16U	522964	5680560	Swamp	Organic Conifer Swamp
Veg344	B127Tt	2023-06-17	16U	523684	5681387	Swamp	Organic Conifer Swamp
Veg351	B128Tt	2023-06-18	16U	528829	5618074	Swamp	Organic Conifer Swamp
Veg356	B128Tt	2023-06-17	16U	531842	5626086	Swamp	Organic Conifer Swamp
Veg358	B127Tt	2023-06-17	16U	578940	5733172	Swamp	Organic Conifer Swamp
Veg362A	B137Tl	2023-06-17	16U	551766	5739393	Bog	Treed Bog
Veg363	B136Tl	2023-06-17	16U	551330	5740010	Fen	Sparse Treed Fen
Veg364	B141N	2023-06-17	16U	546442	5741065	Fen	Open Fen
Veg365	B139N	2023-06-17	16U	548509	5740298	Fen	Open Fen
Veg366	B127Tt	2023-06-17	16U	549319	5739689	Swamp	Organic Conifer Swamp
Veg367	B141N	2023-06-17	16U	551906	5737869	Fen	Open Fen
Veg368	B128Tt	2023-06-17	16U	555784	5737738	Swamp	Organic Conifer Swamp
Veg369	B128Tt	2023-06-17	16U	557493	5737715	Swamp	Organic Conifer Swamp
Veg370	B127Tt	2023-06-18	16U	520691	5709602	Swamp	Organic Conifer Swamp
Veg371	B127Tt	2023-06-15	16U	520094	5664730	Swamp	Organic Conifer Swamp
Veg372	B127Tl	2023-06-15	16U	519504	5664372	Swamp	Organic Conifer Swamp
Veg376	B128Tt	2023-06-15	16U	526338	5739549	Swamp	Organic Conifer Swamp
Veg377	B136Tl	2023-06-17	16U	526761	5739458	Fen	Sparse Treed Fen

Annex B
Results of Visual Survey Sites (Aerial)

Station #	Ecosite (field)	Survey Date	Location			Wetland Type	Peatland Type
			Zone	Easting	Northing		
Veg383	B126Tl	2023-06-15	16U	512070	5742361	Bog	Treed Bog
Veg385	B141N	2023-06-15	16U	512392	5741601	Fen	Open Fen
Veg386	B139S	2023-06-15	16U	512189	5740153	Fen	Open Fen
Veg390	B126Tl	2023-06-18	16U	528085	5724677	Bog	Treed Bog
Veg392	B146N	2023-06-15	16U	517930	5664222	Fen	Shore Fen
Veg393	B128Tt	2023-06-15	16U	518864	5663531	Swamp	Organic Conifer Swamp
Veg394	B128Tt	2023-06-15	16U	519307	5663319	Swamp	Organic Conifer Swamp
Veg396	B128Tt	2023-06-15	16U	519805	5662797	Swamp	Organic Conifer Swamp
Veg399	B127Tl	2023-06-18	16U	523051	5642944	Swamp	Organic Conifer Swamp
Veg400	B149N	2023-06-18	16U	522222	5643101	Marsh	Organic Marsh
Veg402	B128Tt	2023-06-18	16U	525319	5710841	Swamp	Organic Conifer Swamp
Veg403	B146N	2023-06-18	16U	525113	5710448	Fen	Shore Fen
Veg404	B128Tt	2023-06-18	16U	525296	5709703	Swamp	Organic Conifer Swamp
Veg406	B139N	2023-06-17	16U	524893	5659827	Fen	Open Fen
Veg407	B139N	2023-06-15	16U	520203	5664202	Fen	Open Fen
Veg408	B126Tl	2023-06-18	16U	520958	5709934	Bog	Treed Bog
Veg409	B127Tt	2023-06-18	16U	520928	5710083	Swamp	Organic Conifer Swamp
Veg410	B146N	2023-06-18	16U	520907	5710425	Fen	Shore Fen
Veg411	B146N	2023-06-18	16U	521036	5710475	Fen	Shore Fen
Veg412	B127Tt	2023-06-18	16U	522179	5711082	Swamp	Organic Conifer Swamp
Veg413	B128Tt	2023-06-18	16U	522527	5711762	Swamp	Organic Conifer Swamp
Veg414	B146N	2023-06-17	16U	532686	5645876	Fen	Shore Fen
Veg415	B140N	2023-06-17	16U	533498	5646488	Fen	Open Fen
Veg417	B136Tl	2023-06-17	16U	534276	5646334	Fen	Sparse Treed Fen
Veg418	B127Tt	2023-06-17	16U	572271	5734370	Swamp	Organic Conifer Swamp
Veg420	B136Tt	2023-06-17	16U	571024	5733603	Fen	Sparse Treed Fen
Veg429	B128Tt	2023-06-15	16U	520482	5745785	Swamp	Organic Conifer Swamp
Veg430	B127Tt	2023-06-15	16U	520291	5744809	Swamp	Organic Conifer Swamp
Veg431	B128Tt	2023-06-18	16U	523014	5703470	Swamp	Organic Conifer Swamp
Veg433	B128Tt	2023-06-18	16U	520741	5702643	Swamp	Organic Conifer Swamp
Veg439	B126Tl	2023-08-05	16U	521369	5664617	Bog	Treed Bog
Veg440	B128Tt	2023-08-04	16U	517115	5702784	Swamp	Organic Conifer Swamp
Veg459	B128Tl	2023-08-04	16U	560860	5744060	Swamp	Organic Conifer Swamp

Annex B
Results of Visual Survey Sites (Aerial)

Station #	Ecosite (field)	Survey Date	Location			Wetland Type	Peatland Type
			Zone	Easting	Northing		
Veg463	B129Tt	2023-08-05	16U	511194	5631145	Swamp	Organic Conifer Swamp
Veg464	B128Tt	2023-08-04	16U	524671	5681950	Swamp	Organic Conifer Swamp
Veg466	B129Tt	2023-08-03	16U	524969	5621616	Swamp	Organic Conifer Swamp
Veg467	B128Tt	2023-08-03	16U	525940	5622037	Swamp	Organic Conifer Swamp
Veg468	B129Tt	2023-08-03	16U	524666	5621306	Swamp	Organic Conifer Swamp
Veg471	B127Tt	2023-08-05	16U	519442	5631787	Swamp	Organic Conifer Swamp
Veg473	B128Tt	2023-08-05	16U	517967	5636272	Swamp	Organic Conifer Swamp
Veg474	B127Tt	2023-08-05	16U	511475	5638184	Swamp	Organic Conifer Swamp
Veg477	B128Tt	2023-08-05	16U	512992	5640914	Swamp	Organic Conifer Swamp
Veg478	B128Tt	2023-08-05	16U	521376	5641296	Swamp	Organic Conifer Swamp
Veg479	B128Tt	2023-08-05	16U	521828	5644940	Swamp	Organic Conifer Swamp
Veg480	B128Tt	2023-08-05	16U	519884	5660429	Swamp	Organic Conifer Swamp
Veg482	B128Tl	2023-08-05	16U	520964	5663928	Swamp	Organic Conifer Swamp
Veg483	B128Tt	2023-08-05	16U	519566	5667654	Swamp	Organic Conifer Swamp
Veg484	B128Tl	2023-08-05	16U	519413	5667141	Swamp	Organic Conifer Swamp
Veg485	B128Tt	2023-08-05	16U	520238	5669829	Swamp	Organic Conifer Swamp
Veg486	B128Tt	2023-08-05	16U	520153	5670521	Swamp	Organic Conifer Swamp
Veg487	B136Tt	2023-08-05	16U	520152	5671020	Fen	Sparse Treed Fen
Veg488	B127Tt	2023-08-05	16U	520125	5671451	Swamp	Organic Conifer Swamp
Veg490	B128Tt	2023-08-04	16U	519883	5680537	Swamp	Organic Conifer Swamp
Veg492	B128Tt	2023-08-04	16U	521528	5705431	Swamp	Organic Conifer Swamp
Veg493	B127Tt	2023-08-05	16U	524393	5713561	Swamp	Organic Conifer Swamp
Veg500A	B139N	2023-06-17	16U	551069	5739692	Fen	Open Fen
Veg501A	B127Tt	2023-06-17	16U	552179	5739892	Swamp	Organic Conifer Swamp
Veg502A	B135S	2023-06-17	16U	551881	5740029	Swamp	Organic Thicket Swamp
Veg503A	B139N	2023-06-17	16U	552353	5740646	Fen	Open Fen
Veg504A	B128Tt	2023-06-18	16U	527535	5616770	Swamp	Organic Conifer Swamp
Veg505A	B137Tl	2023-06-18	16U	527485	5616528	Bog	Treed Bog
Veg509	B135S	2023-08-04	16U	579767	5725528	Swamp	Organic Thicket Swamp
Veg512	B136Tl	2023-08-04	16U	579392	5724799	Fen	Sparse Treed Fen
Veg514	B136Tl	2023-08-04	16U	579137	5724493	Fen	Sparse Treed Fen

Attachment C – Peatlands Technical Support Document: Carbon Storage and Flux

MARTEN FALLS FIRST NATION
COMMUNITY ACCESS ROAD

Peatlands Technical Support Document: Carbon Storage and Flux

February 2026

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Acronym List

C	Carbon
CH_4	Methane
CO_2	Carbon dioxide

Unit list

C kg/m^2	Carbon mass by square metre
CH_4 mg/m^2/d	Daily methane flux by square metre
CH_4 mg/m^2/y	Annual methane flux by square
CO_2 g/m^2/d	Daily carbon dioxide flux by square metre
CO_2 g/m^2/y	Annual carbon dioxide flux by square metre
kg	Kilogram (1,000 g)
Gt	Gigaton (1,000,000,000 t)
ha	Hectare (10,000 m^2)
t	Tonne (1,000 kg)

1. Introduction

This Report presents the existing conditions and effects assessment for the Peatlands Discipline and is being prepared in support of the Marten Falls Community Access Road Environmental Assessment / Impact Statement Report.

Marten Falls First Nation (Marten Falls) is a remote First Nation community in northern Ontario, approximately 430 km from Thunder Bay, Ontario, located at the junction of the Albany and Ogoki rivers. Marten Falls is proposing a multi-purpose all-season Community Access Road (the Project) that will connect the community to the Ontario provincial highway network. The Project includes the construction and operation of an all-season road with the following key characteristics:

- approximately 190 km to 230 km (depending on the chosen route) of two-lane gravel all-season road on a new right-of-way.
- approximately 100 m wide right-of-way cleared to a width of 60 m; and
- proposed designated speed limit of 80 km per hour.

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

1.1 Project Overview

The Project consists of a new all-season road from Painter Lake Road located approximately 57 km north of Nakina, Ontario to the community of Marten Falls First Nation, a remote First Nation community in northern Ontario located at the junction of the Albany and Ogoki rivers. The Community Access Road will serve community access and industrial supply needs for both the community (e.g., fuel, construction supplies, water treatment supplies) and industrial proponents (e.g., mining, forestry), thereby minimizing infrastructure corridors in the Far North. Therefore, the Project will be for a multi-purpose road 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 for the design, construction and operation / maintenance of the Project. 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.

1.2 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
Laurence Grimond	Environmental Scientist	3	M.Sc.
Max Emile Kessler-Nadeau	Environmental Scientist	4	M.Sc.
Jacques Langlois	Team Lead (Physical Environment and Climate Change)	20	Ph.D.

1.3 Context

This assessment aims to calculate carbon storage and flux potential in each peatland type within the Marten Fall Community Access Road Project Area. This data will be used to inform the peatlands effects assessment. The main source inputs of this assessment are fieldwork information, spatial analysis, an existing dataset, and additional information from the literature. As mentioned in the *All Season Community Access Road: Peatlands Study Plan*, carbon storage and flux constitute an indicator for the Peatland Ecosystem Valued Component.

Northern hemisphere peatlands represent a third of the net carbon stored in terrestrial carbon sinks, sequestering yearly between 10 and 35 g of carbon per m^2 (g $C/m^2/y$) since the deglaciation around 12,500 years ago (Moore, 2002; Occhietti et al., 2011; Packalen et al., 2014; Roulet et al., 2007; Strack et al., 2016; Vitt et al., 2000; Yu et al., 2010). In Canada, these ecosystems account for around 56% of the country's soil organic carbon (Tarnocai, 2006) and cover 12 % (1,135,607 km^2) of the land cover (Tarnocai, 2006; Tarnocai et al., 2011).

Peatland is a collective term for wetlands that accumulate more than 40 cm of organic soil derived from Sphagnum moss species (Asada and Warner, 2005; National Wetlands Working Group; 1997; Sims and Baldwin, 1996; National Wetlands Working Group, 1988). The water table is near the surface (0-30 cm) and limits the decomposition of organic matter. This causes an imbalance between primary production and decomposition rates, resulting in an incremental accumulation of partially decomposed organic matter (Reddy et al., 2022). This carbon storage creates organic soils known as "peat". Peat can accumulate over thousands of years and be multiple meters thick. In the Hudson Bay Lowlands, average peat depth is estimated at 1.84 m but can reach more than 6 m in peatlands located the furthest away from the Hudson Bay coast (Gonsamo et al, 2024).

The Marten Falls Community Access Road will be designed as a 'floating road', constructed directly on a geotextile mat laid out on a locally excavated substrate on top

of the peat surface. This approach should limit peat excavation and loss of underground carbon storage. Carbon sequestration flux will be significantly impacted by the Project footprint and its adjacent surroundings (Saraswati et al., 2023). As noted in the *All Season Community Access Road: Peatlands Study Plan*, the export of dissolved organic carbon (DOC) is not considered part of this assessment as off-site waterborne carbon losses are not anticipated to be significant compared to the on-site emissions (AECOM, 2021). Further fieldwork studies are necessary to assess existing dissolved organic carbon export for the study areas.

2. Methods

For this assessment, three study areas were assessed. The first study area is a 6 km buffer encompassing all route options and corresponds to the Existing Conditions Local Study Area. The second study area is the Effects Assessment Local Study Area corresponding to 6 km buffer along the Preferred Route (i.e., 3 km each side of the alignment centreline). Finally, the third study area is the Construction Disturbance Area corresponding to a 100 m buffer along the Preferred Route alignment (i.e., 50 m each side of the alignment centreline) plus temporary construction access roads, work areas, worker camps, pits, quarries, and associated access roads (see *Draft Peatlands Technical Support Document: Existing Conditions & Effects Assessment* for more details on study areas).

Assessing carbon storage and fluxes in these three study areas gives a range of results, as the minimum direct effect will be encompassed within the Construction Disturbance Area and the maximum direct effect within the Existing Conditions Local Study Areas. Saraswati et al. (2023) provides insight into how peatland areas adjacent to roads, within a 20 m buffer, are biogeochemically, hydrologically, and botanically impacted compared to reference sites at least 50 m from the road. This highlights the importance of assessing the carbon storage and flux within the Construction Disturbance Area. A larger, regional study area was not considered in this assessment considering the availability and quality of data, as well as the lack of field measurements at the regional scale, which would lead to great uncertainty about the results of carbon stocks and fluxes.

2.1 Carbon Storage

2.1.1 Peatland Area

Mapping of terrain, vegetation, and peatlands in the Existing Conditions Local Study Area was conducted using historical and recent aerial photos, high-resolution orthophotos, and a LiDAR digital elevation model, at a scale of 1:5,000 (WSP, 2024).

The terrain mapping provided an area for every peatland group (organic soil with a thickness over 40 cm) under study: bogs, fens, organic marshes, and organic swamps, within 6 km of the road alignment. Mapping was further validated in the field and the total thickness of peat profiles for each peatland group was measured in more than 300 peatland polygons. The area of each peatland group was then calculated in ArcGIS pro for the three study areas detailed above (**Table 2-1**).

Table 2-1: Areas of Peatlands within the Existing Conditions Local Study Area

Peatland Group	Total (ha)	Proportion	Mean Peatland Area (ha)	Max. Peatland Area (ha)	Min. Peatland Area (ha)	Count (*n*)
Bog	2,172	2%	8	144	<0.1	287
Fen	74,069	60%	14	699	<0.1	5,156
Organic Marsh	2,407	2%	7	110	<0.1	356
Organic Swamp	45,328	36%	16	413	<0.1	2,908
Total	**123,976**	**100%**	**-**	**-**	**-**	**8,707**

Table 2-2: Areas of Peatlands within the Effects Assessment Local Study Area

Peatland Group	Total (ha)	Proportion	Mean Peatland Area (ha)	Max. Peatland Area (ha)	Min. Peatland Area (ha)	Count (*n*)
Bog	1,439	2%	7	144	<0.1	193
Fen	46,084	60%	15	699	<0.1	3,149
Organic Marsh	1,511	2%	6	74	<0.1	239
Organic Swamp	27,782	36%	14	413	<0.1	2,003
Total	**76,815**	**100%**	**-**	**-**	**-**	**5,584**

Table 2-3: Areas of Peatlands within the Construction Disturbance Area

Peatland Group	Total (ha)	Proportion	Mean Peatland Area (ha)	Max. Peatland Area (ha)	Min. Peatland Area (ha)	Count (*n*)
Bog	29	1%	1	13	<0.1	20
Fen	786	37%	2	30	<0.1	424
Organic Marsh	26	1%	1	12	<0.1	23
Organic Swamp	1,309	61%	3	30	<0.1	489
Total	**2,151**	**100%**	**-**	**-**	**-**	**956**

The main peatlands found within the study areas are fens followed by organic swamps, particularly the organic conifer swamps. Bogs and organic marshes combined account for less than 4% of the total areas studied within both the Local Study Areas and the Construction Disturbance Area.

2.1.2 Peat Thickness

Across the Existing Conditions Local Study Area, 369 field measurements were carried out in different peatland groups (**Table 2-4**). Different methods were used to measure peat thickness, such as the use of a Dutch auger, corer, and borehole drilling. When it was not possible to probe through the entire peat column to the underlying mineral substrate, incomplete peat thickness records were assigned their nominal value. For instance, records indicating a peat thickness of >100 cm were recorded as 100 cm.

Table 2-4: Field Measurements of Peat Thickness by Peatland Group within the Existing Conditions Local Study Area

Peatland Group	Mean (cm)	Median (cm)	Standard Deviation (cm)*	Min. (cm)	Max. (cm)	Count (*n*)
Bog	177	150	121	50	620	19
Fen	178	175	92	46	450	124
Organic Marsh	117	100	54	60	251	30
Organic Swamp	137	115	76	30	411	196

*Sample standard deviation calculated individually for every peatland group

To provide a comprehensive peat thickness dataset across the three study areas, the Terrain and Soil mapping (WSP, 2024b) was used to complete peat thickness information where no field measurements were conducted. For all polygons with organic values, a thickness value was determined based on their surface material codification. Three types of organic surface material were found across the Soil and Terrain mapping and their thickness was estimated by Dillon (**Table 2-5**) (Dillon Consulting Limited, 2024). The surface mean peat thickness was estimated based on the soil characteristics in the Provincial terrain and soil dataset provided by WSP. This included factors such as surface material (organic or mineral soil), terrain decile (the portion of organic soil with a range of thickness), and a range of peat thickness categories: Veneer (0.2 - 1 m), Blanket (1 - 3 m), and Plain (> 3 m). For the Veneer and Blanket peatland areas, the mean value for the range of peat thickness was used (Veneer = 0.6 m; Blanket = 2 m) for the corresponding terrain decile in calculating the surface mean peat thickness. For areas with peat thickness categorized as Plain (> 3 m), a 3-meter peat thickness was used in the calculations.

Table 2-5: Peat Thickness Determination Based on the Terrain and Soil Mapping

code	Description	Dillon's Peat Thickness Estimation
v	Veneer* (0.2 to 1 m)	60 cm
b	Blanket** (1 to 3 m)	200 cm
p	Plain*** (>3 m)	300 cm

*Notes: * Surficial material is less than 1 m thick (WSP, 2024b, adapted from Howes and Kenk, 1997)*
*** A layer of unconsolidated material greater than 1m thick (WSP, 2024b, adapted from Howes and Kenk, 1997)*
**** Level of very gentle sloping, unidirectional surface between 0 – 5% (WSP, 2024b, adapted from Howes and Kenk, 1997)*

As such, a thickness value was calculated for every peatland polygon across the Existing Conditions Local Study Area. The field measurements override the mapping for peatlands where field measurements intersected the organic layers of the Soil and Terrain mapping. Final peat thickness data for the Effects Assessment Local Study Area and the Construction Disturbance Area were calculated by clipping the Existing Conditions Local Study Area to their corresponding area of interest. A summary of estimated peat thickness is provided in **Table 2-6**.

Table 2-6: Estimated Peat Thickness by Peatland Group by Study Area

Study Area	Peatland Group	Mean (cm)	Median (cm)	Standard Deviation (cm)	Min. (cm)	Max. (cm)	Count (*n*)
Existing Conditions Local Study Area *	Bog	237	300	89	50	620	287
	Fen	163	200	98	46	450	5,156
	Organic Marsh	179	200	109	60	300	356
	Organic Swamp	91	60	63	48	411	2,908
Effects Assessment Local Study Area **	Bog	231	300	93	50	620	193
	Fen	162	200	99	50	450	3,149
	Organic Marsh	193	200	108	60	300	239
	Organic Swamp	89	60	61	50	411	2,003
Construction Disturbance Area ***	Bog	209	200	94	50	300	20
	Fen	150	182	91	50	450	424
	Organic Marsh	177	174	101	60	300	23
	Organic Swamp	99	60	68	50	411	489

*Notes: *6 km buffer encompassing all route options*
***6 km buffer along the Preferred Route (i.e., 3 km each side of the alignment centreline)*
****100 m buffer along the Preferred Route alignment (i.e., 50 m each side of the alignment centreline) plus temporary construction access roads, work areas, worker camps, pits, quarries, and associated access roads.*

2.1.3 Soil Organic Carbon Mass

The soil organic carbon mass, expressed in kilograms per square metre (kg/m^2), was calculated using linear regression equations between soil organic carbon mass and peat thickness (cm) from Magnan et al. (2023) and McLaughlin et al. (2018). Magnan et al. (2023) have compiled a large peat and soil cores dataset across Québec and New Brunswick peatlands and were able to formulate robust linear regression by peatland group (**Table 2-7**). This regression is based on the principle that peat density increases with depth. As peat accumulates over time, the lower layers become compacted under the weight of the upper layers, reducing pore volume and increasing density (Moore,1989). Additionally, deeper layers experience slower decomposition because of cooler and wetter conditions, leading to a higher proportion of mineralized material, which also contributes to greater density (Waddington et al., 2015). Furthermore, organic matter in deeper layers undergoes less decomposition than in the surface layers, resulting in a gradual densification of these layers (Turetsky et al., 2008). Overall, these processes—compaction, slower decomposition, and reduced organic matter breakdown—lead to higher peat density with increasing depth.

It is important to note that the two approaches use different wetland classification systems, i.e. the Quebec system for Magnan et al. (2023) and the Ontario system for McLaughlin et al. (2018). While bogs and fens are similarly defined in both systems, equivalences are needed for organic marshes and swamps.

In the Quebec wetland classification system, swamps are not considered as peatlands since, according to the Quebec definition of a swamp, they do not have a surface organic layer 40 cm thick. They are mainly characterized by a waterlogged mineral substrate soil layer. However, in Ontario, a forested swamp can be a mineral swamp

(i.e., < 40 cm organic soil depth) or organic swamp (i.e., > 40 cm organic soil depth). The equivalent of an Ontario organic swamp is the Quebec forested peatland. Since Magnan et al. (2023) used the Quebec classification, soil organic carbon mass calculations for organic swamps will be performed on the forested peatland linear regression.

In the case of organic marshes, the closest equivalent between the Quebec and Ontario classifications is freshwater marsh. However, according to the Quebec classification, freshwater marshes are wetlands that are temporarily or permanently flooded and develop on mineral substrates, and that do not accumulate peat. Using the freshwater marsh linear regression from Magnan et al. (2023) for organic marshes is therefore likely to undercount the carbon stocks of these environments. The combined use of both approaches to estimate soil organic carbon mass will make it possible to present a range of values, from more conservative to less conservative, providing a comprehensive assessment of carbon storage.

In **Table 2-7**, the error of the predicted soil organic carbon mass has been reproduced from Magnan et al. (2023). It was obtained by comparing the calculated results with measured peat soil organic carbon mass from analyzed peat cores in different wetland groups. Soil organic carbon mass estimates using linear regression had errors of 15%, 14%, 17%, and 57% for bogs, fens, forested peatlands, and freshwater marsh, respectively. In ArcGIS pro, soil organic carbon mass was calculated for all peatland polygons using peat thickness values. The results of each polygon were then summed up for every peatland group.

Table 2-7: Magnan et al. (2023) Linear Regression Formula to Calculate Soil Organic Carbon Mass (kg/m^2) by Peat Thickness (cm) in Peatlands

Wetland Group	Linear Regression	Coefficient of Determination	Significance	Soil Cores*	Error**
Open bog	y = 0.455x + 1.543	R^2 = 0.926	P <0.0001	50	15%
Open fen	y = 0.398x + 11.952	R^2 = 0.867	P <0.0001	29	14%
Forested peatland	y = 0.485x + 13.532	R^2 = 0.955	P <0.0001	22	17%
Freshwater marsh	y = 0.2588x + 0.7974	R^2 = 0.799	P = 0.007	7	57%

*Notes: * Number of soil cores comprising both a thickness value and soil organic carbon density data at a minimum interval of 2 cm.*
*** Relative difference (% in absolute value) between predicted and measured soil organic carbon mass.*

While the McLaughlin et al. (2018) approach only provides a single linear regression for all peatland groups, their results are based on sites in the vicinity of the Hudson Bay Lowlands and were included in the study to compare results from both methods. To predict peat soil organic carbon mass from peat depth, McLaughlin et al. (2018) used published datasets by Packalen and Finkelstein (2014) and Packalen et al. (2014 and 2016) containing 364 peat depths, 100 peat ages, and 42 profiles of peat chemical and

physical properties. Below is their linear regression to calculate soil organic carbon mass (McLaughlin et al., 2018):

$$Soil\ Organic\ Carbon\ mass\ (kg/m^2) = 0.4\ (kg/m^3) * Peat\ Depth\ (m) + 17.2\ (kg/m^2) \quad (R^2 = 0.82)$$

2.1.4 Soil Organic Carbon Storage

To estimate the peatland soil organic carbon storage in tonne (t) within the Construction Disturbance Area and Local Study Areas, the respective study areas (m^2) were multiplied by the soil organic carbon mass (kg/m^2) results of Magnan et al. (2023) and McLaughlin et al. (2018) and converted in t/ha for every peatland polygon.

$$Soil\ Organic\ Carbon\ mass_{\ polygon}\ (t/ha) = Soil\ Organic\ Carbon\ mass\ (kg/m^2) * 10\ (m^2 * t / ha * kg)$$

$$Soil\ Organic\ Carbon\ storage_{\ polygon}\ (t) = Study\ Area\ (ha) * Soil\ Organic\ Carbon\ mass\ (t/ha)$$

Total soil organic carbon storage was then summed for every peatland group.

$$Total\ Soil\ Organic\ Carbon\ storage\ (t) = \sum Soil\ Organic\ Carbon\ storage_{\ polygon}\ (t)$$

The total result, with their descriptive statistics is presented in **Section 3.2**.

2.2 Carbon Flux

To establish the effects of the project on carbon fluxes, a literature review was carried out in order to obtain typical values of carbon dioxide (CO_2) and methane (CH_4) fluxes for peatlands. In this context, a flux is defined as the movement or transfer of gases, such as CO_2 or CH_4, in and out of the peatland ecosystem (Saraswati et al., 2023). In peatland ecosystems, carbon fluxes are influenced by the balance between carbon absorbed by plants and carbon released through respiration and decomposition (Bubier et al., 2003; Clymo et al., 1998; Potter et al., 2001). CO_2 and CH_4 fluxes are determined by the difference between carbon taken up by plants during photosynthesis and the carbon released during respiration and decomposition (Bubier et al., 2003; Clymo et al., 1998). Factors like temperature, soil moisture, vegetation type, and sunlight affect these fluxes (Alm et al., 1999; Chivers et al., 2009; Limpens et al., 2008; Munir et al., 2015). Note that negative flux values represent a sink (carbon sequestration) whereas positive values represent a source of carbon to the atmosphere.

The values selected attempt, as closely as possible, to represent local conditions in the Hudson Bay Lowlands. To be consistent with the approach of McLaughlin et al. (2018), as stated in the AECOM draft *All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021), reference CO_2 and CH_4 fluxes from boreal and subarctic peatlands were added to the analysis for comparison. **Table 2-8** provides the values used for CO_2 and CH_4 daily fluxes by peatland group. Only the CO_2 typical flux for bogs is outside of the reference peatland range determined by McLaughlin et al. (2018). Bogs typically store more carbon than fens and organic swamps due to their highly

waterlogged and acidic conditions, which promote the buildup of peat that is rich in carbon and has a greater density (Gorham, 1991; Limpens et al., 2008). Also, the variability in peat thickness across a vast and diverse landscape means that current carbon storage estimates may be subject to significant uncertainty especially for Hudson Bay Lowlands (Gonsamo et al., 2024). This uncertainty could be related to several parameters that influence peatlands, including water level, temperature, vegetation type, microbial activity, soil chemical composition, and anthropogenic disturbances (Moore et al., 1998; Straková, 2010).

No reliable data on carbon fluxes for organic marshes was found. As this peatland group represent less than 2% of the total study area of the Construction Disturbance Area (**Table 2-8**), it was disregarded in the subsequent analysis.

Table 2-8: Typical Daily CO_2 and CH_4 Flux by Peatland Group (Mean ± Standard Deviation)

Peatland Group	CO_2 Flux (g CO_2 m²/day)	CH_4 Flux (mg CH_4 m²/day)	Reference
Bog	-3.8 ± 1.4	28.8 ± 7.8	Webster et al. (2018)
Fen	-0.9 ± 2.2	17.1 ± 6.0	Webster et al. (2018)
Organic Swamp	0.6 ± 0.1	13.5 ± 10.3	Davidson et al. (2022)
Reference Peatland	-0.2 ± 1.2	48.0 ± 47.0	McLaughlin et al. (2018)

2.2.1 Daily to Seasonal Carbon Flux

To provide a seasonal timescale of peatland carbon fluxes, the daily CO_2 and CH_4 fluxes were converted to growing season using Webster et al. (2018) equations.

$$Growing\ Season\ CO_2\ flux = \frac{Daily\ CO_2 \times Growing\ Season\ length}{5}$$

$$Growing\ Season\ CH_4\ flux = \frac{Daily\ CH_4 \times Growing\ Season\ length}{1000}$$

For the CO_2 seasonal flux, a scaling factor of 5 was used by Webster et al. (2018) to account for additional CO_2 fluxes that occur during the snow-free period outside of the growing season. The scaling factor was derived from literature studies reporting both daily and seasonal CO_2 flux. This factor ensures a 1:1 relationship between observed daily CO_2 flux and daily CO_2 flux calculated from seasonal data. For CH_4 seasonal flux, no scaling factor was necessary to convert daily CH_4 flux to seasonal CH_4 flux, but a factor of 1000 was applied to convert mg unit to g (Webster et al., 2018).

To determine the start and end of the growing season, meteorological data for the 1950-2012 period were obtained from a gridded observational dataset produced by Natural Resources Canada (NRCan) for the Study Area. This data set provides daily minimum and maximum temperature information based on the interpolation of meteorological stations (PCIC, 2023). The location for which the historical data were obtained is a central location within the Existing Conditions Local Study Area (51°29'15"N, -

86°40'1.56"W). Growing season length, in number of days, was calculated by subtracting the average day associated with the start of the growing season from the average day associated with the end of the growing season. The start of the growing season was defined as the first day on which the daily mean temperature is greater than or equal to 5 °C for five consecutive days on or after March 1, whereas the end of the growing season was defined as the first day on which the daily minimum temperature is below −2 °C on or after August 1. The average growing season length between 1950 and 2012 is 153 days.

2.2.2 Total Carbon Flux

The total carbon flux impacted by the three study areas was obtained by multiplying the peatland area with the typical carbon fluxes (**Table 2-8**) per peatland group for the daily and seasonal timescale.

*Total Carbon Flux (g/unit of time) = Study Area (m^2) * Carbon flux (g/m^2 * unit of time)*

For better comparison, CO_2 and CH_4 flux results were convert in tons (t).

Total Carbon Flux (t/unit of time) = Total Carbon Flux (g/unit of time) / 1,000,000 (t/g)

3. Results

3.1 Carbon Storage

Soil organic carbon storage using Magnan et al. (2023) and McLaughlin et al. (2018) methods (**Table 2-7**) have been calculated for every peatland group and the mean of all results are shown in **Table 3-1**. For every peatland group, the difference between the two methods have been calculated.

Within the Existing Conditions Local Study Area, estimated total soil organic carbon storage in peatlands amounts to 92,868,963 t and 96,303,101 t, depending on calculation method. Total soil organic carbon storage estimation in peatlands within the Effect Assessment Local Study Area amounts 58,224,122 t and 60,456,711 t, and within the Construction Disturbance Area, 1,378,912 t and 1,382,779 t, respectively. The main soil organic carbon storage is found in fens and organic swamps, as these peatland groups represent more than 95% of the studied areas. Within the Construction Disturbance Area, organic swamps account for most of the soil organic carbon storage, whereas within the Local Study Areas, fens represent the main peatland group stocking carbon within their soil.

Table 3-1: Soil Organic Carbon Storage per Peatland Group by Study Area

Study Area	Peatland Group	Area (ha)	Soil Organic Carbon storage (t)		Difference Between Methods
			Magnan et al. (2023)	McLaughlin et al. (2018)	
Existing Conditions Local Study Area *	Bog	2,172	2,604,625	2,634,339	1%
	Fen	74,069	63,511,786	67,680,892	6%
	Organic Marsh	2,407	1,119,747	2,115,525	47%
	Organic Swamp	45,328	25,632,806	23,872,345	-7%
	Total	**123,976**	**92,868,963**	**96,303,101**	**4%**
Effects Assessment Local Study Area **	Bog	1,439	1,767,610	1,782,190	1%
	Fen	46,084	40,157,785	42,757,024	6%
	Organic Marsh	1,511	781,715	1,449,763	46%
	Organic Swamp	27,782	15,517,013	14,467,734	-7%
	Total	**76,815**	**58,224,122**	**60,456,711**	**4%**
Construction Disturbance Area ***	Bog	29	24,157	25,864	7%
	Fen	786	557,668	601,179	7%
	Organic Marsh	26	11,775	22,412	47%
	Organic Swamp	1,309	789,179	729,457	-8%
	Total	**2,150**	**1,382,779**	**1,378,912**	**-0.3%**

*Notes: *6 km buffer encompassing all route options*
***6 km buffer along the Preferred Route (i.e., 3 km each side of the alignment centreline)*
****100 m buffer along the Preferred Route alignment (i.e., 50 m each side of the alignment centreline) plus temporary construction access roads, work areas, worker camps, pits, quarries, and associated access roads.*

The **Table 3-2** shows that the differences between the two methods are relatively small for bogs, fens and organic swamps. In contrast, the differences between the results of Magnan et al. (2023) and McLaughlin et al. (2018) for organic marshes is 46% (Effects

Assessment Local Study Area) and 47% (Existing Conditions Local Study Area and Construction Disturbance Area). This can be explained by the fact that Magnan et al. (2023) consider a conservative peat accumulation for wetlands (see definition in Section 2.1.3), whereas McLaughlin et al. (2018) consider a uniform carbon mass within the different peatland groups. By using both methods, we can present a range of values, from more conservative to less conservative, providing a comprehensive assessment of carbon storage.

3.2 Carbon Flux

3.2.1 Total Carbon Flux

Carbon Dioxide (CO_2)

Within the Existing Conditions Local Study Area, the total CO_2 flux amounts to -464 t by day and -14,186 t by season, and within the Effects Assessment Local Study Area, the total CO_2 flux are -294 t by day and -9,009 t by season. Total CO_2 flux within the Construction Disturbance Area amount to 0.06 t by day and 1.88 t by season.

Daily and seasonal CO_2 fluxes for bogs and fens are negative, meaning these ecosystems are considered CO_2 sinks from the atmosphere. The CO_2 flux for organic swamps is positive, meaning this specific peatland group is considered a source of CO_2 to the atmosphere. Bogs and fens are carbon sinks because their waterlogged conditions slow decomposition and promote peat formation (Gorham, 1991; Limpens et al., 2008). In contrast, organic swamps are carbon sources due to fluctuating water levels that increase decomposition and carbon emissions (Bridgham et al., 2006). Bogs generally store more carbon than fens and organic swamps because their highly waterlogged, acidic conditions lead to the accumulation of peat, which is rich in carbon and has a higher density (Gorham, 1991; Limpens et al., 2008). The higher peat density in bogs is primarily due to the slow decomposition rates in these environments, which allow for greater accumulation of partially decomposed organic matter. Fens, while also peat-forming, are less acidic and receive nutrients from groundwater, resulting in slightly higher decomposition rates and lower peat density (Singh et al., 2023). Organic swamps, with their fluctuating water levels, tend to have even higher decomposition rates, leading to lower peat density and higher carbon release (Bridgham et al., 2006). Because of the predominance of fens in the two Local Study Areas, the conclusions are completely different from the Construction Disturbance Area, resulting in an important net sequestration of CO_2 in the soil at the Local Study Area scale.

From their nominal daily value found in the literature, the highest CO_2 flux variability is found in fens, with a coefficient of variation (daily standard variation divided by daily flux) of 244%, followed by bogs (37%) and organic swamps (16%). The high flux variability found in the fen could be related to the few numbers of observation in Webster et al. (2018) study (n=7), explaining the important standard deviation. Although

we have a limited representation of fen in Webster et al. (2018), the article separates the equations based on the type of peatland specific to the Hudson Bay Lowlands region, whereas McLaughlin et al. (2018) use a single equation that applies to all peatland types without distinction.

Table 3-2: Daily and Seasonal CO_2 Flux per Peatland Group by Study Area (Mean ± Standard Deviation)

Peatland Group	Study Area	Daily CO_2 flux (t CO_2/day)			Seasonal CO_2 flux (t CO_2/Growing Season)		
Bog	Existing Conditions Local Study Area **	-83	±	30	-2,526	±	930
	Effects Assessment Local Study Area ***	-55	±	20	-1,673	±	616
	Construction Disturbance Area ****	-1	±	0.41	-34	±	12
Fen	Existing Conditions Local Study Area **	-667	±	1,630	-20,399	±	49,863
	Effects Assessment Local Study Area ***	-415	±	1,014	-12,691	±	31,023
	Construction Disturbance Area ****	-7	±	17	-217	±	529
Organic swamp	Existing Conditions Local Study Area **	286	±	45	8,738	±	1,387
	Effects Assessment Local Study Area ***	175	±	28	5,356	±	850
	Construction Disturbance Area ****	8	±	1.31	252	±	40
Total	Existing Conditions Local Study Area **	-464	±	1,630*	-14,186	±	49,891*
	Effects Assessment Local Study Area ***	-294	±	1,014*	-9,009	±	31,041*
	Construction Disturbance Area ****	0.06	±	17*	1.88	±	531*

*Notes: * Assuming there is no covariance among the peatland groups, the total standard deviation was calculated by taking the square root of the sum of each variable variance.*
**6 km buffer encompassing all route options*
***6 km buffer along the Preferred Route (i.e., 3 km each side of the alignment centreline)*
****100 m buffer along the Preferred Route alignment (i.e., 50 m each side of the alignment centreline) plus temporary construction access roads, work areas, worker camps, pits, quarries, and associated access roads.*

Methane (CH_4)

Within the Existing Conditions Local Study Area, the total CH_4 flux amount to 19 t by day and 2,970 t by season, and within the Effects Assessment Local Study Area, the total CH_4 flux are 12 t by day and 1,843 t by season. Total CH_4 flux within the Construction Disturbance Area amounts to 0.32 t by day and 49 t by season (**Table 3-3**).

For every peatland group, CH_4 flux is positive, meaning peatlands within the Project are considered like a source of CH_4 to the atmosphere. Representing more than 95% of the studied area, fens and organic swamps account for most of the total CH_4 flux in the three study areas. Highest CH_4 flux variability is found in organic swamps, with a coefficient of variation (daily standard variation, from Webster et al. (2018) and Davidson et al. (2022), divided by daily flux) of 76%, followed by fens (35%) and bogs (27%).

Table 3-3: Daily and Seasonal CH_4 Flux per Peatland Group by Study Area (Mean ± Standard Deviation)

Peatland Group	Study Area	Daily CH_4 Flux (t CH_4/day)			Seasonal CH_4 Flux (t CH_4/Growing Season)		
Bog	Existing Conditions Local Study Area **	0.63	±	0.17	96	±	26
	Effects Assessment Local Study Area ***	0.41	±	0.11	63	±	17
	Construction Disturbance Area ****	0.008	±	0.002	1.29	±	0.35
Fen	Existing Conditions Local Study Area **	12.67	±	4.44	1,938	±	680
	Effects Assessment Local Study Area ***	7.88	±	2.77	1,206	±	423
	Construction Disturbance Area ****	0.13	±	0.05	21	±	7
Organic swamp	Existing Conditions Local Study Area **	6.12	±	4.67	936	±	714
	Effects Assessment Local Study Area ***	3.75	±	2.86	574	±	438
	Construction Disturbance Area ****	0.18	±	0.13	27	±	21
Total	Existing Conditions Local Study Area **	19	±	6*	2,970	±	987*
	Effects Assessment Local Study Area ***	12	±	4*	1,843	±	609*
	Construction Disturbance Area ****	0.32	±	0.14*	48.89	±	22*

*Notes: * Assuming there is no covariance among the peatland groups, the total standard deviation was calculated by taking the square root of the sum of each variable variance.*
**6 km buffer encompassing all route options*
***6 km buffer along the Preferred Route (i.e., 3 km each side of the alignment centreline)*
****100 m buffer along the Preferred Route alignment (i.e., 50 m each side of the alignment centreline) plus temporary construction access roads, work areas, worker camps, pits, quarries, and associated access roads.*

4. Synthesis

As part of the study requirements outlined in the *All Season Community Access Road: Peatlands Study Plan* (AECOM, 2021), carbon storage and fluxes in peatlands impacted by the Marten Falls First Nation Community Access Road Preferred Route Alternative were assessed. To formulate a range of results and inform the assessment of changes to carbon storage and fluxes resulting from the preferred route alternative, calculations were performed in three study area scenarios – the Existing Conditions Local Study Area (6 km buffer encompassing all route options), the Effects Assessment Local Study Area (6 km buffer along the Preferred Route (i.e., 3 km each side of the alignment centreline)), and the Construction Disturbance Area (100 m buffer along the Preferred Route alignment (i.e., 50 m each side of the alignment centreline) plus temporary construction access roads, work areas, worker camps, pits, quarries, and associated access roads) (see *Draft Peatlands Technical Support Document: Existing Conditions & Effects Assessment* for more details on study areas). The total area for every peatland group within these three study areas was calculated by GIS based on the *Marten Falls Community Access Road: Peatlands Mapping. Prepared for the Marten Falls Community Access Road Project* (WSP, 2024). Soil organic carbon storage in peatland soils was then estimated by linear regression using field-measured peat thickness as the explanatory variable. Typical daily flux of CO_2 and CH_4 by peatland group were found in the scientific literature work near the Project Area. Seasonal carbon flux (CO_2 and CH_4) was also evaluated for a growing season of 153 days. Carbon fluxes were detailed for all study area scenarios by multiplying the peatland area within the three studied areas (see **Section 2.2.2** for calculation details). Note that negative flux values represent a sink (carbon sequestration) whereas positive values represent a source of carbon to the atmosphere. The key findings of this study are as follows.

Carbon Storage

- For the Existing Conditions Local Study Area, total soil organic carbon storage ranges from 92,868,963 t to 96,303,101 t of carbon.
- For the Effects Assessment Local Study Area, total soil organic carbon storage ranges from 58,224,122 t to 60,456,711 t of carbon.
- For the Construction Disturbance Area, total soil organic carbon storage ranges from 1,378,912 t to 1,382,779 t of carbon.

Carbon dioxide (CO_2)

- Daily CO_2 fluxes for the total peatland area within the Existing Conditions Local Study Area, the Effects Assessment Local Study Area, and the Construction Disturbance Area are -464 t, -294 t, and 0.06 t, respectively.

- Seasonal CO_2 fluxes for the total peatland area within the Existing Conditions Local Study Area, the Effects Assessment Local Study Area, and the Construction Disturbance Area are -14,186 t, -9,009 t, and 1.88 t, respectively.

Methane (CH4)

- Daily CH_4 fluxes for the total peatland area within the Existing Conditions Local Study Area, the Effects Assessment Local Study Area, and the Construction Disturbance Area are 19 t, 12 t, and 0.32 t, respectively.
- Seasonal CH_4 fluxes for the total peatland area within the Existing Conditions Local Study Area, the Effects Assessment Local Study Area, and the Construction Disturbance Area are 2,970 t, 1,843 t, and 49 t, respectively.

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