CREE DEVELOPMENT CORPORATION

LA GRANDE ALLIANCE

LA GRANDE ALLIANCE

PRE-FEASIBILITY STUDY – PHASES II & III – TRANSPORTATION INFRASTRUCTURE

TECHNICAL NOTE 6
TERRESTRIAL ENVIRONMENT

FINAL VERSION

DATE: MARCH 25, 2024

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2024-03-26

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EXECUTIVE SUMMARY

The main purpose of this technical note 6, which is part of Report No. 2 (Socio-Environmental Survey), is to provide a general overview of the terrestrial natural environment crossed by the various La Grande Alliance proposed transportation infrastructures components as presented in Table 1-1.

Table 1-1 La Grande Alliance proposed Infrastructures Overview

PHASE	ACTIVITY
Phase II	A proposed 207 km road extension from La Grande to Whapmagoostui/Kuujjuarapik
	A proposed 340km railway from Rupert to La Grande
	A proposed 376km upgrade & extension of Route 167 to the Trans-Taiga Road
Phase III	A proposed 219 km rail extension from La Grande to Whapmagoostui/Kuujjuarapik
	A proposed Deepwater Port in Whapmagoostui/Kuujjuarapik (which was further redefined to a harbour, refer to Technical Note 13A)

As shown on the Figure 1-1, the study area is located within the territory of the Eeyou Istchee Baie-James region of northern Québec. The study area is divided in three zones:

- Study Area 1 (SA1): Billy-Diamond Highway Railway – Rupert – La Grande
- Study Area 2 (SA2): Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/Kuujjuarapik
- Study Area 3 (SA3): Route 167 - Renard Mine – Trans-Taiga Road.

It is to be noted that these study areas are slightly different that the ones described in La Grande Alliance MOU, thus, to suit the proposed infrastructures scope.

This Technical Note 6 also aims to highlight how these issues will need to be considered during the design process of the proposed infrastructures. Finally, gaps in available information are also highlighted to guide the next steps in information acquisition. It should be noted that engagement activities with local communities have also provided detailed information on natural environment in some areas including the identification of highly sensitive areas (HSAs) identified some sensitive natural sites,), which will also need to be considered in the design. Refer to Technical Note 3for more details regarding engagement with land users.

It should be noted that, during the Study, the proposed roadway of La Grande to Whapmagoostui/Kuujjuarapik was moved to the feasibility stage and thus led to additional work within Study Area 2 (SA2). A photo-interpretation of the vegetation, wetlands and watercourses was carried out over a 1-km wide corridor along the proposed alignment. In addition, a preliminary field campaign was carried out to sample vegetation, wetlands and aquatic habitats. This new information made it possible to refine our understanding of the surrounding environment and potential issues and constraints to be considered for the proposed alignment.

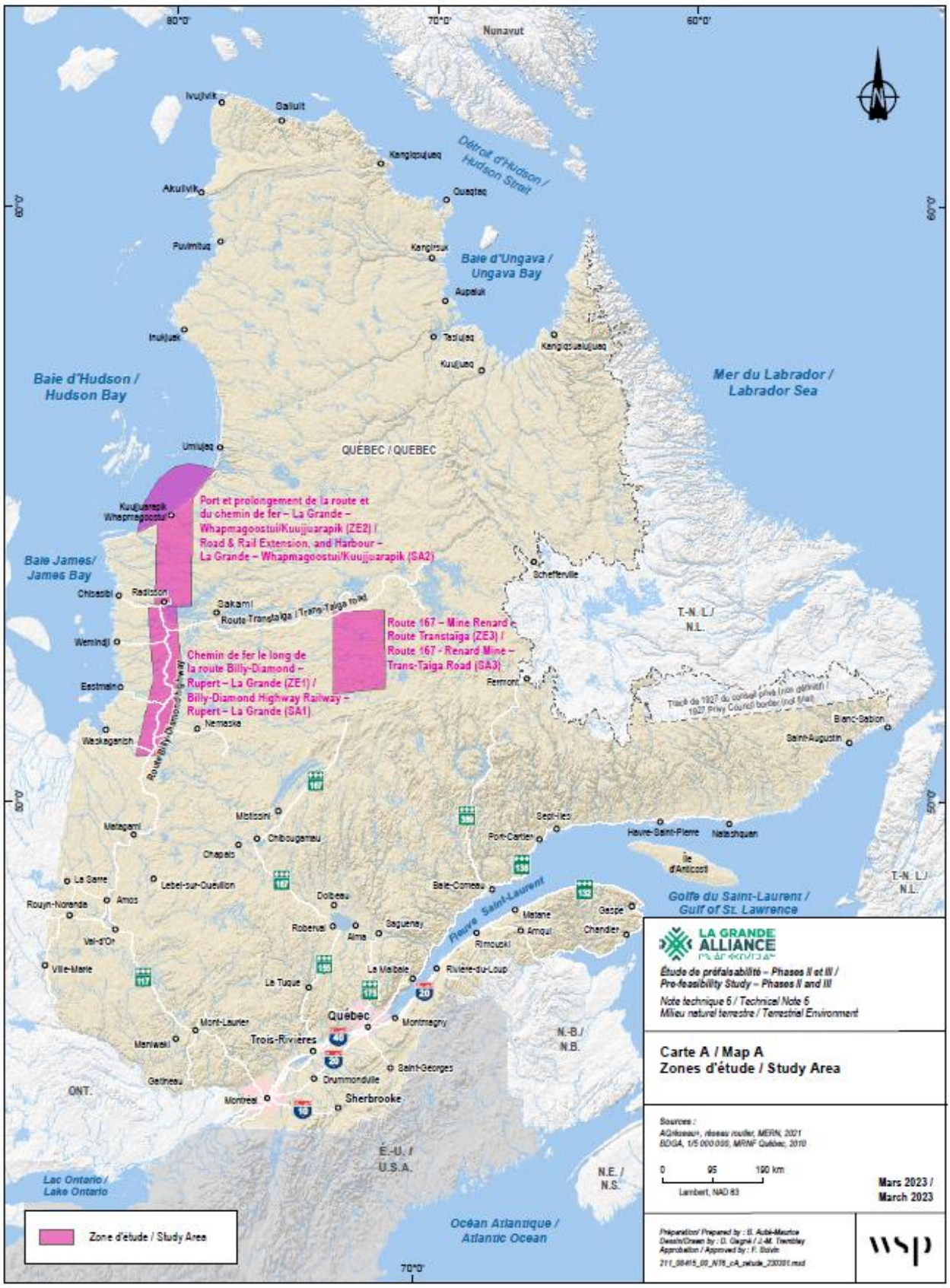

Figure 1-1 Study Area

PORTRAIT OF THE NATURAL ENVIRONMENT

PHYSICAL ENVIRONMENT

The terrestrial portion of the study infrastructures is located entirely on the Canadian Shield in the Superior geological province. SA1 and SA2, located in the western part of Eeyou Istchee, runs parallel to James Bay, some 80 km inland. The northern end of SA2, however, reaches south of Hudson Bay. At its northernmost point, the area covers either side of the communities of Whapmagoostui and Kuujjuarapik. Elevation in most of SA1/SA2 fluctuates around 100 m, ranging from 0 to 250 m. The terrain forms an undulating plain that slopes slightly to the west. SA3 is located much further east, near the geographic center of Québec. This area, which is a platform punctuated by hills, is at a higher elevation, generally in the range of 400 to 600 m, and up to 800 m in the southern part of the area.

In terms of unconsolidated deposits, the three study areas present fairly distinct characteristics. SA1 is characterized by a significant presence of undifferentiated organic sediments (26% of the area), while several other types of deposits (undifferentiated till, undifferentiated bedrock, nearshore and littoral glaciomarine sediments, fine deepwater glaciomarine sediments) are relatively well represented, with proportions ranging from 10 to 20%. Bedrock outcrops in abundance in study area SA2, which is thus dominated by undifferentiated bedrock (36%). Undifferentiated till is also well represented in this area (32%).

In the case of the SA3, the vast majority of the area is characterized by undifferentiated till (85%). Granular materials with potential as a source of borrow material (e.g., proglacial outwash sediments, juxta glacial sediments, frontal moraine sediments) are found in all three zones in much lower proportions.

Regarding hydrography, the location of SA1 and SA2 near James Bay and Hudson Bay results in the presence of many major rivers that cross the study areas from east to west, including, from south to north, the Rupert, Pontax, Eastmain, Opinaca, La Grande, Piagochioui, Roggan, Vauquelin and Grande Baleine rivers. SA3 is largely devoid of large rivers, but the upstream portion of the La Grande River flows through it. Lakes are abundant throughout the area. However, they are most present in zone SA3. The presence of the Robert-Bourassa Reservoir, at the junction of zones SA1 and SA2, is also noteworthy.

VEGETATION AND WETLANDS

The proposed infrastructures are located entirely within the boreal vegetation zone. In general, due to harsh climatic conditions, the plant species present are common and not considered very diversified compared to southern Québec. The vegetation is dominated by black spruce (*Picea mariana*). Almost the entire study area lies in the lichen spruce forest bioclimatic domain, which corresponds to sparse forest. The spruce-moss domain is also represented in the southern part of SA1, while the forest-tundra domain is present at the northern end of SA2, along Hudson Bay. The proposed infrastructuresare located north of the commercial forest boundary and the forest fire suppression zone. Except for hydroelectric reservoirs, the forest landscape in the study area has therefore been subject to very little anthropogenic influence. Large parts of the study areas have been affected by forest fires in recent decades, especially in area SA1. Field data gathered on SA2 reveals that the floral diversity is relatively poor with a total of 241 species recorded in 68 stations inventoried. No special-status plant species or invasive exotic species were identified during the inventory.

Wetlands are scattered throughout the study area. General information sources indicate that they are most abundant in SA1. However, photo-interpretation conducted in the summer of 2022 in a small portion of SA2 suggests that the proportion of wetlands is greater than expected, i.e. of the same order of magnitude as in SA1. In general, peatlands are by far the dominant wetland type in the area. Bogs are generally more widespread than fens. Other wetland types include marshes, swamps, and shallow waters colonized by aquatic plants, but these are generally much smaller than bogs and less abundant. Wetlands provide many ecological functions and habitats ofinterest.

With respect to rare plant species, the CDPNQ reports a total of eight records for protected plant species within the study areas, including two species of vascular flora and six species of mosses. These records are not new

(> 40 years) and are almost all concentrated in a small sector along Hudson Bay. This area is of particular interest for rare or endangered plant species because of its characteristics (calcareous soils, maritime influence, shores, unstable rocky hills). In addition to this small area along Hudson Bay, the shoreline of the major rivers (e.g., Rupert, La Grande, Grande Baleine) also has some potential for rare or endangered plant species, whereas the rest of the study areas have a very low potential for these species. It should be noted that the summer 2022 field campaign did not result in the identification of any plant species of precarious status in SA2, despite an extensive inventory of plant species conducted at 68 different stations, including 9 stations located in the area along Hudson Bay, which is considered to be more suitable for these species.

ICHTHYOFAUNA AND FISH HABITAT

With the many lakes and rivers that criss-cross the study area, there are numerous habitats suitable for fish. In northern Quebec, the diversity of freshwater fish species decreases as one moves further north and east. The region's harsh climate influences species diversity, as well as life cycles. Freshwater fishes found in the region tend to be slow growing, late maturing and long-lived. In total, 34 fish species could potentially be found in the study area, of which 30 are confirmed or highly probable. SA1 has the highest species diversity (27 confirmed or highly probable), followed by SA2 (21 species) and SA3 (19 species). Lakes and rivers have similar communities, but species diversity is lower in small rivers. Field data gathered on SA2 reveals that the majority of the waterways surveyed are inhabited by fish (31 out of 34). Due to the generally flat topography, the streams in SA2 are slow flowing in the area of the proposed road and few impassable obstacles to fish migration were identified. Fishing and environmental DNA analysis also revealed the presence of approximately 20 fish species in the streams crossed by the proposed road.

The species of greatest interest are those that are subject to traditional or sport fishing, notably walleye (*Sander vitreus*), lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), lake cisco (*Coregonus artedi*), brook trout (*Salvelinus fontinalis*), northern pike (*Esox lucius*) and lake sturgeon (*Acipenser fulvescens*). Lake sturgeon is of particular interest and is found in the large rivers and lakes of SA1 and the southern limit of SA2. This species has a traditional importance for Cree communities. Lake sturgeon is protected by both provincial and federal authorities. This species, as well as the majority of fish species of interest reported in the study area, reproduce in fast-flowing water, on gravelly or rocky well-oxygenated substrates. Such sites are often located at the foot of rapids, particularly upstream of long, calm stretches. The spawning grounds used by the fish are particularly sensitive, since they tend to be less widespread and play a key role in recruitment. Furthermore, as rapids are often located where the river narrows, they tend to be selected for crossings and bridges, such that proper mitigation is key.

HERPETOFAUNA

Herpetofauna is not considered very diversified in northern Quebec. The species that are present tend to be widespread and well-adapted to the harsh climate. In the area crossed by the proposed infrastructures, nine species of amphibians are potentially present while only one species of reptile is found. However, most of these species reach the northern limit of their range within the study area. The more northerly section of SA2 has a lower diversity of amphibians and reptiles. Wetlands, lakes, watercourses and surrounding terrestrial environments are good habitats for herpetofauna. Due to its more southerly location and the particularly high abundance of wetlands, SA1 has the best potential for herpetofauna.

AVIAN FAUNA

Although the diversity of species is lower than in southern Quebec, a total of 184 bird species are likely to be found in the study area at some time during the year. These species use a variety of habitats, particularly forest and wetland environments. Of these species, 108 species have been confirmed as nesting in the region. A total of 14 species of birds classified at risk have been reported in the study area. These species include forest and open-water birds, ducks, shorebirds and raptors. In general, however, many of these species are associated with wetland or water habitats. An update of the species at risk reported in the study area will however have to be done in the next steps of the development of the proposed infrastructures, since the lists are regularly updated by both provincial and federal authorities. It should be noted that the status of certain bird species is currently under review by provincial authorities.

The largest number of bird species (159 species) is found in SA2, likely due to the presence of marine species in this area reaching Hudson Bay. It is also the only area among the three study areas with Important Bird Areas (IBAs) [Zones importantes pour la conservation des oiseaux (ZICO)], one of which is located along the Great Whale River. This area, which also includes parts of the major downstream tributaries of the River, is an important nesting area for the endangered harlequin duck (*Histrionicus histrionicus*).

MAMMALS

A total of 54 species of terrestrial mammals have been recorded in the study area, including small, fur-bearing and large mammals. These are broken down as follows: six species of bats, 17 species of small mammals, 26 species of small wildlife/fur-bearers and five species of large wildlife (including bears, which can also be considered fur-bearers). Excluding caribou (*Rangifer tarandus*), which is the subject of a separate chapter, 10 species of mammals at risk are likely to be found in at least one of the study areas, including five species of bats, three species of carnivores and two species of rodents. As stated previously, the species at risk list will have to be updated during the next steps of the development of the proposed infrastructures. The status of some mammal species that can be found in the Study Area is currently being reviewed by provincial authorities. Field data gathered on SA2 reveals several signs of large ruminants (caribou and muskox (*Ovibos moschatus*)), beavers and black bears (*Ursus americanus*) were noted in the field.

Most small species, especially small mammals and small fauna, have small home ranges. In contrast, large wildlife species and some fur-bearers sometimes occupy large territories and can move over very large distances. It is mainly these species that are likely to be affected by the infrastructures under study. Among the large wildlife species, the presence of moose (*Alces alces*) is noteworthy, since this species is popular with sport and traditional hunters. In the study areas, however, the density of this cervid is low and it is found only in the southern part of the territory.

CARIBOU

The caribou is an emblematic cervid of northern Quebec and is of traditional importance to the Cree communities. In the study area, both the migratory and forest ecotypes are found. Migratory caribou make long annual migrations between the tundra and the boreal forest. Although it has declined in recent decades, it has no particular protection status. In Québec, migratory caribou are divided into two herds, the Leaf River herd and the George River herd, both of which may be present in the study area for part of the year.

Remote sensing data obtained from the MFFP indicate that migratory caribou occur in all three study areas but are less abundant in the southern parts of SA1 and SA3.

As for woodland caribou, which live year-round in the boreal forest, five herds are likely to be present in the study area: the Assinica, Nottaway and Reconnaissance herds in area SA1 and the Caniapiscau, Témiscamie and Reconnaissance herds in area SA3. Remote sensing data obtained from the MFFP indicate that the southern end of area SA1 and the area near the Eastmain River are used by woodland caribou, although they are absent from the northern half of this zone. Caribou are also present in SA3, mainly in the southernmost part of this zone, as well as

in the entire eastern half. MFFP data also indicate that woodland caribou are absent from area SA2. Unlike migratory caribou, woodland caribou is considered at risk, both provincially and federally. It should also be noted that it is generally present in very low density, in the order of 1 to 2 individuals per 100 km^2, and its home range is vast (> 1000 km^2). Spatial distribution and habitat heterogeneity play an important role in meeting the needs of woodland caribou over an annual cycle. Large forest areas are sought after by the species, particularly in winter. Conversely, woodland caribou avoid recently disturbed environments such as burnt areas or forest cuttings, as well as linear anthropogenic infrastructures such as power transmission lines or roads. In the latter case, caribou avoidance of roads is proportional to traffic intensity.

TERRESTRIAL PROTECTED AREAS

Several projected protected areas are included in the study areas, but these do not yet have a definitive status. These include three projected biodiversity reserves and eight territorial reserves for protected area purposes (RTFAP). The objective of the biodiversity reserves is to promote the maintenance of biodiversity in the terrestrial environment and, more specifically, the representativeness of the various natural regions of Quebec. The status of territorial reserves for protected area purposes (RTFAP) allows for the recognition of the protected status for a territory before it is granted legal protection status. The largest number of proposed protected areas is found in the study area SA1. SA1 is also where the proposed infrastructuresare most likely to conflict with those areas, as several border are crossed by the Billy-Diamond Highway (it should be noted that a buffer area 500 m on either side of the highway corridor is excluded from protection in most projected protected areas to allow for various works related to the transportation corridor).

WILDLIFE MANAGEMENT

The study areas are located entirely in Hunting Zone 22, while they are divided between fishing Zone 22 South and Zone 22 North. These areas can be used by sport hunters and fishers on Category III lands, as defined by the James Bay and Northern Québec Agreement (JBNQA). Hunting, fishing and trapping on Category I and II lands, located closer to Cree communities, is only permitted for Crees, although non-Crees can harvest some species with the explicit written approval of the community where the activities are taking place. These lands cover nearly 30% of SA1 (Waskaganish, Eastmain and Wemindji), two thirds of the land portion of SA2 (Chisasibi and Whapmagoostui), while they are absent from SA3. In addition to the species that are usually targeted by hunting or sport fishing, Cree land users harvest several other traditionally important wildlife species, and some species designated under the JBNQA are reserved exclusively for their use, such as beaver (*Castor canadensis*) and lake sturgeon.

ISSUES AND CONSTRAINTS TO DEVELOPMENT

Generally speaking, the most sensitive components of the natural environment are wetlands, aquatic habitats, protected areas and woodland caribou habitat. There are also particularly sensitive habitats such as spawning grounds and other habitats of special interest, such as those important for specific species at risk. Although topography and geomorphology are not sensitive components, they are also identified as issues since they influence the infrastructures design. The following is a summary of how these different elements impact on the infrastructures' design or how this will need to be adapted accordingly:

- Topography: For technical reasons, the selected routes should, as far as possible, be established in relativelyflat areas. Areas with steep slopes should therefore be avoided.
- Geomorphology: The proposed routes should avoid areas of low bearing capacity, including peat-dominated areas and sensitive clay deposits. In addition, the choice of route should also take into account the presence of sources ofgranular material suitable for the construction of the railway or road foundation. Such sources should ideally bedistributed at different locations in the vicinity of the alignments, in order to minimize the transport of granularmaterial during construction as well as the ecological footprint of the potential infrastructures.

- Wetlands: Wetlands are habitats of significant ecological interest that should be avoided as much as possible by the new infrastructures. A vegetated protection strip should also be maintained around any wetland area to avoid encroachment effects. Any encroachment on wetlands will likely require adequate compensation by government authorities. The Regulation respecting compensation for adverse effects on wetlands and bodies of water (chapter Q-2, r. 9.1) does not apply to the study's areas. However, compensation could be required by COMEX or KEQC during the environmental assessment.
- Aquatic habitats and waterbodies: Lakes and watercourses are both important physical barriers to the proposed infrastructures and valued aquatic habitats. Lakes, including a riparian strip surrounding them (60 m for permanent watercourses and 30 m for intermittent ones), should be avoided by the selected alignments. As for rivers and streams, these will inevitably need to be crossed by the infrastructures. The number of crossings should ideally be minimized and the choice of crossing sites attempt to minimize the width of the crossings. Conversely, the design of crossings should also aim to minimize encroachment into important aquatic habitat, in particular spawning grounds, and the presence of sensitive habitats should always be considered. Finally, the numerous culverts planned will generally have to be designed to ensure that free upstream fish passage is maintained. It should be noted that encroachments into fish habitat will have to be compensated.
- Woodland caribou habitat: The proposed infrastructures will inevitably encroach on some woodland caribou habitat. Where possible, the selected routes should be located along existing infrastructure corridors where present since Woodland caribou tend to avoid existing infrastructure corridors, such that these areas are considered low quality habitat. In SA3, for which there is currently no existing infrastructure, the road corridor should avoid the eastern half, which is much more frequented by woodland caribou. Woodland caribou are unlikely to be found in SA2, although it would nevertheless be advantageous for the new railway to be located as close as possible to the future road.
- Protected areas: The selected routes should be located outside projected protected areas as much as possible, regardless of the latter's legal status. In the case of SA3, it would be advantageous for the route to pass to the west of the territorial reserve for protected area purposes (RTFAP) Aawiitakuch, to avoid the future road passing between two separate blocks of this reserve, which could hinder the connectivity between these two areas.
- Habitats of particular interest: Some particularly sensitive habitats could potentially be affected by the infrastructures under study. Where appropriate, routes should ideally be adjusted to avoid or minimize impacts on these habitats. Regarding aquatic habitats, spawning grounds are particularly sensitive habitats, while aquatic grass beds are also of interest. Habitats important for rare or endangered species of fauna and flora should also be avoided, especially if their geographic extent is limited.

This Technical Note 6 provides an overview of the potential impacts of the proposed infrastructures on the natural environment as well as some potential mitigation measures that could be considered during the Construction and/or Operation Phases of the new infrastructure. These elements will require to be further detailed in the next phases of the study, more specifically during the Environmental and Social Impact Assessment (ESIA) process, where these will be explicitly required by authorities

GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

For each of the issues identified above, work will have to be carried out during the next stages of the study to further understand the effects of the proposed infrastructures on the surrounding natural environment. The following lines identify the main gaps based on available information and propose actions to be taken in the subsequent stages of the study. It is important to note that knowledge on northern Quebec's natural environment is evolving rapidly and several studies currently underway (e.g., on wetlands, caribou and fishes) will have to be taken into account in the next steps of La Grande Alliance.

- Topography: In the next stages of the study, a complete LIDAR survey will have to be generated for each ofthe proposed routes in order to have an accurate picture of the topography.
- Geomorphology: a photo-interpretation will have to be carried out in order to specify the delimitation of wetlands and deposits made up of unstable materials. This exercise will also identify sources of borrow material

that could potentially be used during the works. In a second phase, it is recommended that an airbornesurvey of these potential sources of borrow materials be carried out to determine the quality and volume of these materials. Finally, the nature of the soils crossed by the selected routes should also be confirmed and specified by geotechnical surveys. It should be noted that in the case of area SA2, gaps in the available information were partially filled during a geotechnical drilling campaign carried out in the summer of 2022 (see Technical Note 10).

- Wetlands: The delimitation of wetlands, likely to be affected by the proposed infrastructures, will have to be clarified by a complete photo-interpretation along the routes, since the information available from CanVec (Canada vectorial) is relatively imprecise. Subsequent field campaigns will make it possible to specify the characteristics of the wetlands potentially affected. In the case of SA2, work conducted in summer 2022 as part of the Feasibility Study refined the delineation of wetlands along the proposed alignment and their characteristics, so that the proposed alignment could be optimized.
- Aquatic habitats: It is recommended that a photo-interpretation of the watercourses crossed by the proposed infrastructuresbe carried out in order to identify the smaller watercourses and to specify their exact location.This exercise will also help determine the optimal crossing sites and will identify certain sensitive habitats. Subsequent field campaigns should aim to characterize in detail the aquatic habitats crossed, which will make it possible, in particular, to specify the impacts and to confirm watercourses for which structures to allow the free passage of fish will be required. For SA2, work carried out in summer 2022 confirmed the precise location and characteristics of the watercourses along the proposed alignment. Further work to characterize in detail the proposed crossing sites will nevertheless be required in future stages.
- Woodland caribou habitat: Information available on woodland caribou is based on precise data from telemetric monitoring carried out by the MFFP. Nevertheless, it will likely be beneficial to conduct additional aerial surveys in future phases, to validate the presence of wintering areas within a 10 km buffer zone on either side of the alignment. Such data would make it possible to better understand the impact on woodland caribou during the winter and to identify appropriate mitigation measures to minimize the risk of collision (e.g. signage or specific monitoring procedures using radio collars).
- Protected areas: In the event that the proposed routes cross or pass close to a projected protected area, the responsible authorities will need to be consulted at an early stage in order to fully understand the possible ways to make theproposed infrastructures compatible with the potentially affected areas. As these areas do not yet have a definitive status, there may be some flexibility in the final delineation of these areas, provided that conservation objectives are not compromised.
- Habitats of particular interest: Close attention should be paid to habitats of particular interest identified during engagement sessions with Cree land users (see Technical Note 3). This should include a detailed inventory with land users as well as photo-interpretation of watercourses crossed by the proposed infrastructuresto identify potential spawning grounds and other aquatic habitats of interest such as grass beds, in particular for smaller waterbodies. With regard to species at risk, future field campaigns should pay particular attention to potential habitats for these species, by photo-interpretation as well as with land users for the areas in question. The field campaigns will have to pay particular attention to the habitats which are of particular interest for rare plant species, especially in the area near Hudson Bay which is considered more suitable for these species.

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G AQUATIC HABITAT INVENTORY SHEETS

H ENVIRONMENTAL DNA ANALYSIS REPORT

1 METHODOLOGY

The description of the terrestrial natural environment and the identification of the issues associated with the proposed infrastructures were based on existing documentation on the region and on the interviews conducted in the communities. Chapters 2 to 10 present a general portrait of each natural environment component.

The literature review focused on publicly available information and was supplemented by requests to various organizations. The sources of information consulted can be grouped as follows:

- Local, provincial and federal authorities: many government websites contain a large amount of information on the natural environment in northern Quebec, including regional portraits, interactive maps and various reports targeting specific components. Targeted requests have also made it possible to obtain additional data on the environment that is not publicly available;
- Previous Studies conducted in the region in the context of various projects: Many studies were conducted in the region crossed by phases II and III of La Grande Alliance, in the context of other programs or projects. A large number of studies conducted for various Hydro-Québec hydroelectric projects were consulted. Studies conducted by the Ministère des transports du Québec (MTQ) in the region were also taken into account, as were certain work conducted in the context of other projects carried out in the territory as part of a Section 22 Environmental and Social Impact Assessment, as required by the James Bay and Northern Québec Agreement (JBNQA) and subsequently analyzed by the federal and provincial Committees (COFEX for Federal reviews, COMEX for provincial reviews);
- Research groups and scientific literature: work or data collected by various groups or organizations working in northern Quebec were also considered in the description of the natural environment whenever publicly available, as well as reference works on fauna and flora;
- Aerial photographs or satellite images: although a detailed photo-interpretation of the region was not carried out as part of the pre-feasibility study, the frequent use of satellite imagery of the region nevertheless made it possible to clarify a generalized portrait of the natural environment. In some cases, a photo-interpretation on a small scale was also carried out to clarify certain potential constraints of the natural environment.

In addition to these sources of information, interviews were also carried out with Cree land users and Tallymen in each of the communities affected by the study. One of the objectives of these interviews is to identify the elements of the natural environment that are sensitive to the potential impacts of these proposed infrastructures, from their perspective. These elements are detailed in Technical Note 3, but will also be taken into account in the description of the natural environment as well as in the identification of potential issues.

With regards to the proposed Whapmagoostui/Kuujjuarapik road that was moved to the Feasibility stage during the course of the study, additional level of detail was obtained through photo-interpretation and preliminary field surveys specifically targeting vegetation, wetlands and aquatic habitats for the areas along the proposed road alignment. It should be noted that these elements were first defined using the set of constraints identified during the Pre-Feasibility Study. Chapter 11 adresses that work.

1.1 STUDY AREA

As shown on the Figure 1-1 , the study area is located within the territory of the Eeyou Istchee Baie-James region of northern Québec. The study area is divided in three zones:

- Study Area 1 (SA1): Billy-Diamond Highway Railway – Rupert – La Grande
- Study Area 2 (SA2): Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/Kuujjuarapik
- Study Area 3 (SA3): Route 167 - Renard Mine – Trans-Taiga Road.

It is to be noted that these study areas are slightly different that the ones described in La Grande Alliance MOU, thus, to suit the proposed infrastructures scope.

Information available outside of these areas was also often considered, in particular to provide a general picture of the environment, in the context of at times limited overall available information. In the case of caribou, larger study areas were considered to take into account the great mobility of this species and the considerable extent of its home range. Here, an additional 20 km wide strip was considered around the periphery of each study area to effectively analyze habitat quality in surrounding areas as well as its potential use of the broader area.

The following is a brief description of the three study areas under consideration, represented on Map A, and on other maps grouped together in Appendix A.

1.1.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

Study area 1, herein referred to as SA1, corresponds to the area along the proposed extension of the Billy-Diamond Highway (herein referred to as BDH) railway line, between the Rupert River in the south and the La Grande River in the north. It extends over a total length of 285 km, between the south of the Rupert River (approximate latitude: 51° 10' N) and La Grande River (53° 45' N). This area runs parallel to James Bay, with the western limit of the study area located more than 50 km away from the coast. SA1 follows the BDH, extending approximately 20 to 30 kms on either side of the existing roadway. SA1 covers a total area of 15,374 km^2. The northern boundary of SA1 coincides with the southern boundary of Study Area 2 (SA2).

1.1.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

Study Area 2, herein referred to as SA2, is the northernmost of the three study areas. It corresponds to the northern extension of the proposed road and rail lines from La Grande to the villages of Whapmagoostui and Kuujjuarapik, located at the mouth of the Great Whale River on Hudson Bay where is the proposed harbour infrastructure is located.

The terrestrial portion of the study area corresponds to an approximately 70 km wide corridor that runs north-south for some 200 km between La Grande River (53° 45' N) and the Hudson Bay coast (55° 40' N). On the Hudson Bay coast, it is narrower than the marine part of SA2, as it extends from Black Whale Harbour (30 km southwest of Whapmagoostui-Kuujjuarapik) to Boat Opening (60 km northeast of Whapmagoostui-Kuujjuarapik). All the proposed infrastructure including the port infrastructure will be located in the terrestrial portion of SA2. The terrestrial component of SA2 covers an area of 12,398 km^2.

1.1.3 STUDY AREA 3 (SA3): ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

Study Area 3, herein referred to as SA3, is located almost 300 km east of Study Area 1, close to the geographic centre of Quebec. This area covers the proposed upgrade and extension of Route 167 to the Trans-Taiga Road. SA3 extends north-south for a distance of approximately 155 km from just south of the current end of Route 167 (Renard Mine) (52° 35' N) to the Trans-Taiga Highway (54° 00' N). SA3 covers a total area of 15,157 km^2.

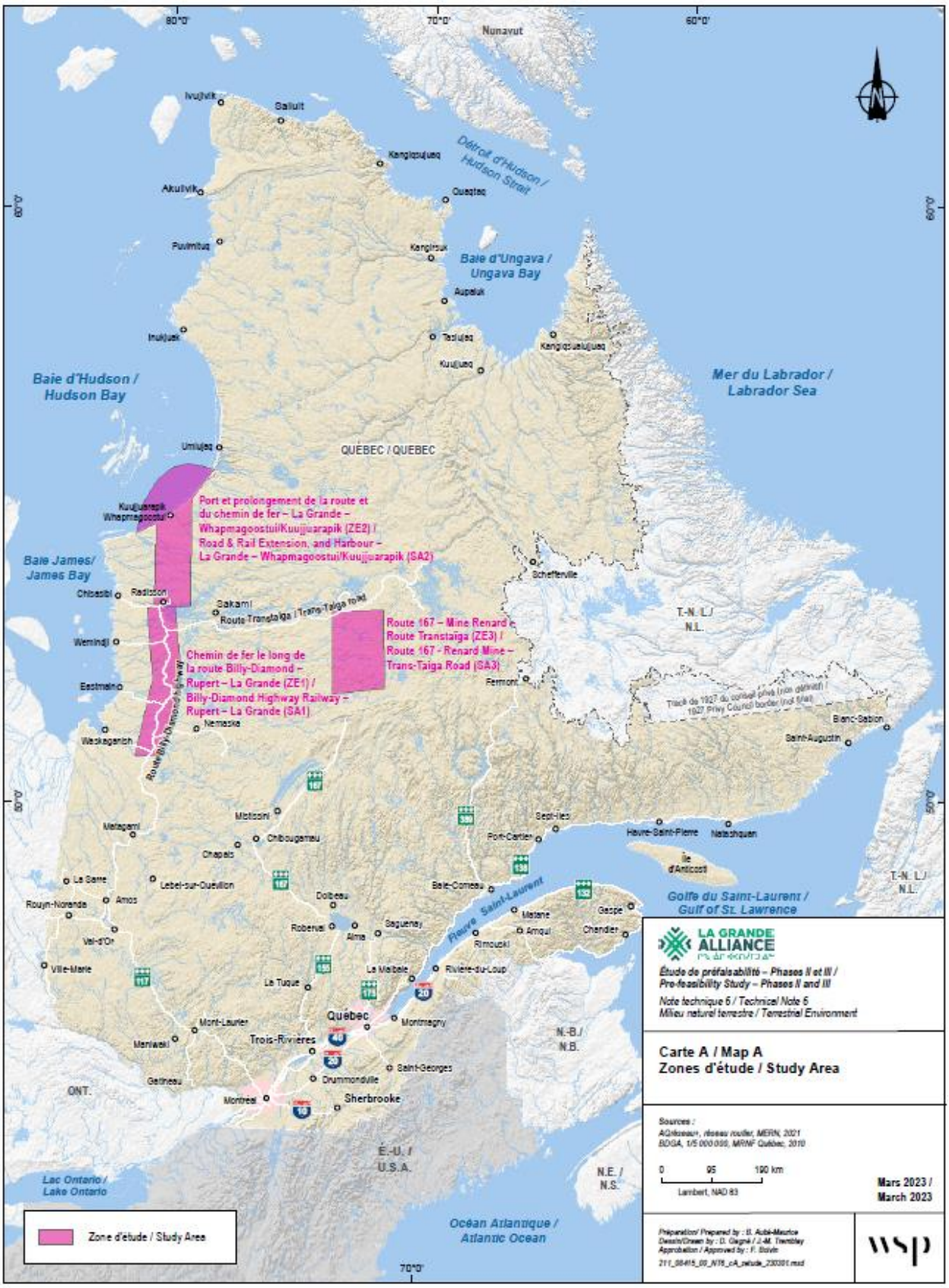

Figure 1-1 Study Area

1.2 PHYSICAL ENVIRONMENT

The analysis aims first to describe the main components of the physical environment, i.e., the topography, geology and geomorphology, by considering the nature of the unconsolidated deposits covering the three target areas.

The main objectives of this research are:

- To characterize the topography and bedrock geology of the targeted study areas;
- To characterize the proportion and arrangement of the different unconsolidated deposits distributed in the study area;
- To identify important geomorphological features found in the study areas.

Information on geology and overburden was processed using ArcGIS Pro and ArcGIS Web AppBuilder software, interpreting maps from the Quebec Geomineral Information System (scale 1:50,000) made available by the Ministère de l'Énergie et des Ressources naturelles (MERN). The geomorphological shapes were identified by 2D photo-interpretation using the same software.

The study then describes the hydrographic system in the three areas of interest for the pre-feasibility study.

The main objectives of this research are:

- Identify and describe the organization of the different catchment areas covering the study areas;
- For SA1 and SA2, assess the length of the proposed alignments crossing each catchment.
- Identify the main water bodies and watercourses intersected by the corridor, including the proposedinfrastructure and 200 m on either side.

The hydrographic network information was processed on ArcGIS Web AppBuilder software. The geodatabase of the Quebec Hydrographic Network (QHN/GRHQ; MERN, 2022e) was also consulted.

1.3 FLORA

The general description of the flora was carried out mainly using the ecological classification of the Québec territory proposed by the MFFP (2021a) and from the James Bay Forest portrait of the Regional Commission on Natural Resources of the James Bay Territory (Commission régionale sur les ressources naturelles du territoire de la Baie-James / CRRNTBJ, 2010a). The general description of wetlands is based on the Canadian Wetland Classification System (National Wetlands Working Group, 1997), while the distribution of wetlands in the three zones is based on Natural Resources Canada (CanVec) photo-interpretation data (scale 1:50,000). To clarify the floristic portrait of each of the study areas, various reports conducted in the context of other projects carried out in the area crossed by the proposed infrastructuresor in its vicinity and based on field inventories were also used. With regards to plant species at risk, a request was made to the Centre de données sur le patrimoine naturel du Québec (CDPNQ, 2021a) to enquire about any mention of such species in the study areas. The work by Tardif et coll. (2016) on plant species at risk in Québec was also a valuable source of information, particularly for a more global view of the distribution of plant species at risk in northern Québec.

1.4 ICHTYOFAUNE AND FISH HABITAT

The ichthyological (fish) portrait of the area crossed by the proposed infrastructures was drawn up with the help of studies conducted in northern Quebec in the context of other projects. The list of species present in each of the study areas was based onthe work of Verdon (2001), which specifies the geographic distribution of fish in northern Quebec based on multiple inventories conducted over a period of about 30 years. A request was also made to the MFFP to obtain results of more recent sports fisheries conducted within the three study areas. The information available on sensitive habitats is very limited, particularly in study areas SA1 and SA3, which have been relatively little studied. On the other hand, sensitive sites such as spawning grounds were not located on the maps because of their high vulnerability. Nevertheless, during the consultations, the location of these sensitive habitats was specified and the users of the territory also identified other vulnerable sites to consider when designing the alignments. Although these sensitive sites are not shown on the maps, they are nevertheless taken into account in the optimization of the alignments. For an overview of the information obtained during the consultations with land users, including sensitive aquatic habitats such as spawning grounds and fishing sites used by communities, see Technical Note 3.

1.5 HERPETOFAUNA

The description of the herpetofauna (reptiles and amphibians) in the study areas is based largely on the Atlas des Amphibiens et Reptiles du Québec (AARQ, 2022), which has a vast database covering the entire territory of Quebec. The results of amphibianand reptile inventories conducted in the context of other projects in the region were also taken into account.

1.6 AVIAN FAUNA

The description of the avian fauna (birds), its management and the main issues associated with a linear development infrastructure such as a road and a railway were based on a literature review. The information collected for the description of the avian group came from pre-project and follow-up inventories carried out in the context of development projects whose footprints are located in or near the study areas. A review of the data available in public ornithological databases and general documents presenting the range of species at risk at the provincial and/or federal level was used to complete this portrait of the avian fauna.

1.7 MAMMALS

The description of mammals was based on a literature review. The information collected for the description of mammals came from pre-project and follow-up inventories conducted in the context of development projects whose footprints are located in or near the study areas. A review of available data in public databases and general documents presenting the range of species at risk at the provincial and/or federal level was used tocomplete the chapter on mammals.

1.8 CARIBOU

The section on caribou was initially carried out by reviewing the existing literature for the study area. Data from the Ministère des Forêts, de la Faune et des Parcs (MFFP) concerning aerial inventories and telemetric monitoring of caribou in the study areas were consulted. Various regional, provincial and national studies were also reviewed in order to integrate the issues related to this species.

Satellite tracking of migratory caribou from the George and Leaf River populations has been conducted since 1986 and show that they regularly migrate southward to 54°N latitude, within the study area. They even occasionally move further south. As for woodland caribou, the MFFP has been installing telemetric collars on individuals of the various populations since 2003. The location data thus collected make it possible to establish the extent and use of the territory of these populations. It should be noted that the location of caribou wearing a telemetric collar does not present an exhaustive picture of the use of the territory by this species, considering that a small proportion of the populations are equipped with these collars. It does, however, allow us to assess the use of the territory by the groups of caribou to which the collared individuals belong. Due to the sensitivity of the caribou location data transmitted, the MFFP requires that a certain level of transformation be performed on the data before publication. In order to meet this requirement and to evaluate the use of the territory by caribou, the breakdown of the areas frequented by caribou will be simplified and no breakdown will be made by seasonal periods associated with the caribou's life cycle (winter, summer calving and rut). By linking, for each individual, the temporal sequence of location points, we can assess its movement on the territory. By grouping the movements of all collared individuals in a population, it is possible to visualize the use of the territory by the population, the overlap of this use by the different populations and to identify connectivity corridors between the main areas they use (Map 5).

The work of Leblond et coll. (2014) developed a habitat quality model (HQM) for woodland caribou in Quebec. The HQM integrates several habitat variables defined from digital maps, grouped into two components. The “Habitat Categories” component integrates information from the different forest stands and surface types of the Eco forestry map, assigning relative weights to eight categories of variables per analysis cell (e.g., proportion of mature conifers, lichen-rich environments, or forest cuts). The second component, “Human infrastructure”, considers the density of paved roads and forest roads, and the presence of mines per analysis cell. The model also incorporates the distance to roads, paths and mines to assign a relative habitat quality value to each analysis cell. The result of the HQM, normalized from 0 to 1, is used to map the potential habitat quality for woodland caribou. The robustness of the model was evaluated in three different regions using location data for 45 GPS-collared woodland caribou. A map extract of the HQM covering the entire study area was ordered from Geoboutique. This extract allows the assessment of the habitat quality at a large scale for the study area. This model will be the main information on which the analysis of the habitat conditions in the study area will be based.

1.9 PROTECTED AREAS

The description of the various terrestrial protected areas (existing or planned) in the study areas is based on information from the MELCC website (2022a) and the conservation plans that are also available from this site.

1.10 WILDLIFE MANAGEMENT

The section on wildlife management provides a summary of the rights of Aboriginals and non-Aboriginals with respect to the harvesting of wildlife resources for the various types of territories present in the study area. The regulatory framework applicable to the various wildlife groups is also presented. For a more detailed portrait of the wildlife species harvested in the territory, particularly by the Cree communities, see Technical Note 3.

2 PHYSICAL ENVIRONMENT

2.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

2.1.1 PHYSIOGRAPHY

SA1 is located within La Grande River Low Hills Natural Province, which slopes gently towards James and Hudson Bays to the west (MERN, 2022a). It is characterized by an undulating plain with a mean elevation generally between 175 m and 225 m. However, the maximum elevation reaches 259 m about 30 km south of the Eastmain River (kilometer point B-370).

The river valleys are generally narrow to moderately incised. The elevation drops to around 150 m at the level of the Pontax, Eastmain and Opinaca rivers (kilometer points B-306, B-394 and B-412) and immediately east of Lac du Vieux Comptoir (kilometer point B-464). A little further north, east of Yasinski Lake (kilometer point B-542), the elevation drops drastically from 197 m to 135 m over about 6 km. The elevation then rises gradually around 175 m to Radisson.

2.1.2 GEOLOGY

SA1 is included in the Superior Geological Province of the Canadian Shield (MERN, 2022b), which is one of the most tectonically stable in the world and is known for its economic potential. The northern and central portions of the section straddle the La Grande sub-province of volcanic-plutonic rock. Locally, the rock is composed of tonalite, diorite, granite and tonalitic to granodioritic gneiss (MERN, 2022c). The southern part of the section intersects the Nemiscau sub-province. The bedrock is metasedimentary rock, mainly composed of paragneiss, schist, iron formation and marble (MERN, 2022d). A few narrow bands of felsic to mafic volcanic rock cross the study area, mainly in the northern and central portions.

Structurally, it appears that the rock is highly deformed. Indeed, several faults, shear zones and regional folds cross the Waskaganish site, generally in a more or less east-west direction (MERN, 2022c).

2.1.3 GEOMORPHOLOGY

2.1.3.1 *GENERAL MORPHO-SEDIMENTARY ZONES*

Map 1 illustrates the disposition of the unconsolidated deposits in SA1. A large part of the area is composed of undifferentiated organic sediments (26.04%; Table 2-1). These are sporadically distributed throughoutthe study area and are particularly present in the southern part of the section.

In addition, a representative portion of the study area is covered by undifferentiated till and bedrock, which occupy 17.74% and 16.54% of the area respectively. These two morpho-sedimentological zones are scattered throughout the northern and central parts of the area, while in the southern part, rock is found to the west and from till to the east.

Littoral and prelittoral glaciomarine sediments represent 14.44% of the surface deposits in the area. These sediments are mainly grouped in the center of the section, but there are also some scattered deposits to the north and south of the study site. In addition, 13.93% of the area is covered by fine deep-water glaciomarine sediments,which are located mainly at the northern and southern ends of the section.

In terms of granular materials, fluvioglacial sediments (subaqueous proglacial outwash sediments 0.04%, juxta glacial sediments 0.74%, and frontal moraine 0.60%) are found in the northern and central parts of the study area.

The undifferentiated lake sediments extend over 7.15% and are laid down at the bottom of the lakes which cuts across the north of the area.

Finally, the other types of deposits present in the study area generally occupy areas of less than 1%.

Table 2-1 Distribution of Unconsolidated Deposits in the Study Area SA1

TYPE OF DEPOSIT	AREA(HA)	PROPORTION OF THE STUDY AREA (%)
Alluvions non différenciées	26,619	0.64
Undifferentiated alluvium	9,818	0.24
Current alluvium	842	0.02
Aeolian sediments	404	0.01
Scree deposits	1,738	0.04
Subaqueous proglacial sediments	30,515	0.74
Juxta glacial sediments	24,678	0.60
Frontal moraine sediments	296,021	7.15
Undifferentiated lake sediments	181	< 0.01
Fine glaciolacustrine deep-water sediments	22,193	0.54
Coastal and prelittoral glaciolacustrine sediments	577,001	13.93
Deep-sea fine glaciomarine sediments	598,097	14.44
Coastal and pre-littoral glaciomarine sediments	4,284	0.10
Deltaic and prodeltaic glaciomarine sediments	1,078,455	26.04
Undifferentiated organic sediments	684,906	16.54
Undifferentiated rock in place	734,711	17.74
Undifferentiated Till	50,953	1.23
Fusion or ablation till	26,619	0.64

2.1.3.2 *GEOMORPHOLOGICAL FORMS*

The entire study area is covered with glacial markers and tapered forms developed during the last glaciation. Most of the geomorphologic features are oriented along the NE-SE axis, reflecting local ice flow to the SE. For more details on geomorphologic features, see the technical note on geotechnical.

The Sakami Moraine, which extends from Lake Mistassini to Kuujjuarapik, marks the regional deglaciation (Hardy, 1982). It forms an arc that extends from the eastern limit of the Opinaca River and the study area (opposite kilometer point B-430) to the northern end of the section. It appears as a discontinuous belt of sandy-gravelly and sandy deposits. Series of De Geer moraines have also developed at the southern end and just north of Lake Boisrobert (kilometer point B-380). These parallel, NW-SE trending ridges were formed during the retreat of the glacial margin in contact with a water body. A few series of north-south oriented moraines are also found in the northeastern portion of this area, just west of Sakami Lake (opposite kilometer point B-536).

In addition, several beach ridges are clustered to the south of study area SA1. These form meandering strands that mark former Tyrrell Sea levels. A few dune clusters are also observed to the south and east of the section and illustrate aeolian reworking of sediments.

2.1.4 HYDROGRAPHY

SA1 is located within the Hudson Bay watershed[1]. The proposed (preliminary) rail alignment along the existing Billy-Diamond Highway will cross ten Level 1 watersheds, however, some of these watersheds intersect several times (Map 2;Table 2-2). In fact, the routewill cross a total of 33 Level 1 and Level 2 watersheds along its route. The Level 1 basins of the Eastmain, Beaver, Pontax and Vieux Comptoir rivers are the ones that are intersected over the longest total distances. Similar to the Kuujjuarapik study area located just to the north, the intersecting watersheds in the Waskaganish area are oriented east-west, given the flow network directed towards the James Bay drainage basin.

The preliminary rail alignment (including a 200 m buffer on either side) starting at the Rupert River will cross 66 major watercourses, the main ones being the westward-flowing Pontax, Eastmain and Beaver rivers (MERN, 2022e). This same corridoralso crosses 238 minor watercourses (Table 2-3).

In addition, several lakes of varying sizes cover the Waskaganish sector, most of which are easily bypassed bythe planned rail route. The northeast portion of the sector is occupied by the Robert-Bourassa reservoir.

Table 2-2 Catchments Intersected (South to North) by the Preliminary Alignment in Study Area SA1

OVERLAPPING CATCHMENTS (LEVEL 1)	OVERLAPPING CATCHMENTS (LEVEL 2)	LENGTH OF RAIL SEGMENT INTERSECTING THE CATCHMENT AREA (KM)
Rupert River		0.6
Pontax River	Machisakahikanish River	23.0
	Pontax River	24.4
	Enistuwash River	4.3
Jolicoeur River		36.3
Eastmain River	Cold Water River	10.0
	Eastmain River	31.5
	Opinaca River	27.2
	La Pêche River	5.7
	Opinaca River	1.9
	River Fishing	1.0
	Opinaca River	8.9
River Conn		1.1
Eastmain River	Opinaca River	1.0
River Conn		14.2
Old Counter River		43.9
The Great River	Sakami River	5.8

[1] The Hudson Bay watershed is an academic term which also include all the streams flowing into James Bay.

OVERLAPPING CATCHMENTS (LEVEL 1)	OVERLAPPING CATCHMENTS (LEVEL 2)	LENGTH OF RAIL SEGMENT INTERSECTING THE CATCHMENT AREA (KM)
Old Counter River		4.0
Poplar River		12.7
Maquatua River		15.4
Beaver River	Rivière au Castor Est	14.8
	Beaver River	12.8
The Great River		1.6
Beaver River		3.3
The Great River		1.5
Beaver River		1.0
The Great River		1.9
Beaver River		1.1
The Great River		2.6
Beaver River		2.3
The Great River		0.8
Beaver River		7.0
The Great River		18,0

Table 2-3 Watercourses Intersected (from South to North) by the Preliminary Alignment in Study Area SA1

CATCHMENT AREAS (LEVEL 1)	NUMBER OF MAJOR RIVERS	NUMBER OF MINOR RIVERS
Rupert River	0	1
Pontax River	4	20
Jolicoeur River	4	16
Eastmain River	15	67
River Conn	4	14
Old Counter River	11	42
The Great River	13	31
Poplar River	3	11
Maquatua River	5	13
Beaver River	7	23
Total	**66**	**238**

2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

2.2.1 PHYSIOGRAPHY

SA2 is included in the 173,000 km Grande Riviere Low Hills Natural Province[2] (MERN, 2022a). It ischaracterized by a platform that slopes gently towards James and Hudson Bays to the west.

The relief forms an undulating plain whose topography is mainly controlled by the abundant bedrock outcrops. The average elevation along the proposed road corridor is generally between 125 m and 150 m. The maximum elevation, however, reaches 236 m at 62 km from the northern end of the area and then gradually decreases northward to Hudson Bay. The valleys are generally narrow and shallowly incised (MERN, 2022a), except for theLa Grande River in the south of the area and the Great Whale River in the north, which are incised to depths generally between 50 m and 100 m.

2.2.2 GEOLOGY

The rock in the study area is part of the Superior geological province of the Canadian Shield, which is Archean in age (MERN, 2022b). The northern and central portions of the section overlap with the Bienville Domain (Minto Sub province), which is primarily granitic to tonalitic orthogneiss (MERN, 2022c). The southern end of the zone overlaps with the Radisson pluton (Minto sub-province), which is mainly composed of hornblende-bearing quartz monzodiorite (Goutier et coll., 1999). Finally, a narrow band of Proterozoic age rock (2.5-1.6 Ga) borders the Hudson Bay coast. This is composed of sedimentary rocks (dolomite, quartzite, basalt) belonging to the Nastapoka Group.

Structurally, a few regional faults intersect the bedrock along the coast northeast of Kuujjuarapik and in thesouthern portion of the study area (MERN, 2022c).

2.2.3 GEOMORPHOLOGY

2.2.3.1 MORPHO-SEDIMENTARY ZONES

The study area is mainly characterized by undifferentiated bedrock, which covers 36.01% of the territory (Map 1;Table 2-4). In fact, bedrock outcrops almost everywhere in the study area. Undifferentiated till covers 31.65% of thestudy area and is fairly uniformly distributed throughout the sector.

In addition, 10.20% of the area is covered by undifferentiated lake sediments. These are found at the bottom of the many small lakes, which are scattered throughout the area. Fine deep-water glaciomarine sediments (9.78%) and littoral and prelittoral glaciomarine sediments (8.97%) cover the river valleys, forming corridors mainly in the northern and central parts of the area.

Although in small proportion in the area, fluvioglacial sediments (subaqueous proglacial outwash sediments (0.02%), juxta glacial sediments (0.31%) and frontal moraine sediments (0.32%)) represent a high potential for granular materials. These deposits are characterized by a grain size range from silty sand to boulder gravel.

Scree deposits (0.001%) and undifferentiated organic sediments (2.58%; mainly located to the north and east ofthe segment) are found in very low proportions in the study area.

Table 2-4 Distribution of Unconsolidated Deposits in the Study Area SA2

TYPE OF DEPOSIT	AREA (HA)	PROPORTION OF THE STUDY AREA (%)
Current alluvium	1,176	0.03
Scree deposits	48	< 0.01
Subaqueous proglacial sediments	879	0.02
Juxta glacial sediments	12,129	0.31
Frontal moraine sediments	12,301	0.32
Undifferentiated lake sediments	397,212	10.20
Deep-sea fine glaciomarine sediments	381,080	9.78
Coastal and pre-littoral glaciomarine sediments	349,233	8.97
Deltaic and prodeltaic glaciomarine sediments	4,112	0.11
Undifferentiated organic sediments	100,395	2.58
Undifferentiated rock in place	1,402,494	36.01
Undifferentiated till	1,232,748	31.65
Fusion or ablation till	1,129	0.03

2.2.3.2 *GEOMORPHOLOGICAL FORMS*

Several landforms mark the deglaciation of this study area. The most important of these is the Sakami Moraine, which forms an arc stretching approximately 630 km from Lake Mistassini to Kuujjuarapik (Hardy, 1982). It illustrates the position of the ice front, parallel to the James Bay coast, during the eastward retreat of the ice around 7,900 years ago. This form is composed of sandy-gravelly and sandy materials arranged in discontinuous sections west of the road corridor.

Series of De Geer moraines have also developed in the southern part of the study area and in smaller quantities inthe center of the transect. They form thin parallel ridges formed during deglaciation at the contact between the icemargin and a water body.

In addition, there are a few beach ridge clusters located around the village of Kuujjuarapik. These ridges form a series of strips that run parallel to the James Bay coast. These deposits, shaped by waves, mark former levels reached by the Tyrrell Sea, which submerged the territory during the late deglaciation. A few dunes have also developed around the village of Kuujjuarapik along the Hudson Bay coast. They form small ridges of windblown sediment.

2.2.4 *HYDROGRAPHY*

SA2 is located within the Hudson Bay watershed. The preliminary proposed road segment established from the alignment defined in the early 2010s (Poly-Geo, 2013) and along which the proposed rail line is proposed intersects 8 different Level 1 watersheds (Map 2;Table 2-5). In total,the proposed route would cross a total of 17 Level 1 and 2 watersheds. The Roggan and Vauquelin Tier 1 watersheds are the ones intersected over the longest total distances. These basins are all oriented east-west, as the flow network is directed towards the James Bay and Hudson Bay catchments.

The main tributaries intersecting the proposed route are, from south to north, the La Grande and Piagochioui rivers,as well as the westward-flowing Great Whale River. Several lake and river systems running east-west are also crossed by the study transect. The main bodies of water covering the sector are the Robert-Bourrassa reservoir located at the southern limit of the area, as well as Lake Julian, Craven Lake and Roggan Lake, which are mainly located in the center of the study area (MERN, 2022e).

A total of 139 major streams would be crossed by the route (including a buffer zone of 200 m on either side) and 260 minor streams (Table 2-6). A high proportion of these streams are found in the Roggan and Sucker watersheds, 78 and 43 respectively.

Table 2-5 Catchments Intersected (South to North) by the Preliminary Alignment in Study Area SA2

OVERLAPPING CATCHMENTS (LEVEL 1)	OVERLAPPING CATCHMENTS (LEVEL 2)	LENGTH OF RAIL SEGMENT INTERSECTING THE CATCHMENT AREA (KM)
The Great River		24.3
Piagochioui River		6.3
River Roggan	Lake Apichatinachits Discharge	4.9
	Corbin River	40.0
		0.9
	Corbin River	3.7
		7.6
	Corbin River	0.7
		15.8
Vauquelin River	Lake Burton landfill	3.2
River Roggan		0.9
Vauquelin River	Lake Burton landfill	15.1
		22.0
Sucker Creek		22.9
Hudson Bay (residual 1)		18.6
Great Whale River		15.0
Hudson Bay (residual 2)		5.0

Table 2-6 Watercourses Intersected (from South to North) by the Preliminary Alignment in Study Area SA2

CATCHMENT AREAS (LEVEL 1)	NUMBER OF MAJOR RIVERS	NUMBER OF MINOR RIVERS
The Great River	16	35
Piagochioui River	5	11
River Roggan	54	78
Vauquelin River	24	40
Sucker Creek	15	43
Hudson Bay (residual 1)	15	29
Great Whale River	6	17
Hudson Bay (residual 2)	4	7
Total	**139**	**260**

2.3 STUDY AREA 3 (SA3): ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

2.3.1 PHYSIOGRAPHY

SA3 is included in the natural province of the Central Plateau of Northern Quebec, which covers an areaof 159,000 km^2 and forms a high plateau sloping to the north and west (MERN, 2022d).

The area is characterized by a platform punctuated by hills (Topographic Map, 2022). To the south of the section,the territory rises to about 800 m, then the altitude decreases towards the north-west until it reaches 370 m.

2.3.2 GEOLOGY

This area is included in the Superior Geological Province of the Canadian Shield (MERN, 2022b), which is one of the most tectonically stable in the world and is known for its economic potential. The northern andcentral parts overlap with the La Grande sub province, which is composed of volcanic-plutonic rock. Locally, the rock is composed of tonalite, diorite, granite and tonalitic to granodioritic gneiss (MERN, 2022c). The southern partof the section crosses the Opinaca sub province, which is made up of metasedimentary rocks composed mainly of paragneiss, schist, iron formation and marble. A few narrow bands of mafic to intermediate volcanic rock cross the center of the study area.

The bedrock appears structurally highly deformed. Several faults, shear zones and regional folds cut the sectionfrom east to west, particularly in the southern portion of the study area (MERN, 2022c).

2.3.3 GEOMORPHOLOGY

2.3.3.1 GENERAL MORPHO-SEDIMENTARY ZONES

SA3 is composed of glacial sediments (Map 1;Table 2-7), i.e., undifferentiated till (84.78%) and melt or ablation till (5.53%). In addition, 5.73% of the area is covered by lake sediments that line the bottom of the many small lakes found throughout the sector. The southern part of the area is punctuated by bedrock, whichoutcrops over 1.38% of the area.

Some surface deposits with granular material potential have been identified in the area. Subaerial proglacialoutwash sediments (0.39%) and juxta glacial sediments (1.41%) are located along corridors that cross the southern portion of the study area.

Finally, the other deposits present in the study area occupy areas of less than 1%.

Table 2-7 Proportion of Loose Deposits in the Renard Mine Area

TYPE OF DEPOSIT	AREA (HA)	PROPORTION OF THE STUDY AREA (%)
Undifferentiated alluvium	8,455	0.12
Scree deposits	287	< 0.01
Subaerial proglacial sediments	26,558	0.39
Juxta glacial sediments	96,432	1.41
Undifferentiated lake sediments	392,503	5.73
Coastal and prelittoral glaciolacustrine sediments	17,089	0.25
Glaciolacustrine deltaic/prodeltaic sediments	2,387	0.04
Undifferentiated organic sediments	25,282	0.37
Undifferentiated rock in place	94,588	1.38
Undifferentiated Till	5,803,190	84.78
Fusion or ablation till	378,273	5.53

2.3.3.2 GEOMORPHOLOGICAL FORMS

The glacial spindle whorl is very well developed in the study area SA3. Indeed, several clusters of drumlinoid features-oriented NE-SW are evidence of the last local glacial flow towards the SW. Perpendicular to these forms are numerous series of ribbed moraines (Rogen) arranged parallel to the ice front, i.e., in a NW-SE direction. These moraines are characterized by short, undulating and sometimes slightly arched ridges. They are easy to spot as they form parallel bulges across the water bodies.

2.3.4 HYDROGRAPHY

The entire study area is included in the level 1 catchment area of La Grande River. The latter is subdivided intofour level 2 sub-basins (Map 2). The Sakami River and Pontois River sub-basins are located to the south and southwest of the study area SA3 respectively. The subbasin surrounding the Robert-Bourassa reservoir extends to the north-west of the study area. Finally, the sub-basin to the northeast of the sector extends to Lake Caniapiscau.

The main tributaries intersecting the study area are the Sakami River and La Grande River, flowing westward through the centre and north of the area respectively (MERN, 2022e). The northern portion of the section is covered by small & elongated water bodies in a NW-SE direction, set between the ridges of the numerous ribbed moraines (Rogen).

2.4 ISSUES AND RECOMMENDATIONS

2.4.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

The various components of the physical environment are not particularly sensitive to the proposed infrastructures. Nevertheless,they are the source of several technical constraints that are likely to influence the choice of preferred routes.

First of all, **topography** will need be taken into account when establishing the different route variants. In order to simplify the design of the proposed infrastructure, the optimal route should avoid as much as possible areas with steep and uneven slopes.

Geomorphology is also a component of the environment that needs to be carefully considered. Indeed, the proposed routes should avoid as much as possible areas with low bearing capacity such as peaty areas in order to simplify the design of the infrastructure. Thus, the routes should avoid wetlands as much as possible, which are both a physical and a biological constraint (see section 3.3.1). Deposits of sensitive clay are also areas to be avoided for infrastructure development. On the other hand, the selected routes should ideally pass close to sources of granular material suitable for the construction of the railway or road foundation. Ideally, these sources should be distributed at different locations in the vicinity of the alignments to minimize the transport of granular material during the construction phase.

Finally, in addition to being sensitive aquatic habitats (see section 4.3.1) **rivers** and **lakes** are also physical barriers that require appropriate design. Lakes should therefore be avoided by the routes, while the number of watercourse crossings should be minimized, as should the length of the crossings.

It should be noted that the presence of permafrost in the area crossed by the infrastructures under study, particularly in the northern part of zone SA2, is also a potential constraint. This is taken into account in the technical note on geotechnical aspects (Technical Note 10).

2.4.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

If the proposed infrastructures (collectively or individually) are deemed valuable by the communities, the next stages of the study should include a complete LIDAR survey to have an accurate picture of the topography for each proposed infrastructures. Geotechnical surveys will be required along the prproposed alignments to confirm the nature of the soils. The results of these surveys may lead to specific modifications of the proposed alignments.

A detailed and complete photo-interpretation along the proposed infrastructures should also be carried out to specify the delimitation of wetlands (see section 3.3.2) and also of deposits that may be made up of unstable materials. This exercise will allow to identify smaller watercourses or to specify their location. Finally, this detailed photo-interpretation will also be used to identify the sources of borrow material that could potentially be used during the works. Following that , an airborne survey of these potential identified sources of borrow material should be carried out to specify the quality and volume of those materials.

3 FLORA AND WETLANDS

3.1 GENERAL DESCRIPTION

3.1.1 VEGETATION ZONES AND BIOCLIMATIC DOMAINS

Phases II and III of La Grande Alliance are located between 51° and 56° north latitude, in northern Québec.This territory is entirely located within the boreal vegetation zone, which extends in Québec approximately between48° and 58° north latitude (MFFP, 2021a and b, Appendix B). The tree layer in this zone is dominated by conifers and the diversity of plant species is relatively low due to the very harsh climate. There is also a reduction in the number of trees as you move northward in this zone. The boreal zone includes a mosaic of plant habitats largely influenced by forest fires that favour an opening of the vegetation landscape (Genivar - SNC Lavalin, 2010; Bouchard et coll., 2004). Although the northern limit of the managed forest (commercial forest) is in the boreal zone, it is located south of the Rupert River, beyond the southern limit of the study (CRRNTBJ, 2010a). Phases II and III of La Grande Alliance are therefore entirely outside the boundaries of the area where the forest is commercially harvested. They are also outside the forest fire control zone. With the exception of the hydroelectric reservoirs, the forest landscape in these areas has therefore been subject to very little anthropogenic influence.

The southern end of the study (south of the Eastmain River) belongs to the closed boreal forest sub-zone, which is characterized by the presence of relatively dense coniferous forests, composed mainly of black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*). The portion of the study within this sub-area lies within the moss spruce bioclimatic domain (western subdomain) (Map 3). In addition to the two main species mentioned above, there are seven other tree species in this zone, six of which are more likely to occur at the latitudes of the study areas.

These include jack pine (*Pinus banksiana*), white spruce (*Picea glauca*) and tamarack (*Larix laricina*) among the conifers and white birch (*Betula papyrifera, B. cordifolia*), trembling aspen (*Populus tremuloides*) and balsam poplar (*P. balsamifera*) in the hardwoods, the latter being mainly present in the lowlands (CRRNTBJ, 2010a). The shrub layer is dominated by Ericaceae and is represented by Labrador-tea (*Rhododendron groenlandicum*), creeping snowberry (*Gaultheria hispidula*), sheep laurel (*Kalmia angustifolia*), American twinflower (*Linnaea borealis*) and a few species of blueberry (*Vaccinium* sp.). The herbaceous layer is generally not very abundant.

Species such as bunchberry (*Cornus canadensis*), blue-bead lily (*Clintonia borealis*), three-leaved goldthread (*Coptis trifolia*), Canada-mayflower (*Maianthemum canadense*), and Sitka ground-cedar (*Diphasiastrum sitchense*) are found in this stratum (CRRNTBJ, 2010a; Bouchard et coll., 2004). Bryophytes (mosses) form extensive mats on the forest floor.

Further north, the open boreal forest sub-zone, also known as taiga, occupies most of the study areas. In this sub-zone, dominated by black spruce, trees are sparser. The characteristic bioclimatic domain of this sector is the lichen spruce forest (western subdomain) (MFFP, 2021a) (Map 3). The forest cover is generally more open and there is a lichen mat on the ground. The characteristic tree species in this zone are essentially the same as in the moss spruce forest, but except for black spruce and jack pine, they are rarer (CRRNTBJ, 2010a). Most species of the vascular flora of the lichen spruce stand are few in number, but common and abundant. The main lichen species in this area are in the genus *Cladina* (*C. stellaris*, *C. mitis* and *C. rangiferina*) and are an integral part of the winter diet of caribou (*Rangifer tarandus*).

The northern end of the study lies in the bioclimatic domain of the forest tundra. This domain constitutes a transition between the boreal and arctic zones (Payette, 1983). Tundra alternates on the most exposed sites with lichen spruce in the more sheltered areas. From south to north, a forest sub-zone, dominated by forest areas, and a shrub sub-zone, dominated by tundra areas, can be distinguished. The tree line located around 58° north latitude marks the end of this sub-zone (MFFP, 2021a). The northern part of the study area belongs to the forest sub-zone, where it forms a band about 50 km wide along Hudson Bay on either side of the villages of Whapmagoostui and Kuujjuarapik (Map 3). In the forest tundra domain, the plant community is even less diverse than in the southern domains. Only four tree species are found in this domain: black spruce, white spruce, tamarack and balsam poplar. It should be noted that, in general, the vascular flora becomes poorer as one moves north, although the coastal areasremain more diverse than the interior.

3.1.2 WETLANDS

Wetlands are recognized for their high ecological value and for the many functions they perform in the ecosystem. These transitional habitats between terrestrial and aquatic environments are characterized by high biological productivity and biodiversity (CRRNTBJ, 2010b). Like lakes, wetlands are very numerous in northernQuebec and are scattered throughout the territory crossed by the infrastructures under study. However, they are most abundant in thesouthwestern part of the study area, i.e., in SA1. The Canadian wetland classification system (National Wetlands Working Group, 1997) recognizes five major wetland classes:

- Bog: This type of peatland is usually elevated or level with the surrounding terrain and is virtually unaffected by runoff or groundwater from the surrounding mineral soils. Instead, bogs are supplied with water by precipitation, snowmelt or fog. They are typically poor in minerals and relatively acidic (pH between 4.0 and 4.8). Open pools of water are sometimes present on the surface. The vegetation is generally dominated by sphagnum moss with the presence of shrubs. Trees may also be present.
- Fen: Fens are characterized by a fluctuating water table at and below the surface whichmay be via channels. As the name suggests, unlike bogs, fens benefit from a supply of dissolved minerals (miner trophy) through lateral water circulation (*seepage*). The vegetation is variable and is influenced in particular by the depth of the water table and the water chemistry. Species of the *Carex* genus and brown mosses are characteristic of this type of bog.
- Swamp: Swamps are wetlands dominated by trees or shrubs and influenced by minerotrophic groundwater.This type of wetland can occur on mineral soils as well as on peat. The water table is at or above ground level.
- Marsh: This type of wetland is based on a mineral substrate and is characterized by a fluctuating water level on a daily or seasonal basis. The vegetation is generally characterized by emergent aquatic plants, mainly of the graminoid type (rushes, grasses, Cyperaceae). Shrubs, floating or submerged herbaceous plants, bryophytes and algae can also be found. Wet meadows are a subclass of this type of wetland.
- Shallow water: Shallow water, sometimes called aquatic grass beds, is an intermediate habitat between other wetland types that are waterlogged or periodically flooded and deeper water bodies. These environments are less than 2 m deep in midsummer. They are characterized by the presence of submerged, emergent or floating vegetation. They may include ponds or shallow areas on the edges of lakes or rivers.

Wetlands are recognized as fulfilling many ecological functions, hence their great importance in the ecosystem, which justifies special regulatory protection. These environments contribute to biodiversity by offering a habitat of interest for feeding, sheltering or reproduction of numerous species. They also regulate water levels and contribute to the purification of water by acting as a filter against pollution and by favouring the deposition of fine sediments. Peatlands also play an important role in carbon sequestration. Finally, from a human perspective, wetlands have an aesthetic quality that contributes to the conservation of the natural character of the landscape. Some are also used by local communities, particularly for hunting and gathering.

Map 3 shows the distribution of wetlands in each of the three study areas. The wetland delineation is derived from the 1:50,000 scale photo-interpretation by Natural Resources Canada (CanVec). Although this information is imprecise, it does provide a good overview of the wetland area. Table 3-1 details the total and relative areas occupied by wetlands in each of the three study areas. It should be noted, however, that the photo-interpretation carried out in the summer of 2022 along the proposed road in area SA2 suggests that the proportion of wetlands in this area is greater than anticipated, i.e., of the same order of magnitude as in area SA1 (see Chapter 11 on additional information obtained as part of the feasibility study for the road to Whapmagoostui/Kuujjuarapik). Peatlands are the main wetland type present. Bogs are generally more prevalent than fens, although the proportion of fens increases towards the north of the study area. The most abundant bogs in terms of area, particularly in the southern portion of the study, are large, uniform, wrinkled, ponded bog complexes (Bouchard et coll., 2004). Marshes, swamps and shallow water colonized by aquatic plants are also present in places, but these wetland types are generally much smaller than bogs and less abundant. Swamps are mainly shrub swamps along small rivers or lakes, while marshes or shallow waters (seagrass beds) are sometimes present in calm areas around lakes or along large rivers (MTQ, 2010). In the region, the presence of vast coastal marshes on the shores of James Bay and Rupert Bay is noteworthy because of their great ecological importance, particularly for waterfowl, but these habitats are located entirely outside the study areas.

Table 3-1 Wetland Coverage in the Three Study Areas

STUDY AREA	TOTAL AREA (KM^2)	AREA OCCUPIED BY WETLANDS (KM^2)	PROPORTION OFLAND OCCUPIED BY WETLANDS (%)
SA1	15,374	3,785	24.6
SA2	12,398 [1]	818	6.6 [2]
SA3	15,157	614	4.1
Total	42,929	5,217	12.2

Source: CanVec (échelle 1 : 50 000).

1 The marine portion of the SA2 area is excluded.

2 Photo-interpretation along the proposed alignment indicates that the proportion of wetlands would be higher in area SA2 (see Chapter 11).

3.1.3 SPECIES AT RISK

Overall, the vascular flora present in the study areas is rather undiversified compared to Southern Quebec. The species observed are generallycommon or even very common. Nevertheless, some species with precarious status (species at risk) could still be found in the area crossed by the study, particularly in the small sector along Hudson Bay (area SA2), as this sector is of greater interest for these species (see Section 3.2.2). According to the database of the Centre de données sur le patrimoine naturel du Québec (CDPNQ, 2021a), eight species totalling only nine records are reported within the study areas. Almost all of these records (7 species, 8 records) are reported near Hudson Bay, on the outskirts of the villages of Whapmagoostui and Kuujjuarapik. It should be noted, however, that these records were all made several decades ago (Table 3-2).

These eight plant species are considered likely to be designated as threatened or vulnerable in Quebec and none considered at risk at the federal level. They include two species of vascular plants, upswept moonwort (*Botrychium ascendens*) and Rocky Mountain Willowherb (*Epilobium saximontanum)*, which are described briefly below:

- The **upswept moonwort** is a member of the Ophioglossaceae family. It is a perennial herbaceous plant that grows in saltwater estuaries (sandy shores) or in terrestrial environments (maritime moors). It grows more commonly in sunnylocations, but also tolerates shade, on mesic and basic substrates (Tardif et coll., 2016).
- **Rocky Mountain willowherb** is a perennial herbaceous plant of the Onagraceae family. It grows in sunny locations in both palustrine (rocky or gravelly shores, wet meadows) and terrestrial (subalpine meadows) environments on amoist substrate (Tardif et coll., 2016).

Six species of bryophytes (mosses) were also recorded (Table 3-2). It should be noted that this group of species has been much less studied than the vascular plants. Consequently, the information available on these species is more fragmentary.

In addition to the species listed in Table 3-2, several other protected plant species are also considered potentially present in the study areas, although the CDPNQ does not record any mention of them within the study areas. As mentioned in section 3.2.2 however, these species are most likely to be found in the specific habitats along the Hudson and James coasts (Genivar - SNC Lavalin, 2010). In the study areas, such habitats are only present at the northern end of the study area, along Hudson Bay (area SA2). The James Bay Regional Commission on Natural Resources and Territory reports the presence of 42 plant species with precarious status in the James Bay region, for a total of 146 mentions (CRRNTBJ, 2010a). With the exception of lesser fringed gentian (*Gentianopsis virgata* subsp. *macounii*) and the spotted lady's-slipper (*Cypripedium passerinum*), both of which are threatened, these species are all likely to be designated threatened or vulnerable.

Table 3-2 Flora Species at Risk Reported by the CDPNQ within the Study Areas

SPECIES	GROUP (FAMILY)	LAST MENTION	STATUS[1] (QUEBEC / CANADA)	CONFIRMED HISTORICALPRESENCE		
				SA1	SA2	SA3
Upswept moonwort (*Botrychium ascendens*)	Vasculaire (Ophioglossaceae)	1944	LDTV / -	-	X	-
Rocky Mountain willowherb (*Epilobium saximontanum*)	Vasculaire (Onagraceae)	1969	LDTV / -	-	X	-
Lax notchwort (*Hygrobiella laxifolia*)	Bryophyte	1955	LDTV / -	-	X	-
Aquatic notched rustwort (*Marsupella aquatica)*	Bryophyte	1947	LDTV / -	-	X	-
Ladder flapwort (*Nardia scalaris*)	Bryophyte	1956	LDTV / -	X [2]	X	-
Norwegian earwort (*Scapania scandica*)	Bryophyte	1939	LDTV / -	-	X	-
Purple-lobed notchwort (*Schistochilopsis grandiretis*)	Bryophyte	1981	LDTV / -	-	X	-
Arctic crisp moss (Trichostomum *arcticum*)	Bryophyte	1899, 1949	LDTV / -	-	X	-

Source: CDPNQ, 2021a

1 MELCC, 2022b and Government of Canada, 2022: LDTV = Likely to be designated as threatened or vulnerable (Quebec)

2 The record reported by the CDPNQ for Nardia scalaris comes from a site located about 100 metres north of the boundary of zone SA1. This species is therefore also considered possible in zone SA1

3.1.4 INVASIVE ALIEN PLANT SPECIES

The invasive alien species (IAS) present in Quebec generally correspond to species introduced from Eurasia, although not all introduced species are invasive. These species prefer ruderal environments such as disturbed non-forest habitats, for example the disturbed soil of ditches or road or railway shoulders. Introduced species observed in the study areas or neighbouring regions in recent decades are, however, few in number and rarely abundant partly due to the harsh climate of the study area which restrict the number of potential invasive species.

Invasive species are usually introduced accidentally, sometimes for landscaping or other domestic purposes. Among these species, a few rare IAS specimens have been observed at the La Grande Alliance latitudes, notably reed canary grass (*Phalaris arundinacea*) along the edge of the Eastmain reservoir, near SA1, and smooth brome (*Bromus inermis*) in Kuujjuarapik, in SA2. This IAS was even collected in Kuujjuaq in 1963 and has been known from Waskaganish since 1943. In summary, the probability of occurrence of IAS in the study areas is low, but real. It should be noted, however, that the inventories conducted in the summer of 2022 in SA2 did not identify any IAS (see Chapter 11). The known occurrences to date are from isolated localities that are not connected to an access corridor. However, since the consruction of the James Bay Highway and the subsequent construction of the Route du Nord, the effect of these penetration routes on the spread of weeds or undesirable species has never been measured. Since it is well documented that road or railways tend to facilitate and accelerate the spread of invasive species, the proposed infrastructures could potentially promote a northward extension of some invasive plant species, especially where these corridors coincide with heavily disturbed habitats.

3.1.5 TRADITIONAL USES BY INDIGENOUS PEOPLE

Cree communities use many species of plants for medicinal and food purposes as well as for making tools. During consultations conducted in 2002 and 2003 in the context of the Eastmain-1-A hydroelectric power plant and Rupert River diversion project, some 50 vascular plant species were identified as having traditional uses (Bouchard et coll., 2004; Hydro-Québec, 2004a). These include trees, shrubs and herbs (Table 3-3). The number of species used traditionally by communities is likely to decrease slightly as they move northward, as floristic diversity also decreases. In general, these species tend to be common and so the proposedinfrastructures are not likely to have a significant impact. According to the sources consulted, the most regularly used plants tend to be the most abundant. Multiple uses (mostly medicinal) exist for trees (coniferous and deciduous), shrubs and herbaceous plants, generally dicotyledons or broadleaf herbs. There seems to be little use of graminoid herbs (Juncaceae, Cyperaceae and Grasses).

Uprety et coll. (2012) presents a comprehensive synthesis of the knowledge gained by the various First Nations present in the Canadian boreal forest on the use of vascular plants for medicinal purposes.

During consultations with the users of the territory, numerous sites used for gathering various plant species, particularly blueberries, were identified along the proposed alignments. In addition, although it does not involve plant species per se, mushroom picking is also practised by Cree communities. This is particularly true in the northern portion of SA1, where some sectors are used to gather mushrooms of high commercial value. For a portrait of the information collected during the consultations, see Technical Note 3.

Table 3-3 Vascular Plants Identified by Cree Communities for their Traditional Use in the Southern Portion of the Study Area (Rupert River and Eastmain River Area)

ENGLISH NAME	SCIENTIFIC NAME
Trees	
Paper birch	*Betula papyrifera*
White spruce	*Picea glauca*
Black spruce	*Picea mariana*
Larch	*Larix laricina*
Balsam poplar	*Populus balsamifera*
Quaking aspen	*Populus tremuloides*
Jack pine	*Pinus banksiana*
Northern white cedar	*Thuja occidentalis*

ENGLISH NAME	SCIENTIFIC NAME
Shrubs	
Low sweet blueberry	*Vaccinium angustifolium*
Alpine bilberry	*Vaccinium uliginosum*
Bog rosemary	*Andromeda glaucophylla*
Mountain alder	*Alnus crispa*
Speckled alder	*Alnus rugosa*
Leather-leaf	*Chamaedaphne calyculata*
Fire-cherry	*Prunus pensylvanica*
Choke-cherry	*Prunus virginiana*
Creeping snowberry	*Gaultheria hispidula*
American dogwood	*Cornus stolonifera*
Skunk currant	*Ribes glandulosum*
Swamp black currant	*Ribes lacustre*
Canada gooseberry	*Ribes hirtellum*
Swamp laurel	*Kalmia polifolia*
Sheep laurel	*Kalmia angustifolia*
Labrador-tea	*Ledum groenlandicum*
Small cranberry	*Oxycoccus microcarpus*
Long-beaked willow	*Salix bebbiana*
Shining willow	*Salix lucida*
Balsam willow	*Salix pyrifolia*
Prairie willow	*Salix humilis*
Bog willow	*Salix pedicellaris*
Tea-leaved willow	*Salix planifolia*
Silky willow	*Salix pellita*
American mountain-ash	*Sorbus americana*
Mountain-ash	*Sorbus decora*
Squashberry	*Viburnum edule*
Herbs	
Chives	*Allium schoenoprasum*
Wild sarsaparilla	*Aralia nudicaulis*
Water avens	*Geum rivale*
Cow-parsnip	*Heracleum lanatum*

ENGLISH NAME	SCIENTIFIC NAME
Bunchberry	*Cornus canadensis*
Strawberry	*Fragaria virginiana*
Stiff club-moss	*Lycopodium annotinum*
Common mint	*Mentha arvensis*
Buckbean	*Menyanthes trifoliata*
Pubescent meadow-rue	*Thalictrum pubescens*
Red raspberry	*Rubus idaeus*
Dwarf raspberry	*Rubus pubescens*
Pitcher-plant	*Sarracenia purpurea*
Common cat-tail	*Typha latifolia*

Source: Bouchard et coll., 2004

3.2 REGIONAL SPECIFICITIES

3.2.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

Although this area crosses the closed boreal forest sub-zone south of the Eastmain River and the open boreal forest sub-zone to the north, the forest cover of SA1 has been heavily affected by forest fires in recent decades. For example, most of the area along the Billy-Diamond Highway between kilometer points B-300 and B-460 has been affected byvarious forest fires since 2005 (Map 3) (Government of Québec, 2022a). In this regenerating area, shrubby vegetation often dominates the tree cover.

SA1 is also distinguished by its greater abundance of wetlands compared to the other two study areas. Thesewetlands are common throughout most of the area. In total, they occupy almost 25% of the study area, which is significantly higher than in the other two study areas (Table 3-1). They are most abundant in the sector along the Eastmain River. Generally speaking, these wetlands are mainly bogs, but fens are also present (Hydro-Québec, 2004a).

Unlike the riparian areas of James Bay and Rupert Bay, SA1 is not particularly conducive to the presence of special status plant species (species at risk). The great northern aster (*Canadanthus modestus*) is reported by the CDPNQ on the banks of the Rupert River, outside the study area (Bouchard et coll., 2004; Tardif et coll., 2016). Three other species that were once likely to be designated as threatened or vulnerable are also present in some places along the Rupert River. These are golden hedge-hyssop (*Gratiola lutea*), woolly heather (*Hudsonia tomentosa*) and Robinson's hawkweed (*Hieracium robinsonii*) (Bouchard et coll., 2004; Genivar - SNC Lavalin, 2010). However, these species have been shown to be more common than previously thought and were therefore recently removed from the list of species at risk in Quebec (MELCC, 2020).

3.2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

Like SA1, the southern half of SA2 has also been heavily influenced by forest fires in recent decades, but these fires are generally older (NRTSB, 2010a), resulting in a more advanced stage of regeneration. Most of this zone is part of the open boreal forest, such that while many plant species found in SA1 and SA3 are present, the overall number of species is lower. The northern end of SA2, located on the edge of Hudson Bay, is characterized by forest tundra, calcareous soils and the presence of largely bare rocky coastal hills within 10 km of the coast. These hills include the Hudson cuestas, a particular geological formation that runs along the Hudson Bay coastline and includes the Manitounuk Islands (Pesca Environment, 2021). This formation has a characteristic topography (gentle slope on the west side and steep slope on the east side) and includes an abundance of limestone deposits. In this sector, the proximity to Hudson Bay also results in higher atmospheric humidity and the regular presence of fog. This humidity favours white spruce over black spruce (Hydro-Québec, 1993). This coastal zone is also characterized by a greater diversity of flora than inland.

With regard to wetlands, peatlands are abundant in SA2.The proportion of fens increases as one moves northward in SA2 (Hydro-Québec, 1993; Payette et Rochefort, 2001). The northern partof SA2 also enters the sporadic permafrost zone. Palsas are a particular type of peat bog appears in this sector (Hydro-Québec, 1993). These wetlands are found on year-round mounds of peat and mineral matter that can take theform of domes or plateaus up to a few metres high. They overhang the surrounding environment, which thaws completely during the summer. Palsas may be fens or bogs (National Wetlands Working Group, 1997).

With regard to species at risk, the area bordering Hudson Bay at the northern end of SA2, is of particular interest (Map 3). Although this area has a low floristic diversity, its distinctive characteristics (calcareous soils, maritime influence, shores, bare rocky hills that are sometimes steep and unstable) make it a potential habitat for certain rare or protected plant species. In general, these species of interest are mainly established in permanently open habitats (non-forest environments), particularly on maritime shores, steep slopes or in limestone scree areas. The basic nature of limestone soils favours rarer species, since the typical flora of the Canadian Shield is acidophilic and composed of highly competitive species (Hydro-Québec, 1993). In addition, the instability of limestone soilsfavours pioneer plant species, including some rare species. It should be noted that 8 of the 9 historical records reported by the CDPNQ (7 of 8 species) come from a very small fraction of the study area located near Hudson Bay (see section 3.1.3). It should also be noted that several other rare plant species are reported in this area, although they do not have any particular protection status to be considered at risk. Along the banks of the Great Whale River, another plant species as risk is noteworthy, although it has not been reported within the study areas. This is the Ojibway waterwort (*Elatine ojibwayensis*) found on the clayey shores of the river (Genivar - SNCLavalin, 2010).

Robinson's hawkweed has also been reported along the Great Whale and La Grande rivers, but this species was recently removed from the list of species at risk in Québec (MELCC, 2020). It should be noted that during the field work conducted in the summer of 2022, no plant species of precarious status were identified in the 68 stations inventoried, including 9 stations located in the area along Hudson Bay, which is considered to be more suitable for the presence of such species. Two species recently removed from the provincial list of threatened, vulnerable or potentially vulnerable species (EMVS) were identified. For more details on the floristic inventories conducted in the area SA2 in the summer of 2022, see Chapter 11.

3.2.3 STUDY AREA 3 (SA3) : ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

Area SA3 is entirely located in the lichen spruce bioclimatic domain. Compared to zones SA1 and SA2, it is distinguished by a higher altitude (generally around 500 m rather than 200 m) and lies about 300 km further east. Although it is also part of the western subdomain, SA3 is located near the boundary of the eastern subdomain, which is wetter and has less frequent forest fires. In fact, recent forest fires occupy a smaller area than in the area SA1 (Map 3) (Government of Québec, 2022a).

As in the other zones, wetlands are dominated by peatlands and are relatively abundant throughout the zone, although they occupy a smaller relative area than in the other two zones (Table 3-1). With regard to plant species at risk, the CDPNQ reports no mentions in the zone Study Area 3 (SA3), which has been minimally explored, but is not considered particularly suitable for these species, unlikethe Otish Mountains area, which lies approximately 35 km south of SA3.

It should be noted that in the context of the impact study for the Route 167 extension towards the Otish Mountains, the presence of the false mountain willow (*Salix pseudomonticola*) was noted along Route 167 (MTQ, 2010).

However, this species has never been identified at latitudes as far north as those of the proposed infrastructures(Tardif et coll., 2016).

3.3 ISSUES AND RECOMMENDATIONS

3.3.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

Considering the available information on flora, **wetlands** are the main issue associated with this component. These habitats play an important ecological role and are protected by provincial regulations. It should be kept in mind that wetlands are mostly peatlands (bogs and fens) and that they are distributed almost everywhere in the territories crossed. They are, however, present in greater density in the area SA1 zone. Since they are widespread in places, it is not realistic to avoid them entirely. Nevertheless, the choice of routes will have to take into account the presence of these sensitive habitats, to avoid them as much as possible and to maintain a natural protection strip around them. A 20 m wide strip is recommended wherever possible. In cases where complete avoidance is not possible, encroachment into these habitats should be minimized and the areas affected may have to be compensated if required during the analysis by the authorities (COMEX or CQEK). Indeed, even if the Regulation respecting compensation for adverse effects on wetlands and bodies of water (chapter Q-2, r. 9.1) does not apply to the study reas, compensation could be required during the environmental assessment. This compensation could take the form of a compensatory work, a contribution to a research project or the improvement of another natural environment. The delineation of wetlands will, however, have to be clarified by photo-interpretation (see next section).

Although no species of **flora at risk** have been identified in the study areas for several decades, the possible presence of habitats conducive to these species in certain areas will still require special attention during the next stages of the study. It should be kept in mind that these species are most likely to grow in the coastal zone along Hudson Bay. The shoreline of large rivers is also a potential habitat for some species.

The establishment of roads or railways creates permanently open corridors that can favour the expansion of **invasive alien species** (IAS). Although few mentions of IAS have been reported for the study areas despite the presence of roads for several decades in some areas, the proposed infrastructurescould still favour the expansion of IAS, which are adapted to the harsh climate that prevails at the study areas' latitudes.

Finally, the proposed roads and railways will inevitably result in encroachment on natural flora, which will lead to a **loss of habitat**. Despite the large areas affected, the vastness of the natural territory crossed will help to reduce the significance of this impact on a regional scale. Nevertheless, it is planned to integrate several measures in order to minimize the areas encroached upon and to ensure the rapid revegetation of the temporarily affected areas. In addition, special attention will be paid to the possible presence of interesting plant habitats during the next stages of the study.

3.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

During the subsequent stages of the study, it is proposed to carry out a photo-interpretation campaign along the selected corridors in order to clarify the floristic portrait of the regions crossed by the proposed infrastructures. This work should also make it possible to more precisely delineate the wetlands located in the vicinity of the study in order to ensure their protection, as far as possible. It is also recommended to meet with the responsible authorities to clarify requirements in relation to compensation for the loss of wetlands, considering that these habitats are extremely common in the area. It should also be noted that there is currently a study on wetlands underway in which CNG is a partner. This study aims at reviewing the evaluation criteria for northern wetlands, considering that these habitats are much more common than in southern Quebec. Moreover, there is also the NSERC-UQAT Industrial Research Chair on northern biodiversity that is ongoing since 2018 that relates to many studies on wetlands, notably one addressing the Multidimensional Environmental Richness Index for Peatlands to help decision-making. The results of these studies should be considered in the next steps of La Grande Alliance.

It is also recommended that a stratified sampling of the different types of plant habitats identified, based on photo-interpretation work be carried out in order to gain a better understanding of their characteristics and the plant community. During this inventory, particular attention should be paid to the potential presence of plant species at risk or habitats that are suitable for them, especially in areas that are more likely to contain such species. If plant habitats of particular interest are discovered during the surveys, they will be added to the constraints to be considered when refining the choice of routes. An update of the species at risk susceptible to be found in the study will also have to be made in the ESIA stage, since the species at risk lists are regularly updated by both provincial and federal authorities.

4 ICHTHYOFAUNA AND FISH HABITAT

4.1 GENERAL DESCRIPTION

4.1.1 FISH HABITAT

The study areas have a wide variety of aquatic habitats suitable for many fish species. The western portion of the study located near James Bay and Hudson Bay (SA1 and SA2) is crossed by several large rivers (e.g., Rupert, Eastmain, La Grande, Great Whale). Smaller rivers, including many streams, are also found throughout the study area. There are also numerous lakes of varying sizes, and they are particularly abundant in SA3. A large hydroelectric reservoir (Robert-Bourassa Reservoir) is also found at the junction between study areas SA1 and SA2. Table 4-1 presents the total and relative surface area occupied by water bodies in each of the study areas. These data are derived from map references obtained from the MERN Topographic and Administrative Database (TAD). It should be noted that these data are based on a scale of 1:250,000, which limits their accuracy. Thus, only relatively large rivers and lakes are included in the surface areas.

Smaller watercourses are not included in this analysis. Nevertheless, the exercise carried out does allow the relative importance of water bodies in the study areas to be assessed.

Table 4-1 Water Body Coverage in the Three Study Areas

STUDY AREA	TOTAL AREA (KM^2)	AREA OCCUPIED BYWATER BODIES (KM^2)	PROPORTION OF THE TERRITORY OCCUPIED BYWATER BODIES (%)
SA1	15,374	4,254	27.7
SA2	12,398 [1]	4,357	35.1
SA3	15,157	6,228	41.1
Total	42,929	14,840	34.6

Source: BDTA (scale 1 : 250,000)
1 The marine portion of the area SA2 is excluded

4.1.2 ICHTYOFAUNA

The following table shows 34 species of freshwater fish likely to be found in the water bodies in any of the study areas. Of these species, 30 have been confirmed in the study areas or are considered highly probable. This list was drawn up with the help of Verdon (2001), which is based on multiple inventories conducted between 1973 and 2000 by the Société d'Énergie de la Baie James (SEBJ) and Hydro-Québec. Figures are based on data from 2,201 inventory stations spread over the territory of James Bay and northern Quebec, which ledto the capture of approximately 570,000 fish, thus making it possible to specify the distribution range of freshwater fish species in northern Quebec.Other data from more recent fishing stations and transmitted by the MFFP in the fall of 2021 were also taken into account in order to further clarify the portrait of the species present in each zone.

Species confirmed or considered highly likely to occur were caught at fishing stations located within or in close proximity to either study area. Species considered likely to occur are mainly those whose range limits are near the southern boundary of either study area.

Compared to southern Québec, freshwater fish communities are much less diverse in the study areas due to the particularly harsh climate (Hydro-Québec, 1993). In general, the diversity of freshwater fish species in Northern Québec decreases as one moves northward or eastward. It is therefore in SA1 that the diversity of species is greatest (27 species confirmed or highly probable), followed by SA2 (21 species confirmed or highly probable), and SA3 (19 species confirmed or highly probable) (Table 4-2). Lakes and rivers generally support fairly similar communities (Hydro-Québec, 1993). However, species diversity is lower in small rivers, which are not suitable to large fish species. Lack of adequate winter habitat is often the limiting factor in these waterbodies, which are mainly home to smaller species such as cyprinids (minnows), gasterosteids (sticklebacks) and cottids (sculpins). Brook trout (*Salvelinus fontinalis*) is also common in these smaller habitats. This salmonid can grow very large in lakes and large rivers but adapt well to small waterbodies where it stays relatively small. These species also frequent larger bodies of water.

The harsh climate in the study areas influences not only the diversity of fish species found in the area, but also their life history. For example, fish species found in freshwater habitats in the area are characterized by slow growth, late sexual maturity and long life spans (NRTBJRC, 2010b). The majority of species in the region spawn in the spring, while salmonids (trout, cisco and whitefish) tend to spawn in the fall, with eggs overwintering and subsequently hatching the following spring. Among the species of interest that are briefly described below, the vast majority spawn preferentially in fast flowing water (lotic habitats), on a gravelly or rocky substratewith good oxygenation. Such sites are often located at the foot of rapids, particularly upstream of long, calm stretches (lentic habitats) (Hydro-Québec, 2004a).

Table 4-2 Fish Species Potentially Present within the Study Areas

SPECIES	FAMILY	STATUS IN QUEBEC [1]	STATUS IN CANADA [2]	CONFIRMED OR POTENTIALPRESENCE [3]		
				SA1	SA2	SA3
Lake sturgeon (*Acipenser fulvescens*)	Acipenseridae	LDTV	SC	X	X*	
Goldeye (*Hiodon alosoides*)	Hiodontidae	-	-	(x)		
Mooneye (*Hiodontergisus*)	Hiodontidae	-	-	(x)		
Lake chub (*Couesius plumbeus*)	Cyprinidae	-	-	X	**X**	X
Pearl dace (*Margariscus margarita*)	Cyprinidae	-	-	X	(x)	X*
Emerald shiner (*Notropis atherinoides*)	Cyprinidae	-	-	X	(x)	
Spottail shiner (*Notropis hudsonius*)	Cyprinidae	-	-	X	**X***	
Blacknose dace (*Rhinichthys atratulus*)	Cyprinidae	-	-	(x)		

SPECIES	FAMILY	STATUS IN QUEBEC [1]	STATUS IN CANADA [2]	CONFIRMED OR POTENTIALPRESENCE [3]		
				SA1	SA2	SA3
Longnose dace (*Rhinichthys cataractae*)	Cyprinidae	-	-	X	X	X
Creek chub (*Semotilus atromaculatus*)	Cyprinidae	-	-	(x)	(x)	(x)
Fallfish (*Semotilus corporalis*)	Cyprinidae	-	-	X	(x)	(x)
Longnose sucker (*Catostomus catostomus*)	Catostomidae	-	-	X	**X**	X
White sucker (*Catostomus commersoni*)	Catostomidae	-	-	X	**X**	X
Northern pike(*Esox lucius*)	Esocidae	-	-	X	**X**	X
Lake cisco (*Coregonus artedi*)	Salmonidae	-		X	X	X
Lake whitefish (*Coregonus clupeaformis*)	Salmonidae	-	-	X	X	X
Dwarf lake whitefish (*Coregonus clupeaformis*)	Salmonidae	-	-			X
Round whitefish (*Prosopiumcylindraceum*)	Salmonidae	-	-	X	X	X
Arctic charr (*Salvelinus alpinus*)	Salmonidae	-	-		X	
Brook charr (*Salvelinus fontinalis*)	Salmonidae	-	-	X	**X**	X
Lake trout (*Salvelinus namaycush*)	Salmonidae	-	-	X	**X**	X
Trout-perch (*Percopsis omiscomaycus*)	Percopsidae	-	-	X	**(x)**	

SPECIES	FAMILY	STATUS IN QUEBEC [1]	STATUS IN CANADA [2]	CONFIRMED OR POTENTIALPRESENCE [3]		
				SA1	SA2	SA3
Burbot (*Lota lota*)	Lotidae	-	-	X	**X**	X
Brook stickleback (*Culaea inconstans*)	Gasterosteidae	-	-	X	(x)	
Threespine stickleback (*Gasterosteus aculeatus*)	Gasterosteidae	-	-	X	**X**	
Ninespine stickleback (*Pungitiuspungitius*)	Gasterosteidae	-	-	X	**X**	X
Mottled sculpin (*Cottus bairdi*)	Cottidae	-	-	X	X	X
Slimy sculpin (*Cottus cognatus*)	Cottidae	-	-	X	X	X
Spoonhead sculpin (*Cottus ricei*)	Cottidae	-	-	X*		
Fourhorn sculpin (*Myoxocephalus quadricornis*)	Cottidae	LDTV	-		X	
Yellow perch (*Perca flavescens*)	Percidae	-	-	X	**X***	X
Logperch (*Percina caprodes*)	Percidae	-	-	X	(x)	X
Sauger (*Sander canadensis*)	Percidae	-	-	X*		
Walleye (*Sander vitreus*)	Percidae	-	-	X	**X***	X*

Source: Verdon, 2001 and MFFP, 2021c

1 MFFP, 2022 : LDTV = Likely to be designated as threatened or vulnerable

2 Government of Canada, 2022: SC = Special Concern (as per Schedule 1 of the Species at Risk Act)

3 X = Confirmed or highly probable presence, X* = Confirmed or highly probable presence in the southern part of theterritory only, (x) = Possible presence (range limit near the edge of the study area)

4 Bold = Species confirmed to be present in the summer of 2022 in SA2 as a result of fishing or environmental DNA analysis (see Chapter 11).

Of the species reported in the study areas, brook trout (*Salvelinus fontinalis*) is the most widely distributed speciesof interest. It is the most common salmonid species in Quebec. It frequents fresh, clear and well-oxygenated water bodies throughout Quebec (CRRNTBJ, 2010b). Brook trout is present in streams as well as in large rivers and lakes. The freshwater form is the most widespread, but an anadromous form is also present in certain coastal streams in the region. Like other salmonids found in the region, brook trout spawn in late summer or fall.

They lay their eggs on a shallow gravel substrate, often at the head of a river or on the shoals of lakes (Hydro-Québec, 1993). Its productivity is significantly lower in the areas crossed by the proposed infrastructuresthan in southern Québec(CRRNTBJ, 2010b).

Lake trout (*Salvelinus namaycush*) is another popular salmonid species found throughout most of Northern Quebec. However, it is absent from the James Bay lowlands and the southern end of SA1. This species can reach advanced ages, particularly in northern environments where its growth is slower (NRTBJRC, 2010b). It is a primarily lake species that spawns in lakes on rock and pebble substrates, usually located near shoals or shorelines (Scott and Crossman, 1974).

The northern pike (*Esox lucius*) is another species of interest that is widespread throughout the study areas. This species spawns in spring, immediately after the ice melts. Unlike the majority of fish species of interest in the region that spawn in fast-flowing water, northern pike spawn in shallow, calm, heavily vegetated areas along theedges of large rivers and lakes (CRRNTBJ, 2010b). However, it exploits a wide variety of habitats outside of itsbreeding period.

Lake whitefish (*Coregonus clupeaformis*) and lake cisco (*Coregonus artedi*) are two other members of the salmonid family that are traditionally fished by locals and are distributed throughout most of the area. The lakewhitefish, which frequents both lakes and rivers in the region, is the more abundant of the two species. As with many other salmonids, there is an anadromous form of these species that frequent some of the rivers crossed by the infrastructures under study. In the case of lake whitefish, this species is appreciated mostly by the people of the coast (anadromous form). A dwarf form of the species is also noteworthy. The latter is reported in several lakes in the eastern part of Northern Quebec. The breeding populations and distribution of anadromous lake whitefish and cisco are poorly known. However, the FISHES (Fostering Indigenous Small-scale fisheries for Health and food Security) research project led by Louis Bernatchez's team at Laval University, which focuses on the utilizing genetic markers to identify and manage fish stock populations, should provide a better understanding of this.

Although they are of more limited interest, the two sucker species that frequent the region's water bodies are probably the two most widespread and abundant fish species in the study areas. These two species frequent diversified habitats and reproduce in fast-flowing stretches of water, on gravel or pebble substrates (Hydro-Québec, 1993). Both are consumed from time to time by Cree communities.

Lake sturgeon (*Acipenser fulvescens*), walleye (*Sander vitreus*) and Arctic char (*Salvelinus alpinus*) are alsospecies of interest that frequent the water bodies in the study area. These species are described briefly in sections 4.1.3, 4.2.1 and 4.2.2 respectively. Lastly, it should be noted that during the consultations conducted with the users of the territory, numerous fishing sites traditionally used by the local communities were identified, as well as certain sensitive habitats. In this regard, see Technical Note 3, which provides an overview of the information gathered from community engagement work.

4.1.3 SPECIES AT RISK

Among the fish species potentially present (Table 4-2), there are two species of special status (species at risk): lake sturgeon (*Acipenser fulvescens*) and fourhorn sculpin (*Myoxocephalus quadricornis*). Both species are likely to be designated as threatened or vulnerable in Québec, while in the case of lake sturgeon, the southern Hudson Bay and James Bay population are also listed in Appendix 1 of the Species at Risk Act as a species of special concern (Government of Canada, 2022). These two species are briefly described below:

The **lake sturgeon is** the only representative of the Acipenseridae family in northern Québec. It is of great traditional importance to the Cree communities, which practise a subsistence fishery for the species, particularly in the spring and summer (Environment Unlimited, 2012). In northern Québec, it reaches the northern limit of its range around 55°N latitude (CRRNTBJ, 2010b). In this area, it is only found in the western portionof the territory. This species is therefore present in SA1 and in the extreme southern limit of SA2, where it is mostly found in the La Grande River. The lake sturgeon isabsent from SA3.

The southern Hudson Bay and James Bay population is considered to be of federal concern because of a decline in populations resulting from both the exploitation of the species and the large number of hydroelectric dams. In the Rupert and Eastmain rivers, sturgeon spawn in the spring, around the end of May or in June, at water temperatures between 8.5 and 14.5°C, but they reach sexual maturity at an advanced age (20 years for males and 30 years for females) and do not reproduce every year (intervals of 2 to 4 years for males and 4 to 6 years for females). The optimal spawning habitat for the species is areas 0.5 to 1.0 m deep, with a current of 0.2 to 1.0 m/s. The eggs are laid on a substrate consisting mainly of boulders, cobbles and pebbles (Environnement Illimité, 2012). Lake sturgeon spawning grounds are thus often located immediately downstream (less than 400 m) of a major rapid that is often impassable. The feeding habitat of adult sturgeon is quite different and generally corresponds to very calm areas 2 to 4 m deep characterized by a silty substrate devoid of aquatic vegetation. It is in this type of substrate that it feeds on

a varied benthic fauna, including insect larvae, crustaceans and molluscs (Environnement Illimité, 2012). In winter, the species moves to greater depths (4 to 10 m), in calm areas resting on a sand or silt substrate. The species is characterized by its large size and long life span. In the study area, specimens over one metre in length are frequently reported, while the maximum documented age is 60 years. Elsewhere in Canada, however, much larger (up to 4.6 m) and older (about 150 years) specimens have been reported.

The **fourhorn sculpin** belongs to the cottidae family. Although this species frequents several large freshwater lakes in southern and western Canada, the form present in northern Quebec is the marine form, which also frequents brackish waters (Scott and Crossman, 1974). In the study areas, this species is therefore limited to the downstream or estuarine portion of rivers, near the marine environment. It is therefore likely to frequent only the portion of the study area SA2 that borders Hudson Bay (Verdon, 2001).

4.2 REGIONAL SPECIFICITIES

4.2.1 STUDY AREA 1 (SA1) : BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

Like the other two study areas, SA1 is characterized by a large number of water bodies, including streams of varying size and a multitude of lakes, providing numerous and varied habitats for fishes. Compared to the other two zones, however, the overall surface area occupied by water bodies is proportionally smaller (Table 4-1), probably due to the smaller number of lakes which tend to be relatively small. The main lakes in SA1 are, from south to north, Duxbury, Vieux Comptoir, McNab, Yasinski and Duncan lakes (Map 2). The vast Robert Bourassa reservoir at the northern end of the zone is also noteworthy even though it was created. The fact that SA1 covers the downstream portion of several large watersheds is reflected in the presence of several large rivers that cross the study area, the most important of which are the Rupert and Pontax rivers in the southern part of SA1, and the Eastmain and Opinaca rivers in the central part. Note that the Eastmain and Opinaca Rivers were completely diverted northwards in 1980, approx. 50-km upstream from the BDH. This resulted in the creation of the Opinaca Reservoir, upstream from the point of diversion. The flow in these rivers as they cross SA1 is therefore significantly reduced compared to natural conditions.

Note also that major hydroelectric development project was completed on the Eastmain River in 2005 and 2012 (Eastmain-1, Eastmain-1A and Sarcelle powerhouses), resulting in the creation of the Paix-des-Braves (EM-1) reservoir. However, these modifications have no influence on flows downstream from the original point of diversion. The Eastmain-1A powerhouse also resulted in the partial diversion of the Rupert River. This resulted in the creation of the Rupert Diversion Bays, flooded areas located approx. 200-km upstream from the BDH. Approximately 71% of the Rupert River flow has been diverted northwards, towards the EM-1/EM-1A, Sarcelle Powerhouses, ending up in the La-Grande River. An instream ecological flow is ensured, with 29% of flows released at the point of diversion following seasonal modulations (higher flows in spring and fall; lower flows in winter and summer), resulting in approximately 50% of annual natural flows in the river (as a result of tributaries contributing water below the dam) as it flows through SA1 to its mouth into James Bay. Furthermore, eight hydraulic structures were built along the reduced flow sector of the Rupert River to replicate average summer water levels along a portion of the river (Hydro-Québec, 2004a), one of which is a weir located at KP110 of the river, approximately 3 km upstream of the Rupert River Bridge along the BDH.

To mitigate the negative impacts of the EM-1A/Sarcelle Powerhouses and Rupert Diversion Project on fish and fish habitat, Hydro-Québec carried out a number of measures along the Rupert River. These include the construction of artificial spawning grounds and migratory channels for various fish species in the lower river. Furthermore, stocking of young-of-the-year lake sturgeon was carried out in the sector of the Rupert River just upstream from SA1 for five years during the Construction Phase. Within the portion of the Rupert River that crosses SA1, a multispecies spawning ground was built downstream of the KP110 weir.

Hydro-Québec documentation allowed to identify a number of important natural spawning grounds in SA1. These are particularly sensitive habitats. In the Eastmain River, a sturgeon spawning ground is present at the foot of a rapid located some 500 m upstream from the Conglomeration Bridge on the BDH. Further north, a large walleye spawning ground is located in the upstream portion of Yasinski Lake, immediately upstream from a culvert along the BDH. These two spawning grounds were also identified as very sensitive habitats during consultations with Cree land users (see Technical Note 3). Along the Rupert River, in addition to the spawning ground mentioned above, sensitive habitats were identified in the Eastmain-1A and Sarcelle powerhouses and the Rupert diversion Project Environmental and Social Impact Assessment (ESIA) in the immediate vicinity of the Rupert River Bridge, such as a sturgeon spawning ground directly below the bridge and just upstream, at the foot of the large rapids visible from the BDH (Environnement Illimité, 2012; Hydro-Québec, 2004b). Spawning grounds for walleye, lake whitefish and suckers are also found in this area (Environnement Illimité, 2012). Another walleye spawning ground is located approximately 1 km downstream from the BDH (Hydro-Québec, 2004b). The Rupert River area going from the rapids to 5-6 km downstream are also fished by Cree land users.

Although it is outside the study area and more than 80 km downstream of the Billy-Diamond Highway, there is another particularly sensitive site on the Rupert River. This is the segment downstream of Smokey Hill Rapids, located at kilometre 24 of the Rupert River. This is a major traditional anadromous lake cisco fishing site and there are also several spawning grounds in this segment of the Rupert River, mainly for lake cisco and lake whitefish (Hydro-Québec, 2004b).

In terms of fish diversity, study area SA1 has the highest number of fish species, with 27 confirmed or highly probable species (Table 4-2), many of which are, however, restricted to the southern portion of SA1. Although walleye (*Sander vitreus*) is also reported in part of the territory of the other two study areas, this species, which is particularly popular with anglers, is most abundant in SA1, where it is reported throughout the territory. Walleye is particularly fond of large, deep lakes with irregular contours (NRTBJRC, 2010b), such as Lake Yasinski. This species characterized by high fecundity and spawns in the spring, in late May or early June in the James Bay Territory. It should be noted that the other walleye species present in Québec, the sauger (*Sander canadensis*), is also present in the SA1, but is limited to the southernmost part of this area.

With regard to species at risk, lake sturgeon (*Acipenser fulvescens*) is the only one reported in SA1. This is described in section 4.1.3. Like walleye, this species is mainly found in SA1, although it also reaches the southern end of SA2. This species, which is highly valued by Cree communities, has been the subject of spawning ground development and a stocking program in the segment of the Rupert River upstream of the Billy-Diamond Highway (upstream of the hydraulic structure at km 110) as well as further upstream, as part of the Eastmain-1A and Sarcelle Powerhouses and Rupert Diversion Project (Environnement Illimité, 2012).

4.2.2 STUDY AREA 2 (SA2) : ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

Like SA1, SA2 is also characterized by the presence of a few large rivers, although lakes are more abundant. As a result, water bodies occupy a greater proportion of the area (Table 4-1). The main lakes in SA2 are Roggan Lake, Craven Lake, Julian Lake and Burton Lake, but these are located close to or partially outside the study area (Map 2). A small portion of Robert-Bourassa Reservoir is also located at the southern end of the study area. The main rivers in SA2 are located at opposite ends of the study area. These are the La Grande River to the south and the Great Whale River to the north. The Piagochioui, Roggan and Vauquelin rivers are other major rivers that will need to be crossed by the proposed railway. Because of its position along Hudson Bay in its northern part, SA2 also has the distinction of including the estuarine portion of several rivers that flow into Hudson Bay, including the Great Whale River. These aquatic habitats adjacent to Hudson Bay are influenced to some extent by the marine environment (tides, salinity) and therefore have characteristics not found in the other two study areas.

In terms of sensitive aquatic habitats, little information is available for SA2. Nevertheless, several spawning grounds were identified in the lower reaches of the Great Whale River during studies conducted by Hydro-Québec for the Great Whale project (Consortium Gilles Shooner & associés, Somer and Environnement Illimité, 1991). Although these are not identified on the maps, they are considered in the development of the proposed infrastructures. In addition, several other sensitive aquatic habitats were identified in SA2 during the consultations conducted with the users of the territory. It should be noted that the results of these consultations are presented in Technical Note 3 and that the sensitive elements identified are also taken into account in the development of the proposed infrastructures.

In terms of fish fauna, there are 21 fish species confirmed or considered highly probable in the SA2 study area (Table 4-2). The presence of several of these species was in fact confirmed during fisheries or environmental DNA analyses conducted in summer 2022 (see Chapter 11). Some of these species reach the northern limit of their range in study area 2 and are therefore limited to the southern portion of the study area. Thus, in the northern part of the study area, 17 fish species are confirmed or highly probable (Table 4-2). During the fish inventories conducted in the Great Whale River watershed as part of the draft-design report for the Great Whale hydroelectric complex, the most common fish species were lake whitefish (*Coregonus clupeaformis*) white sucker (*Catostomus catostomus*), lake trout (*Salvelinus namaycush*), brook trout (*Salvelinus fontinalis*), round whitefish (*Prosopium cylindraceum*), lake chub (*Couesius plumbeus*) and burbot (*Lota lota*) (Hydro-Québec, 1993). In total, these fisheries confirmed the presence of 16 species. Of the 17 species potentially present, only the fourhorn sculpin (*Myoxocephalus quadricornis*) was not fished as part of these inventories, while the arctic char (*Salvelinus alpinus*) is limited to estuarine areas since it does not have access to continental freshwater. The potential presence of these two species, which are absent from the other two zones, is explained by the proximity of the northern part of zone SA2 to Hudson Bay. A few other marine fish species can also be found in the estuary of the Great Whale River. For more details on these predominantly marine species, see Technical Note 7 - Marine Environment.

Arctic char is a predominantly northern salmonid species that occurs south to the northern end of James Bay. In this area, however, only the anadromous form is present. However, its ability to cross river barriers is limited (CRRNTBJ, 2010b), which explains why it is only found in the downstream portion of the rivers in the study area. The freshwater form of the species is found further north, beyond the northern limit of the study area, as well as in the high altitude lakes of southern Québec (subspecies *oquassa*). The fourhorn sculpin is a species likely to be designated as threatened or vulnerable in Québec and is reported in the estuarine portion of several rivers that flow into Hudson Bay in the northern part of SA2. The other species considered at risk that are likely to be found in the SA2 area is the lake sturgeon (*Acipenser fulvescens*), which is, however, limited to the southern part of SA2. Both species are described in section 4.1.3.

4.2.3 STUDY AREA 3 (SA3) : ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

The aquatic habitats in Study Area 3 (SA3) differ from those in the other two study areas in that there are few major riversand streams, due to the location of this area near the head of La Grande River watershed, which crosses the northern part of the area. However, there is a great abundance of lakes throughout the area, including a very large number of small lakes and some larger lakes (e.g., Lake Dalmas) which are often characterized by a very irregular shoreline and an abundance of islands. It is in this study area that the relative surface area occupied by water bodiesis the largest (>40%,Table 4-1). Information on habitats of interest for aquatic fauna is very limited, but consultations with users of the territory have nevertheless made it possible to identify some of them (see Technical Note 3).

In terms of fish fauna diversity, Zone SA3 is the least diverse with 19 confirmed or highly probable species (Table 4-2). These species are all found in one of the other two study areas, with the exception of the dwarf form of lake whitefish (*Coregonus clupeaformis*), which is absent from the western part of northern Québec but is considered potentially present in zone SA3 (Verdon, 2001). In the context of the Route 167 extension to the Otish Mountains, fishing was conducted in 2009 and 2010 in the Misask River watershed, located at the southern end of the study area. These fisheries confirmed the presence of 13 of the 19 fish species considered to be present in the SA3 area (MTQ, 2010). However, no species of fish at risk were reported in this area.

4.3 ISSUES AND RECOMMENDATIONS

4.3.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

The proposed roads and railways will inevitably involve the construction of a large number of watercourse crossings. Such structures are likely to result in the **loss of fish habitat.** This is the case for all culverts that will have to be installed on smallwatercourses, since these structures, even if they can be used by fish to a certain extent, considerably modify the natural conditions of the aquatic habitat. Culverts result in the elimination of the natural riparian buffer, reduced light levels, and often substrate modification and habitat linearization.

The development of bridges may also result in a loss of fish habitat if a pier is required or if the abutments or riprap protecting the abutments encroach below the natural high water mark (NHWM) which is the upper limit of fish habitat. Permanent losses of fish habitat caused by the infrastructures under studywill have to be compensated under Section 35 (2) of the Fisheries Act.

On the other hand, some aquatic habitats are particularly sensitive because they play an important role in the life cycle of one or more fish species (e.g., reproduction, feeding, migration, rearing). This is particularly true of **spawning grounds**, which are essential for fish reproduction. It should be kept in mind that most of the species of interest in the study areas reproduce in lotic habitats, often located at the foot of rapids. These sensitive habitats should therefore be avoided as much as possible by the planned infrastructures.

The numerous culverts that will need to be installed under proposed conveyance routes may also compromise the **free movement of fish** from downstream to upstream by creating barriers to fish passage. To avoid impeding fish movement, culvert design will need to follow Fisheries and Oceans Canada guidelines (DFO, 2016), unless it can be demonstrated that there is already a natural impassable barrier in the vicinity of the crossing site or that the habitat upstream of the culvert is marginal in quality and/or quantity. These guidelines propose different approaches to allow upstream fish migration, depending on the fish species and the natural characteristics of the watercourse. Arch culverts allow for a more natural watercourse bed that can facilitate fish passage (if adequately designed), but those structures are not adapted to all situations. Other types of culverts can also be adequate to ensure upstream fish migration (e.g., backwater culvert, weir culvert, culvert with stream simulation). Moreover, these crossing structures will also have to comply with the standards of the Regulation respecting wildlife habitats (chapter C-61.1, r.18), otherwise they must be subject to an authorization.

In general, the design of crossing structures should be optimized to minimize impacts on fish and fish habitat, by reducing encroachment, protecting fish habitat and ensuring free movement of fish where required. It should be noted, however, that the proposed structures are not likely to cause a high level of vibration in the aquatic habitat, although some of them may include in-water piers. These structures will meet modern construction standards, which include high stability, with piers resting on solid foundations, deeply anchored below the surface of the stream bed.

During the construction phase, aquatic habitats are likely to be negatively affected by the **suspension of fine particles** in the water column. The increase in turbidity can contribute to the temporary degradation of the quality of the habitat, while the accumulation of fine particles on spawning grounds can lead to the clogging of the latter.

Appropriate measures will therefore have to be taken during the works to minimize the risk of fine particles being suspended in the aquatic environment. The structures will also have to be adequately stabilized so that they do not encourage bank erosion once construction is complete. In addition, the surface area occupied by temporary structures below the high-water level (HWL), which generally do not have to be compensated, should be minimized as much as possible.

Finally, by facilitating access to areas that are difficult to access, the proposed infrastructures are also likely to **increase fishing pressure**. This issue mainly affects zone SA3, where the extension of a road is planned, which would inevitably increase the use of the zone by both traditional and recreational fishermen. Lakes and streams closer to the proposed road will be more affected. As for the other two study areas, the extension of the railway line that is thesubject of this pre-feasibility study is not, likely to significantly affect the influx of fishermen

4.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

During the next stages of La Grande Alliance, it is proposed to carry out a photo-interpretation campaign of the aquatic habitats along the selected corridors, in order to specify the characteristics of the aquatic habitat and to identify potential spawning grounds or certain habitats that are of particular interest (e.g., grass beds) and which have not already been identified in the consultations carried out (see Technical Note 3). This photo-interpretation will also make it possible to identify or specify the location of the small watercourses that will have to be crossed. This exercise should be followed by field campaigns to further document the characteristics of the aquatic habitats crossed, as well as the species found in those habitats. At the impact study stage, the field campaigns to be carried out will have to include a detailed characterization of all the watercourses crossed by the infrastructures under study, in order to specify the characteristics of the aquatic habitat and to decide, in particular, on the need to maintain the free passage of fish at the crossing points. These approaches should integrate Cree knowledge as much as possible, and active land user participation in field work should be a requirement.

The field campaigns to be carried out during the impact study phase will allow the characteristics of each of the watercourses crossed to be specified with a view to further optimizing the development of the proposed infrastructures (e.g. optimization of the design of the crossing structures and localized adjustments to the route).

Moreover, CNG is currently leading the development and implementation of the lake sturgeon management plans required under the Species at Risk Act. When finalized, this plan will need to be taken in account in the future stages of La Grande Alliance, should it proceed.

An update of the species at risk susceptible to be found in the study rea will also have to be made in the next steps of the development of the proposed infrastructures, since the species at risk lists are regularly updated by both provincial and federal authorities.

5 HERPETOFAUNA

5.1 GENERAL DESCRIPTION

The vast majority of the 21 species of amphibians and 17 species of reptiles found in the province are restricted to the extreme south of Quebec, notably in the St. Lawrence Lowlands and along the Outaouais River (AARQ, 2022). Species diversity decreases drastically as we move north, as conditions become increasingly inhospitable for this group. Indeed, the short, cool summers that alternate with very long winters contribute to making it difficult for poikilothermic (cold-blooded) animals to survive in Northern Quebec (Kuyt, 1991). Nevertheless, the region crossed by the proposed infrastructures includes many potential habitats for herpetofauna because of the abundance of water bodies and wetlands that are habitats of choice for this group of species, in particular amphibians which lay their eggs in water and include an aquatic larvae life cycle stage. It should also be noted that this group of species remains poorly understood and has been less studied than other groups of vertebrate fauna (fish, birds, mammals).

Of the 11 species of herpetofauna reported in the James Bay region (CRRNTBJ, 2010b), 10 species are considered potentially present in at least one of the study areas, i.e., 9 amphibian species and one reptile species (Table 5-1). The number of potential species decreases in the more northerly SA2.

During amphibian inventories conducted in James Bay, the American toad (*Anaxyrus americanus*), the northern spring peeper (*Pseudacris crucifer*) and the wood frog (*Lithobates sylvaticus*) were the most frequently identified species (CRRNTBJ, 2010b). These three amphibians utilize both aquatic and terrestrial environments during their life cycle (AARQ, 2022). The other frog species reported in the territory have a more aquatic lifestyle. As far as salamanders (urodela) are concerned, the northern two-lined salamander (*Eurycea bislineata*) is the only stream salamander present in the territory. The other two salamander species are burrowing species that are rarely observed (CRRNTBJ, 2010b). Only one species of reptile is found in the study areas, the common garter snake (*Thamnophis sirtalis*). This is by far the most common species of snake in Québec and also the one with the most northerly distribution. It uses a wide variety of terrestrial and wetland habitats (AARQ, 2022).

Table 5-1 Amphibian and Reptile Species Potentially Present within the Study Areas

SPECIES	GROUP	STATUS IN QUEBEC [1]	STATUS IN CANADA [2]	CONFIRMED ORPOTENTIAL PRESENCE [3]		
				SA1	SA2	SA3
Blue-spotted salamander (*Ambystoma laterale*)	Amphibian (Urodela)	-	-	X	(x)	X
Yellow-spotted salamander (*Ambystoma maculatum)*	Amphibian (Urodela)	-	-	(x)		(x)
Northern two-lined salamander (*Eurycea bislineata*)	Amphibian (Urodela)	-	-	X	(x)	X
American toad (*Anaxyrus americanus*)	Amphibian (Anuran)	-	-	X	X	X
Northern spring peeper (*Pseudacris crucifer*)	Amphibian (Anuran)	-	-	X	X*	X
Wood frog (*Lithobates sylvaticus*)	Amphibian (Anuran)	-	-	X	X	X
Northern leopard frog (*Lithobates pipiens*)	Amphibian (Anuran)	-	-	X	(x)	X
Green frog (*Lithobates clamitans*)	Amphibian (Anuran)	-	-	X*		(x)
Mink frog (*Lithobates septentrionalis*)	Amphibian (Anuran)	-	-	X	X	X
Common garter snake (*Thamnophis sirtalis*)	Reptile (Snake)	-	-	X	X*	X

Source: AARQ, 2022.
1 MFFP, 2022.
2 Government of Canada, 2022
3 X = Confirmed or highly probable presence, X* = Confirmed or highly probable presence in the southern part of the territory only, (x) = Possible presence (range limit near the edge of the study area)

The only herpetofauna species considered at risk in Eeyou Istchee is the boreal chorus frog (*Pseudacrismaculata*). This species is likely to be designated as threatened or vulnerable in Québec, whereas it has no particularprotection status at the federal level. Its distribution in the province is limited to the James Bay Lowlands (AARQ, 2022) and its presence in Québec was only confirmed in 2002 (Bouchard et coll., 2004). Three populations have since been identified in wetlands (coastal marshes or minerotrophic bogs) in the vicinity of Rupert Bay, Boatswain Bay and Cabbage Willows Bay (CRRNTBJ, 2010b). In Québec, this species is likely limited to the eastern coast of James Bay (Fortin et coll., 2003) and is not likely present in the study areas.

5.2 REGIONAL SPECIFICITIES

Wetlands, lakes, watercourses, as well as peripheral terrestrial environments constitute habitats of interest for herpetofauna. Such habitats are abundant throughout the area crossed by the infrastructures under study. However, only SA1, with a higher proportion of wetlands as well as being the southernmost study area, demonstrates high potential for this group of vertebrates.This zone has the highest species diversity with 9 confirmed or highly probable species (Table 5-1). As part of a 2002 inventory, the species most often caught along the Billy Diamond Highway were the American toad, the northern spring peeper, the wood frog, the mink frog (*Lithobates septentrionalis*) and the common garter snake (Desroches et al., 2010).

In contrast, thenorthernmost zone, SA2, is limited to 5 species, of which only 3 are likely to reach the northern end of the zone. These are the American toad, the wood frog and the mink frog (Hydro-Québec, 1993).

SA3 (SA3) has been little explored in general and remains difficult to access, with the exception of the southernmost part of the area, which is now served by Route 167 (MTQ, 2010). In this case, the list of potential species presented in Table 5-1 is largely based on the northern distribution limit of Quebec amphibians and reptiles. Eight species are considered highly probable in this zone, essentially the same as in Zone SA1, with the exception of the green frog (*Lithobates clamitans*). It should be noted,however, that the altitude of SA3 is on average higher than that of the other two zones, which favours a colder climate and could further reduce species diversity.

5.3 ISSUES AND RECOMMENDATIONS

5.3.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

The amphibian and reptile species likely to frequent the area crossed by the proposed infrastructures are common species in Québec for which no particular constraints have been identified in the context of the study. The main impacts of the proposed infrastructureson this group of species will result from the **loss of habitat** associated with the presence of the proposed infrastructures and the **barrier effect** created by them. It should be noted, however, that habitats that are particularly suitable for this group of species (rivers, lakes, wetlands) must be avoided whenever possible or will be the subject of specific mitigation or compensation measures (see sections 3.3.1 and 4.3.1), which will also help to reduce the impact on herpetofauna. In addition, the maintenance of free circulation in the culverts that will be installed (see sections 4.3.1 and 7.3.1) will also benefit amphibians and reptiles.

5.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

During the next stages of La Grande Alliance phase II and III, it is recommended that a photo-interpretation campaign be carried out along the selected corridors in order to specify the characteristics of the wildlife and plant habitats crossed by the proposed roads and railways. This exercise will make it possible to more precisely delineate the wetlands that constitute prime habitats for herpetofauna. Given the limited knowledge of herpetofauna in northern Québec, field inventories specifically targeting this group of species could also be considered during the impact study stage. Such inventories would provide a more accurate picture of the abundance and distribution of the various herpetofauna species along the study.

6 AVIAN FAUNA

6.1 GENERAL DESCRIPTION

6.1.1 PORTRAIT OF THE AVIFAUNA

The review of available data allowed us to list a total of 184 species in 40 families (see Appendix C) on an annual basis that are likely to frequent the region of the three zones. These species have been observed during inventories carried out since 2002 as part of pre-project and follow-up studies (AECOM Tecsult, 2010; Benoit et coll. 2016; Benoit and Bourguelat, 2012; Benoit and Ibarzabal, 2004; Consortium Otish, 2016; Consortium Roche SNC Lavalin, 2010; Mousseau, 2004; Tecsult, 2006; Tecsult, 2004; WSP, 2018, Pesca Environnement, 2020), during pre-project inventories carried out from 1975 to 1991 for the Great Whale hydroelectric project (Hydro-Québec, 1993) and in public ornithological databases (AONQ, 2021; BIOMQ, 2017; CDPNQ, 2021b; eBird, 2021; OGSL, 2021; SCF, 2021; Consortium Gauthier and Guillemette - GREBE, 1992).

The nesting status was confirmed for 108 species, considered probable for 22 and possible for 23 species (see Appendix C). In addition, nine species were observed without a nesting status and 22 were considered to be migrants or visitors. These observations will be reviewed in more detail in the following sections on each of the study areas.

6.1.2 SPECIES AT RISK

The study area is likely to be frequented by 14 species at risk. The following species have been recorded in or near the area in the literature consulted:

- The **golden eagle** is provincially listed as Vulnerable (MFFP, 2022) and federally listed as Not at Risk (Government of Canada, 2022). The species nests on cliffs (MFFP, 2021h);
- The **harlequin duck** is listed as Vulnerable provincially (MFFP, 2022) and Special Concern federally (Government of Canada, 2022). The species nests near fast flowing streams (MFFP, 2021i);
- The **red knot, subspecies *rufa***, is on the list of species likely to be designated threatened or vulnerable at the provincial level (MFFP, 2022) and endangered at the federal level (Government of Canada, 2022). The species was observed during inventories carried out by Hydro-Québec (1993) and is classified as migratory.It nests in arctic regions in barren habitats (Government of Canada, 2021a);
- **Nelson's sharp-tailed sparrow** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and not at risk federally (Government of Canada, 2022). The nesting habitat of this species is a thin strip of salt or brackish marsh along the coast or islands, and less frequently freshwater marshes (MFFP, 2021j). As freshwater marshes are present in the area, nesting of the species is possible, but unlikely;
- The **common nighthawk** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and as threatened federally (Government of Canada, 2022). The species usually nests in open areas (Falardeau, 2019a);
- **Peregrine falcon subspecies *anatum*** is listed as Vulnerable provincially (MFFP, 2022) and of Special Concern federally (Government of Canada, 2022), while **subspecies *tundrius*** is listed as Likely to be Designated Threatened or Vulnerable provincially (MFFP, 2022) and of Special Concern federally (Government of Canada, 2022). According to MFFP (2021d), both subspecies are present in Québec. Subspecies *tundrius* nests north of the tree line while subspecies *anatum* ranges from the boreal forest to Mexico. However, the range limits between these two subspecies are not clearly defined. Cliffs remain the preferred nesting habitat of the species. Some falcons also nest successfully in man-made sites such as bridgesand quarries;

- **Barrow's goldeneye** is listed as vulnerable provincially (MFFP, 2022) and of special concern federally (Government of Canada, 2022). In Québec, the species generally nests around lakes with a surface area ofless than 10 ha and located at an altitude of over 500 m (Eadie et coll., 2000). In addition, the lakes used are generally fishless or at the head of a watershed (Robert et coll., 2008);
- The **short-eared owl** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and of special concern federally (Government of Canada, 2022). The species prefers to nest in open areas such as marshes, farmland and tundra (MFFP, 2021f);
- The **bank swallow** has no special status at the provincial level (MFFP, 2022) and is on the list of threatened species at the federal level (Government of Canada, 2022). In the wild, this swallow often nests in colonies in cavities built into riverbanks and coastal cliffs. In anthropogenic environments, it can also take advantage of sand and gravel pits or more unusual locations such as sand piles and abandoned mines (Falardeau, 2019b);
- The **barn swallow** has no special status at the provincial level (MFFP, 2022) and is on the list of threatened species at the federal level (Government of Canada, 2022). In the wild, this swallow nests in caves, holes, crevices and projections on cliff faces. In anthropogenic environments, it may also nest on structures such as bridges and culverts (Government of Canada 2021b);
- The **olive-sided flycatcher** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and as threatened federally (Government of Canada, 2022). However, the status of this species should be modified soon to become vulnerable. In the boreal forest, suitable habitatis most likely to be in or near wetlands (Government of Canada 2021c);
- The **red-necked phalarope** is of no status at the provincial level (MFFP, 2022) and on the list of species of special concern at the federal level (Government of Canada, 2022). Nesting of the species has been confirmedby Hydro-Québec (1993). It nests in subarctic and low arctic wetlands near ponds, lakes or freshwater streams (Government of Canada, 2021d);
- The **bald eagle** is provincially listed as Vulnerable (MFFP, 2022) but not federally listed at the moment (Government of Canada, 2022). The species prefers to nest in large trees in mature forests near large bodies of water (PFFM, 2021g);
- The **rusty blackbird** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and of specialconcern federally (Government of Canada, 2022). The rusty blackbird nests in the boreal forest where the species prefers the banks of wetlands such as slow-moving streams, bogs, marshes, swamps and beaver ponds (Government of Canada 2021e).

6.2 REGIONAL SPECIFICITIES

6.2.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

Study Area 1 does not cross any Important Bird Areas (IBAs), or Waterfowl Areas (WBAs) and no major migration corridors were identified. Nevertheless, during interviews, Cree users (see Technical Note 3) identified a few migratory bird staging areas near the Billy-Diamond Highway in the southern portion of the area, as well as one migration corridor.

In the southern part of SA1, the zone crosses the territorial reserve for protected area purposes (RTFAP) *Waskaganish*, which protects one bald eagle and two yellow rail colonies, but these are located on the edge of Rupert Bay, outside the SA1 zone. Two colonies of 3 to 5 great blue heron nests were identified in 1990 and 1991 by Consortium Gauthierand Guillemette - GREBE (1992) in the southern part of the area. No staging areas were identified in the study area during the data review.

A review of the available data revealed a total of 129 species (36 families) likely to frequent the area on an annual basis (see Appendix C). These species were observed during pre-project surveys conducted between 2002 and 2005 for Eastmain-1-A and Rupert diversion powerhouses and during subsequent follow-up surveys conducted between 2009 and 2017. In these cases, only observations made in the Rupert River and Broadback sections were retained whenever possible. Species observed by WSP (2018) during surveys in the James Bay lithium mine sector were also compiled, as well as those from public ornithological databases (AONQ, 2021, BIOMQ, 2017, CDPNQ, 2021b, eBird, 2021, OGSL, 2021, CWS, 2021). Of the 129 species recorded, the nesting status was confirmed for 68 species, considered probable for 23 and possible for 26 species (see Appendix C). In addition, 12 species were observed without being assigned a nesting status.

A list of special-status species likely to frequent the study area (see Appendix D-1), as well as their preferred habitat was based on the literature reeview. This list is based on the mentions reported in the various sources consulted, but also on the known distribution areas of the species. On an annual basis, the SA1 area is likely to be frequented by 18 species (including two subspecies) with status, 11 of which have nesting potential and7 of which are migratory. Eight species have been recorded in or near the area in the literature consulted.

Common nighthawk nesting has been confirmed in the area by the AONQ (2021) with one record listed, in addition to 14 possible records and one probable record. The species usually nests in open areas (Falardeau, 2019a). Bald eagle nesting is considered possible by the AONQ (2021) with three records at this level. Although no nests have been confirmed in the study area, two active nests in 2002 and 2003, PT-190 and PT-193 respectively, are located less than 25 km west of the area by the CDPNQ (2021b).

Although no observations of short-eared owls have been recorded in the study area, an active nest in 2003, HM-227, was located approximately 20 km west of the area by CDPNQ (2021b). Given the potential presence of favourable nesting habitat in Zone SA1 and the observations recorded by CDPNQ (2021b), the zone is consideredto have nesting potential for the species. olive-sided flycatcher nesting was rated as probable based on one recordin the area by AONQ (2021), in addition to eight records with a possible nesting index. With regard to the bank swallow, nesting of the species was rated as possible based on one record in the area by the AONQ (2021).

Nelson's sharp-tailed sparrow was identified by Mousseau (2004) during surveys conducted along the Rupert River and the Rupert diversion bay section. The exact location of the sightings was not available. The breeding habitat of this species is a thin strip of salt or brackish marsh along the coast or islands, and more rarely freshwater marshes (MFFP, 2021j). Freshwater marshes are present in the area, so nesting of the species is possible, but unlikely rusty blackbird nesting was confirmed with two records by the AONQ (2021), in addition to one probable and three possible records.

rusty blackbird nesting was confirmed with two records by the AONQ (2021), in addition to one probable andthree possible records.

6.2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

No waterfowl concentration area (ACOA) is located in the study area SA2. However, there is an IBA in the northern portion of the study area. Only one colony was identified of four herring gulls observed in 1992 and listed in the OGSL database (2001). No staging areas were identified in the study area during the data review. The area passes through the following three areas of particular interest for birdlife:

- Part of the *Great Whale River Kuujjuarapik and Whapmagoostui* Important Bird Area (IBA) crosses the area (IBA, 2022a). This IBA includes the Great Whale River and its tributaries, which are important nesting grounds for the endangered harlequin duck (IBA, 2022b).
- The *RTFAP Kanaaupscow River and Kukamaw Lake* has a number of wildlifespecies at risk, including bald eagles and harlequin duck (MELCC, 2022a).
- The *RTFAP Lake-Burton-Rogan River-and-Pointe-Louis-XIV* allows for the protection of sites of interest, including Pointe Louis-XIV, which has climatic, floristic and faunal characteristics that are unique at this latitude. It contains plant communities typical of the erect shrub tundra normally found 200 km further north (MELCC, 2022a). This habitat is therefore also likely to be frequented by bird species that are exceptional forthe region.

A review of the available data revealed a total of 159 species (37 families) likely to frequent the area on an annual basis (see Appendix C). These species were observed during pre-project inventories conducted from 1975 to 1991 as part of the Great Whale hydroelectric complex project (Hydro-Québec, 1993), inventories conducted in 2012 and 2013 as part of the hybrid power plant project in the Whapmagoostui Kuujjuarapik sector (PESCA Environnement, 2020), and in public bird databases (AONQ, 2021; BIOMQ, 2017; CDPNQ, 2021b; eBird, 2021; SLGO, 2021; CWS, 2021). Of these, nesting status was confirmed for 67 species, considered probable for 30 and possible for 25 species (see Appendix C). In addition, eight species were observed without a nesting status and a further 29 species were considered to be migratory or visiting.

The literature review made it possible to draw up a list of special-status species likely to frequent the study area (see Appendix D-2), as well as their preferred habitat. This list is based on the mentions reported in the various sources consulted, but also on the known distribution areas of the species. On an annual basis, the SA2 area is likely to be frequented by 15 status species (including two subspecies), 12 of which have nesting potential and three of which are migratory. Eight species of special status have been recorded in or near the area in the literatureconsulted.

Several confirmed nesting records for harlequin duck were noted by the sources consulted (CDPNQ, 2021b; Hydro-Québec, 1993; ZICO, 2022b), indicating a high-nesting potential for this species. Barrow's goldeneyes were observed during inventories conducted by Hydro-Québec (1993) and their nesting status was established as possible. However, according to current knowledge of the biology of the species, it is observed in the area during the migration period, Hudson Bay being one of the species' moulting areas, and its known nesting area being mainly located north of estuary and Gulf of St. Lawrence (MFFP, 2021e). As for the common nighthawk, the AONQ (2021) considers nesting of the species to be possible in the area, with one record. The red knot was observed during the inventories carried out by Hydro-Québec (1993) and was classified as migratory. As for the red knot, its nesting was confirmed by Hydro-Québec (1993). As for the golden eagle, the nesting of this species was confirmed in the area by CDPNQ (2021b). Indeed, an active nest (AR-009) was recorded in 1990 but was inactive from 1991 to 1993 and in 2016 during the last monitoring. The nearby nest AR-026 has never been used.

Bald eagle nesting has also been confirmed in the area by CDPNQ (2021b). Indeed, an active nest (PT-429) was recorded in 2011 on the bank of a river to the south of the area. AONQ (2021) also reports two probable nesting records for the species and one with a possible nesting index. Consortium Roche SNC Lavalin (2010) also reported several immature individuals observed during the surveys, although no nests were located. The short-eared owl was

observed during the surveys conducted by Hydro-Québec (1993) and its nesting status was established as probable. Given the potential presence of favourable nesting habitat in zone SA2 and the observations recorded by Hydro-Québec (2013), the zone is considered to have nesting potential for the species, although it is outside the nesting area listed by the MFFP (2021f).

Peregrine falcon nesting was confirmed during inventories conducted in 1990 by Hydro-Québec (2013), without, however, identifying the subspecies or subspecies observed, as both subspecies are likely to be found in the territory. As for the bank swallow, it was observed during inventories conducted by Hydro-Québec (1993) and its nesting status is considered possible. Finally, the rusty blackbird was observed during surveys conducted by Hydro-Québec (1993) and its nesting status is confirmed.

6.2.3 STUDY AREA 3 (SA3): ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

In general, little is known about the avifauna in SA3 due to its inaccessibility. No bird colonies or staging areas were identified in the study area during the data review. In addition, the area does not have any IBAs (IBA 2022a) or protected areas for the specific conservation of birdlife (see Chapter 9).

The review of available data identified a total of 105 species (30 families) likely to frequent the area on an annual basis (Appendix C, AONQ, 2021; BIOMQ, 2017; CDPNQ, 2021b; eBird, 2021; OGSL, 2021; CWS, 2021;

Consortium Roche SNC Lavalin, 2010). These data include the results of inventories conducted as part of the Route 167 North to the Otish Mountains impact study in 2009 and 2010 (Consortium Roche SNC Lavalin, 2010). Being located in the vicinity, SA3 is likely to harbour bird communities similar to those inventoried during this study. Of the 105 species inventoried, the nesting status was confirmed for 48 species, deemed probable for 22 and possible for 31 species (see Appendix C). In addition, four species were observed without a nesting status being assigned.

The literature review made it possible to draw up a list of special-status species likely to frequent the study area (see Appendix D-3), as well as their preferred habitat. This list is based on the mentions reported in the various sources consulted, but also on the known distribution areas of the species. On an annual basis, the zone SA3 is likely to be frequented by 15 species (including two subspecies) with status, nine of which have a nesting potential and six of which are migratory.

Eight species have been recorded in or near the area in the literature consulted. No direct observations of harlequin duck have been made in SA3. However, one record was reported in the summer by Consortium Roche SNC Lavalin (2010) and the species is confirmed as breeding in the region in the CDPNQ database (2021b). However, the last record in the CDPNQ dates to 1992. Based on the nature of the observations and the potential presence of favourable habitat, there is therefore a potential for harlequin duck to nest in Zone SA3.

The nesting of the common nighthawk is considered possible in the area by the AONQ (2021) with two records. Several observations were also made by Consortium Roche SNC Lavalin (2010). A mature golden eagle was observed in flight to the south of the SA3 area by Consortium Roche SNC Lavalin (2010) in 2009 and 2010, thus categorizing the species as a possible breeder. Inspection of the cliffs, the species' nesting habitat (MFFP, 2021h), did not result in the location of a nest. It should be noted that zone SA3 is not part of the known nesting area of the species (MFFP, 2021h). Bald eagle nesting was confirmed in the area by CDPNQ (2021b). Indeed, an active nest (PT-375) was recorded in 2010 on the edge of a lake to the south of the zone. AONQ (2021) also mentions one observation confirming the nesting of the species and two presenting a possible nesting index. Consortium Roche SNC Lavalin (2010) also reports several immature individuals observed during the surveys, although no nests were located. The species prefers to nest in large trees in mature forests located near large bodies of water (MFFP, 2021g). Short-eared owl nesting is considered possible in the area by the AONQ (2021) with one record recorded. Given the potential presence of favourable nesting habitat in Zone SA3 and the observation recorded by AONQ (2021), the area is considered to have nesting potential for the species, even though it is not part of the known nesting range (MFFP, 2021g).

Nesting of the olive-sided flycatcher was confirmed in the area by the AONQ (2021) with one record, in addition to three records with a possible nesting index. Consortium Roche SNC Lavalin (2010) also reports a family group observed and individuals heard at 11 stations. The latter observations were made in open or semi-open habitats such as open black spruce-moss stands, burns and bogs. For the bank swallow, nesting was confirmed by Consortium Roche SNC Lavalin (2010) and the AONQ (2021) reports two records with a possible nesting index. Finally, the nesting of the rusty blackbird has been confirmed. The AONQ (2021) reports four confirmed, two probable and three possible records. In addition, Consortium Roche SNC Lavalin (2010) observed one active nest and several foraging activities. Habitats used in the Consortium Roche SNC Lavalin (2010) study area include bogs, open spruce forests, marshes and swamps.

The situation of migratory birds and bird species at risk has been changing rapidly in recent decades. Unfortunately, the data currently available is already out-dated. It would be relevant to further our current understanding during the subsequent stages of the study by using, among other things, Cree knowledge and expertise.

6.3 ISSUES AND RECOMMENDATIONS

6.3.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

In general, avian fauna is not considered to be particularly sensitive to the infrastructures under study, given the relatively small footprint and narrowness of the proposed infrastructures in relation to the vastness of the natural area traversed. The main potential issue concerns the potential habitats of **species at risk** during the nesting period and the presence of nests. Thus, clearing must be carried out outside the nesting period of these species in order to avoid destroying nests. It shouldbe noted that wetlands constitute a habitat of interest for several bird species, including some species considered at risk. As mentioned in section 3.3.1, wetlands are an important issue. The choice of routes must therefore take these sensitive habitats into account in order to avoid them as much as possible.

The construction and operation of linear infrastructure such as roads and railways may raise the general concerns described below. In addition, it should be noted that the Migratory Birds Convention Act 1994 and its associated regulations prohibit the disturbance or destruction of migratory bird nests.

Deforestation leads to a **loss of nesting habitat** for species nesting on the ground, in tree cavities and on branches. Crossing and redevelopment of watercourses also causes disturbance to species nesting along their banks, in addition to potentially contributing to their silting up, which can result in a degradation of the feeding habitat. The opening up of the environment also creates a **habitat fragmentation**, often associated with a loss of biodiversity (Bouliner et coll., 1998). In addition, this has the effect of favouring certain species that frequent the edges to the detriment of other, more forested species that will establish themselves further into the forest. For example, the quality of the habitat could decrease within the first 100-m of the edge of the right-of-way, notably as a result of the decrease in the diversity and availability of macroinvertebrate prey (Haskell, 2000). In addition, experiments have shown that many forest bird species avoid crossing gaps in the forest cover as narrow as 50 m (Clevenger et coll., 2003). Mitigation measures such as clearing outside of the nesting season, maintaining intact edges around more sensitive habitats (e.g., wetlands) and implementing stream protection measures help to reduce this impact.

Noise and traffic disturbance associated with construction activities and during the operational phase may result in the abandonment of nests or nesting sites. Simple mitigation measures such as limiting the movement of machinery and workers to work areas during construction and maintaining wooded edges along more sensitive habitats such as wetlands and lakes can reduce disturbance.

Access to land generally leads to **increased harvesting pressure** through hunting. It can also encourage poaching. Some bird species, particularly waterfowl such as Canada geese, are traditionally harvested by Aboriginal people. During consultations with Cree users of the territory, concerns were raised about the opening of the territory to a greater number of users and the impact this could have on wildlife resources (see Technical Note 3).

Finally, road and rail traffic will result in **mortality from collisions** with vehicles. Since northern roads have alow traffic intensity, this impact is generally lower.

6.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

With the exception of waterfowl, for which the communities consulted provided several pieces of information of interest (see Technical Note #3), knowledge of the bird communities in the three study areas is generally limited to studies on only part of the areas or in their vicinity, as well as fragmentary data from public databases. Moreover, most of the inventories carried out are more than 10 years old. As part of the feasibility study, it is recommended that detailed photo-interpretation be carried outto clarify the characteristics of the habitats crossed. Some of these habitats could be subsampled to further clarify their characteristics. Targeted inventories of the various bird groups (forest birds, birds of prey, waterfowl and otheraquatic species, shorebirds) as well as species at risk are recommended during the nesting period in the ESIA stage. An update of the species at risk that are reported in the study area will also have to be made, since the species at risk lists are regularly updated by both provincial and federal authorities. Information provided from Cree knowledge will also need to be taken in consideration. Among other things, these inventories will make it possible to better document and mitigate the potential impacts of the construction and operation of these linear infrastructures on avian fauna, particularly with regard to habitat loss. Such inventories could also lead to the identification of particularly sensitive habitats, especially for species with special status. Where appropriate, specific protection, mitigation or mitigation measures will need to be implemented.

7 MAMMALS

7.1 GENERAL DESCRIPTION

The review of available data identified a total of 54 species of mammals in the three-zone region, including small game and fur-bearers as well as large wildlife. These species were observed during inventories conducted since 2002 as part of pre-project and follow-up studies (WSP, 2018; Consortium Roche SNC Lavalin, 2010; Genivar - SNC Lavalin Environnement, 2010; Del Degan, Massé et Associés Inc, 2004; Hydro-Québec, 2004a; PESCA Environnement, 2020), during pre-project inventories conducted in 1990 for the Great Whale hydroelectric complex project (GREBE Inc., 1990), and in public databases and scientific articles (MFFP, 2021; Équipe de rétablissement des chauves-souris du Québec, 2019; CRRNTB, 2010).

Each of the following subsections deals successively with small game/fur-bearers and large wildlife. It should be noted, however, that the caribou, which is a particularly important issue, is dealt withseparately. This species, which is considered at risk, is present throughout the territory and is of great importance to the Cree communities.

7.1.1 SMALL FAUNA AND FUR-BEARING ANIMALS

In Québec, there are eight species of bats. Of these, six species could frequent the study areas (Table 7-1). In addition, 17 species of small mammals could frequent all or part of the study area (Table 7-2) and 28 species of small wildlife and fur-bearers (Table 7-3). These observations will be reviewed in more detail in the following sections on each of the study areas. It should be noted that black bear (*Ursus americanus*) and polar bear (*Ursus maritimus*) are included in this list because furs of these species were harvested in the territory via the UGAFs ("unités de gestion des animaux à fourrure" or fur-bearing animals management units).

However, these species are described in detail in the large wildlife section (section 7.1.2).

The study area is likely to be frequented by 10 species at risk. The following species have been mentioned in the area crossed by the proposed infrastructures or in the vicinity in the literature consulted:

- **The hoary bat** is on the list of species likely to be designated as threatened or vulnerable at the provincial level (MFFP, 2022) and without status at the federal level (Government of Canada, 2022). This species frequents a variety of wetland and forest environments (MFFP, 2022a);
- **The little brown bat** is federally listed as endangered (Government of Canada, 2022). At the provincial level, it is not yet considered at risk, but it should soon be designated as threatened. It frequents a wide variety of habitats, from forest environments located near water bodies (MFFP, 2022b). Some dwellings may be used by this species in summer. In addition, it breeds in cavities and under the bark oftrees. It hibernates in caves and abandoned mines;
- **The northern long-eared myotis** is federally listed as endangered (Government of Canada 2022). At the provincial level, it is not yet considered at risk, but it should soon be designated as threatened. The northern bat is found in the boreal forest (MFFP, 2022c). It is found in crevices and under the barkof trees and may also occupy buildings. They hibernate in caves, rock crevices and sometimes under tree bark;
- **The silver-haired bat** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and with no status federally (Government of Canada, 2022). It uses the tops of trees, can take refuge under the bark of trees in addition to abandoned woodpecker holes (MFFP, 2022e);
- **The red bat** is on the list of species likely to be designated as threatened or vulnerable at the provincial level (MFFP, 2022) and without status at the federal level (Government of Canada, 2022). Although its presence is not noted in the various sources consulted, it could frequent the study area, up to the 52nd parallel, thus south of the study area (CRRNTB, 2010;Levesque and Tremblay, 2008). It finds refuge in the tops of trees (MFFP, 2022f);

- **The rock vole** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and has no federal status (Government of Canada, 2022). It primarily uses rocky habitats in mature mixed or coniferous forests, but is also found in moist microhabitats, transitional habitats and disturbed habitats (Duhamel and Tremblay, 2013);
- **The southern bog lemming** is on the list of species likely to be designated as threatened or vulnerable at the provincial level (MFFP, 2022) and without status at the federal level (Government of Canada, 2022). This species was detected during inventories conducted in 2009 and 2010 as part of the impact study for Route 167 North to the Otish Mountains (Consortium Roche SNC Lavalin, 2010). The study area is located north of the species' range according to the Atlas des micromammifères du Québec (Desrosiers et coll., 2002). However, the latter may be present in the south of the study area. This animal is usually found in wetlands with abundant vegetation and thick humus cover, particularly bogs, grassy marshes and wet mixed forests near these habitats (Desrosiers et coll., 2002). The species is also found in fields, meadows and forest cuttings;
- **The least weasel** is listed as likely to be designated as threatened or vulnerable provincially (MFFP, 2022) and has no status federally (Government of Canada, 2022). The range of this species is very large. It occupies tundra or coniferous forest in the north, but prefers open areas such as grasslands, wet meadows, marshy areas, stream banks and scrubland in more southerly areas (Proulx, 2012; Prescott and Richard, 2014). Some of these habitats are present in the study area (e.g., treed swamps, bogs and streams). However, this species is generally considered rare throughout its range (MFFP, 2022h);
- **The polar bear** is listed as vulnerable provincially (MFFP, 2022) and special concern federally (Government of Canada, 2022). The presence of habitat for this species is related to ice type and distribution, as well as the density and distribution of ringed seals (*Pusa hispida*) with which polar bears have co-evolved (MFFP, 2022g). At low latitudes, i.e., in Québec, polar bears are generally forced to remain on land when the waters are ice-free, i.e., during the summer, and until the ice returns in the fall. It is at this time that they can be observed in the study area;
- **The wolverine** is listed as threatened provincially (MFFP, 2022) and as a species of special concern federally (Government of Canada, 2022). In Québec, the relative density of wolverine, based on the probable distribution of the species, is considered low (Fortin, 2006). Tardif et coll. (2005) reported 16 records for the entire Quebec territory in the CDPNQ database. However, according to the wolverine recovery program, most of the observations made in Québec are not currently confirmed. The last official captures in the eastern population were two wolverines taken in Labrador in 1965, and one in Québec near Schefferville in 1978 (Dagenais, 1988). In Quebec, there have been no records of captures in the past 40 years in indigenous communities within the wolverine's historical range (Environment Canada, 2016). Wolverine is generally associated with the presence of migratory caribou. The area most likely to support the eastern population would be northern Quebec (Gallais and Messier, 2012).

Table 7-1 List of Chiropteran Species Recorded in the Study Areas or likely to Occur there

ENGLISH NAME	SCIENTIFIC NAME	AREA SA1	AREA SA2	AREA SA3	THE ENTIRE STUDY AREA
Silver-haired bat	*Lasionycteris noctivagans*	X[3]	-	-	X[3]
Hoary bat	*Lasiurus cinereus*	X[1]	-	-	X[1,3]
Red bat	*Lasiurus borealis*	X[3,4]	-	-	X[3,4]
Bats of the genus *Myotis*	*Myotis sp.*	X[1]	-	-	X[1]
Big brown bat	*Eptesicus fuscus*	X[1]	-	-	X[1,3]
Little brown bat	*Myotis lucifugus*	X[2,3]	X[2,3]	X[2,3]	X[2,3]
Northern long-eared bat	*Myotis septentrionalis*	X[2,3]	X[2]	X[2]	X[2,3]

Sources: [1] WSP 2018; [2] Quebec Bird Recovery Team (2019); [3] CRRNTB (2010); [4] Levesque and Tremblay (2008)

Table 7-2 List of Small Mammal Species Recorded in the Study Areas or likely to Frequent them

ENGLISH NAME	SCIENTIFIC NAME	AREA SA1	AREA SA2	AREA SA3	THE ENTIRE STUDY AREA
Cinereus shrew	*Sorex cinereus*	X[1,2]	X[1]	X[1,4]	X[1,2,4]
American water shrew	*Sorex palustris*	X[1]	X[1]	X[1]	X[1]
Smoky shrew	*Sorex fumeus*	X[2]	-	-	X[2]
Arctic shrew	*Sorex arcticus*	X[1]	-	X[1]	X[1]
American pygmy shrew	*Sorex hoyi*	X[1,2]	X[1]	X[1]	X[1,2]
Northern short-tailed shrew	*Blarina brevicauda*	X[1]	-	-	X[1]
Star-nosed mole	*Condylura cristata*	X[1]	X[1]	X[1]	X[1]
Deer mouse	*Peromyscus maniculatus*	X[1,2]	X[1,5]	-	X[1,2]
Ungava collared lemming	*Dicrostonyx hudsonius*	-	X[1]	-	X[1]
Northern bog lemming	*Synaptomys borealis*	X[1]	X[1]	X[1]	X[1]
Southern bog lemming	*Synaptomys cooperi*	-	-	X[4]	X[4]
Southern red-backed vole	*Clethrionomys gapperi*	X[1,2]	X[1,5]	X[1,4]	X[1,2,4]
Heather vole	*Phenacomys intermedius*	X[1,2]	X[1]	X[1,4]	X[1,2,4]
Meadow vole	*Microtus pennsylvanicus*	X[1,2]	X[1]	X[1,4]	X[1,2,4]
Rock vole	*Microtus chrotorrhinus*	**X[1,2]**	-	X[4]	**X[1,2,4]**
Meadow jumping mouse	*Zapus hudsonius*	X[1]	X[1]	X[1,4]	X[1,4]
Woodland jumping mouse	*Napoeozapus insignis*	X[1]	-	X[4]	X[1,4]

Sources: [1] Desrosiers et al 2002; [2] WSP 2018; [3] CRRNTB 2010; [4] Consortium Roche SNC Lavalin 2010; [5] PESCA Environment 2020

Table 7-3 List of Small Wildlife and Furbearer Species Found in or Likely to Occur in the Study Areas

FAMILY	ENGLISH NAME	SCIENTIFIC NAME	AREA SA1	AREA SA2	AREA SA3	THE ENTIRE STUDY AREA
Canidae	Grey wolf	*Canis lupus*	X[3,4,8]	X[4,6,8]	X[4,5,8]	X[3,4,5,6,8]
	Arctic fox	*Alopx lagopus*	X[4,8]	X[4,8]	X[4]	X[4,8]
	Red fox	*Vulpes vulpes*	X[2,3,4,8]	X[4,6,8]	X[4,5,8]	X[2,3,4,5,6,8]
	Coyote	*Canis latrans*	X[4]	X[4]	X[4]	X[4]
Castoridae	North American beaver	*Castor canadensis*	X[2,3,4,8]	X[4,8]	X[4,5,8]	X[2,3,4,5,8]
Cricétidae	Muskrat	*Ondatra zibethicus*	X[3,4,8]	X[4,8]	X[4,8]	X[3,4,8]
Leporidae	Snowshoe hare	*Lepus americanus*	X[2,3,8]	X[6,8]	X[5,8]	X[2,3,5,6,8]
	Arctic hare	*Lepus arcticus*	-	X[8]	-	X[8]
Erethizontidae	North American porcupine	*Erethizon dorsatum*	X[2,8]	X[8]	X[5,8]	X[2,5,8]
Procyonidae	Raccoon	*Procyon lotor*	X[4]	-	X[4]	X[4]
Felidae	Canadian lynx	*Felis lynx*	X[2,3,4,8]	X[4,8]	X[4,5,8]	X[2,3,4,5,8]
	Bobcat	*Lynx rufus*	-	-	X[4]	X[4]
Mustelids	Least weasel	*Mustela nivalis*	X[7,8]	X[7,8]	X[7,8]	X[7,8]
	Wolverine	*Gulo gulo*	X[7,8]	X[7,8]	X[7,8]	X[7,8]
	Stoat	*Mustela erminea*	X[8]	X[8]	X[8]	X[8]
	Ermine and weasels	*Mustela sp.*	X[1,2,3,4]	X[4]	X[4]	X[1,2,3,4]
	North American river otter	*Lutra canaensis*	X[2,3,8]	X[4,6,8]	X[4,5,8]	X[2,3,4,5,6,8]
	Fisher	*Martes americana*	X[2,3,4,8]	X[4,8]	X[4,5,8]	X[2,3,4,5,8]
	Striped skunk	*Mephitis mephitis*	X[4,8]	X[4]	X[4,8]	X[4,8]
	Fisher	*Martes pennanti*	X[4,8]	X[4]	X[4]	X[4]
	American mink	*Mustela vison*	X[2,3,4,8]	X[4,8]	X[4,5,8]	X[2,3,4,5,8]

FAMILY	ENGLISH NAME	SCIENTIFIC NAME	AREA SA1	AREA SA2	AREA SA3	THE ENTIRE STUDY AREA
Sciuridae	Red squirrel	*Tamiasciurus hudsonicus*	X[8]	X[8]	X[5,8]	X[5,8]
	Red squirrel or flying squirrel	-	X[3,4]	X[4]	X[4]	X[3,4]
	Striped chipmunk	*Tamias striatus*	X[8]	-	X[8]	X[8]
	Woodchuck	*Marmota monax*	X[8]	X[8]	X[8]	X[8]
	Northern flying squirrel	*Glaucomys sabrinus*	X[8]	X[8]	X[8]	X[8]
Ursidae	Polar bear	*Ursus maritimus*	X[4,8]	X[4,8]	-	X[4,8]
	Black bear	*Ursus americanus*	X[3,4,8]	X[4,8]	X[4,8]	X[3,4,8]

Sources: [1] CRRNTB 2010,[2] Del Degan, Massé et Associés inc. 2004. [3] Hydro-Québec 2004a,[4] MFFP 2021, [5] Roche SNC Lavalin Consortium 2010. [6] GREBE Inc. 1990,[7] Government of Quebec (2022b), [8] Prescott and Richard(2014).

Note that the black and polar bear are included in this list since furs of these species have been harvested in the territory via the UGAF.

7.1.2 LARGE WILDLIFE

Five species of large mammals are likely to frequent the study area. These are moose (*Alces alces*), black bear, polar bear, muskox (*Ovibos moschatus*) and caribou (*Rangifer tarandus caribou*). The text below will deal withthe first four species, while woodland and migratory caribou are described in Chapter 8.

7.1.2.1 *MOOSE*

The moose has a home range of 5 to 10 km^2. It inhabits mixed forests; particularly white and yellow birch fir stands. They frequent clearings, burns and areas of intensive logging, as well as alder groves, bays of lakes covered with submerged vegetation, swamps and ponds (MFFP, 2021k). In summer, moose are basically solitary(females with calves, males alone or near other individuals when feeding). In winter, they gather in small groups(two to eight individuals), particularly when the snow is deep, in wooded areas where they make a network of trails (MFFP, 2021k).

According to the 2012-2019 Québec moose management plan, the density in hunting zone 22, which includes the study area, is one of the lowest in Québec. It was estimated at 0.26 moose/10 km^2 in 1991 and at 0.31 moose/10 km^2 in 1997. Applying a 3% growth rate, between 1991 and 2012, the moose population isestimated at 0.5 moose/10 km^2, or 9,872 individuals (Morin, 2015). Higher densities (1.1 moose/10 km^2) were observed west of Eastmain 1 reservoir (Del Degan, Massé et Associés inc., 2004). InHunting Zone 22, an average of 117 moose were hunted from 2017 to 2021 (MFFP, 2022). During the consultations conducted with the users of the territory, numerous traditional moose hunting areas were identified in the three study areas (see Technical Note 3). These areas are spread throughout the territory, with the exception of the northern end of area SA2.

The low density of moose in Quebec's boreal region can be explained to a large extent by the low productivity of the habitat. It is during the winter period that the low availability of food and its poor quality are the most critical. Fires, which are disruptive to forest dynamics, can increase the amount of available browse.Several years after a fire, regenerating burns with a high proportion of deciduous tree or shrub species provide food-rich habitats (Courtois et coll., 1996; Samson et coll., 2002). The scarcity of betula groves, poplar groves and mixed stands could explain the increased use by moose of old burnt areas and riparian shrublands in the Nord-du-Québec region (Maltais et coll., 1993). The forest species sought by moose for food are white birch and willow in summer and balsam fir in winter (Dussault et coll., 2002; Samson et coll., 2002; Dussault et coll., 2004).

Hardwood and regenerating stands used for feeding, interspersed with mature softwood stands providing shelter, are suitable habitats for moose establishment. During calving, the preferred habitats are the banks of lakes and streams, softwood stands and hilltops.

7.1.2.2 *BLACK BEAR*

Black bears are hunted for their meat and fur. In the Cree traplines north of the 50th parallel, however, it is reserved for the exclusive use of Cree. The latter mainly use trapping to capture the animal (Lamontagne et coll., 2006). During the consultations conducted with the users of the territory, which are the subject of Technical Note 3, numerous black bear hunting sites as well as a few dens spread throughout the study area were identified by the local communities.

In hunting zone 22, the population density of black bears was estimated at 0.2 bears/10 km^2 in 2003. This density represents a population of approximately 5,600 bears (Lamontagne et coll., 2006). In autumn, this species mainly uses bare ground, areas where ericaceous plants dominate, recent burns and bogs devoid of lichens. In the spring, it also frequents mixed and deciduous forests, deciduous and mixed shrublands, marshes, swamps, streams and lakes (Tecsult Inc. 2005; CRRNTBJ, 2010b). In the study area, the availability of food used by black bears is likely determined by the occurrence of wetlands and disturbed areas. The latter are particularly important for berry production, which bears rely on for fat storage (Samson 1996).

7.1.2.3 *POLAR BEAR*

As noted in section 7.1.1, polar bear is listed as Vulnerable provincially (MFFP, 2022) and Special Concern federally (Government of Canada 2022). The presence of habitat for this species is related to ice type and distribution, as well as the density and distribution of ringed seals (*Pusa hispida*) with which the polar bear has co-evolved (MFFP, 2022g). At low latitudes, i.e., in Québec, polar bears are generally forced to remain on land when the waters are ice-free, i.e., during the summer, and until the ice returns in the fall. It is at this time that polar bears can be observed in the study area, particularly in zones SA1 and SA2. A few polar bear specimens were trapped in the FMUs covering the study area. Details of these captures are presented in section 7.2.1.

7.1.2.4 *MUSKOX*

In 1967, the muskox was introduced to Québec in the Kuujjuaq region for breeding purposes (Jean et coll., 2006). This species frequents wetlands, the edges of watercourses and bodies of water, and shrubby areas populated by willow in the summer. In winter, it prefers windswept areas where it can feed. In 2003, the muskox population around Kuujjuaq and Tasiujaq was estimated to be 1 400 animals (Jean and Rivard 2005). Cuyler *et al*. (2019) report that the population was estimated to be around 1 000 individuals in 2016. According to a survey conducted by the MFFP, the muskox population in 2019 was approximately 4,400 individuals (La Presse 2019). The majority of this population is located east of Ungava Bay. However,part of the population frequents the Hudson Bay coast. In the study areas, this species is therefore likely to frequentthe coastal portion of the study area SA2 only (see section 7.2.2.2).

7.2 REGIONAL SPECIFICITIES

7.2.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

7.2.1.1 SMALL FAUNA AND FUR-BEARING ANIMALS

According to the literature consulted, SA1 has the best potential for chiropteran presence with six species recorded. In addition, although the silver bat and the red bat were not detected in the studies consulted, the latter could be present according to the CRRNTB's wildlife portrait (2010). As for small mammals, 15 species could frequent the study area. As for small fauna and fur-bearing animals, 21 species could be found in the study area.

SA1 is likely to be frequented by seven species of special concern. These species were mentioned in the literature consultedas being observed in or near the area. The hoary bat was recorded via automated recording stations at the James BayLithium Mine, located in the southern sector of the study area. In addition, according to CRRNTB (2010), this species has been detected up to the 52nd parallel in the James Bay region. As for the little brown bat, the study area is located within its known range, according to the Équipe de rétablissement des chauves-souris du Québec (2019). In addition, according to the CRRNTB (2010), it is present throughout the James Bay territory, up to about the 54th parallel. The study area is also located within the known range of the northern long-eard bat (Équipe de rétablissement des chauves-souris du Québec, 2019), but it is rarely detected in the region. It is, however, present as far as the 52nd parallel (CRRNTB, 2010). Although the presence of the hoary bat was not noted in the various sources consulted, it could frequent the study area (CRRNTB, 2010). However, it should be noted that only two records, located south of the 50th parallel, have been reported in the James Bay Territory. The southern limit of the study area SA1 is located north of the 51st parallel. The presence of the red bat was not noted in the various sources consulted. However, the latter may frequent the study area as far south as the 52nd parallel (TRNBC, 2010; Levesque and Tremblay, 2008).

The study area is located north of the southern bog lemming's range according to the Atlas des micromammifères du Québec (Desrosiers et coll., 2002). However, two individuals were captured in September 2002 east of the study area, approximately 64 km north of Les Mélèzes (CDPNQ, 2021b). The rock vole was detected in the James Bay lithium mine, located about 10 kilometers south of the Eastmain river, about 100 km east of James Bay, near the James Bay Highway 381 roadside stop. in the southern sector of the study area (WSP, 2018). In addition, the study area is located in the species' range according to the Atlas des micromammifères du Québec, but south of the Waskaganish river (Desrosiers et coll., 2002).

7.2.1.2 LARGE WILDLIFE

Polar bears were caught eight times between the 2006-2007 and 2014-2015 trapping seasons in FMU 89 and once more in the 2005-2006 trapping season in FMU 92 covering the study area (MFFP, 2022). This species could therefore be present, but in very limited numbers and on an occasional basis, in SA1 since the latter islocated more than 65 km from the coast.

As for moose, higher density (1.1 moose/10 km^2, Del Degan, Massé et Associés inc., 2004) compared to the general average for hunting zone 22 (0.5 moose/10 km^2, Lamontagne et coll., 2006) were observed west of Eastmain 1 reservoir, at a latitude corresponding to the southern portion of study area SA1.

The available data do not allow us to determine the density of black bears in the study area, but their numbers remain low. However, its occurrence is reported throughout the study area by the communities (see Technical Note 3).

7.2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

7.2.2.1 SMALL FAUNA AND FUR-BEARING ANIMALS

According to the literature consulted, the SA2 area has a low potential for chiropteran presence with two species recorded. In addition, although the silver-haired bat and red bat have not been detected in the studies consulted, the latter could be present according to the CRRNTB's wildlife portrait (2010). As for small mammals, 11 species could frequent the study area. As for small fauna and fur-bearing animals, 17 species could be found in the study area.

Zone SA2 is likely to be frequented by three special status species. Indeed, these species were mentioned in the literature consulted as being observed in the area or nearby. According to the Équipe de rétablissement des chauves-souris du Québec (2019), the study area straddles the known range of the little brown bat and its potential range. Moreover, according to CRRNTB (2010), it is present throughout the James Bay territory, up to about the 54th parallel. As for the northernbat, the study area is located in its potential range (Équipe de rétablissement des chauves-souris du Québec 2019). It should be noted, however, that according to CRRNTB (2010), this species is rarely detected in the James Bay region but is present as far as the 52nd parallel.

7.2.2.2 LARGE WILDLIFE

Polar bears were caught three times between the 2002-2003 and 2011-2012 trapping seasons in FMU 94 and seven times in FMU 95 covering the study area. Study area SA2 is the most likely to host this species. This is because this study area is juxtaposed with the marine area (see Technical Note 7 on the marine environment).

With respect to muskox, depending ontheir range, they may frequent Study Area 2 near the Hudson Bay coast. Indeed, an extensive survey of the Hudson Bay coast was conducted in September 2016, from the coast to 20 km inland (SEPAQ, 2017). A total of 606 animalswere counted between Pointe Louis XIV and Inukjuak. The species could therefore be observed in the SA2 study area.

Based on available habitat, the presence of black bear and moose is probably lower in this study area, especially in its northern compared to the other study areas.

7.2.3 STUDY AREA 3 (SA3) : ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

7.2.3.1 SMALL FAUNA AND FUR-BEARING ANIMALS

According to the literature consulted, SA3 has a low potential for chiropteran presence with two species recorded. In addition, although the silver-haired bat and red bat have not been detected in the studies consulted, the latter could be present according to the CRRNTB's wildlife portrait (2010). As for small mammals, 13 species could frequent the study area. As for small fauna and fur-bearing animals, 20 species could be found in the study area.

SA3 is likely to be frequented by five status species. These species have been recorded in or near the area in the literature consulted. The study area is located within the known range of the little brown bat and the northern long-eared bat (Équipe de rétablissement des chauves-souris du Québec 2019). In addition, according to CRRNTB (2010), the little brown bat is present throughout the James Bay territory, up to about the 54th parallel, while the northern bat is rarely detected in the James Bay region but is present up to the 52nd parallel. The rock vole was detected during the inventories conducted in 2009 and 2010 as part of the impact study for Route 167 North towards the Otish Mountains (Consortium Roche SNC Lavalin 2010). In addition, the study area is in the species' range according to the Atlas des micromammifères du Québec (Desrosiers et coll., 2002). The southern-bog lemming was detected during inventories conducted in 2009 and 2010 as part of the impact study of Route 167 North to the Otish Mountains (Consortium Roche SNC Lavalin 2010). The study area is located north of the species' range according to the Atlas des micromammifères du Québec (Desrosiers et coll., 2002). However, the species could be present to the south of the study area.

7.2.3.2 *LARGE WILDLIFE*

The large wildlife species most likely to frequent SA3 are black bear and moose. Based on available habitat, population density should approach the values established in the respective management plans for these two species. It should be noted that the occurrence of these two species is reported by land users throughout area SA3 (see Technical Note 3).

7.3 ISSUES AND RECOMMENDATIONS

7.3.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

The main issues related to small fauna, furbearers and large fauna are related to the **habit fragmentation** of these species and the increased **risk of collision**. The opening up of the environment creates habitat fragmentation, which is often associated with a loss of biodiversity (Boulinier et coll., 1998). Mitigation measures such as maintaining intact edges around more sensitive habitats such as wetlands and implementing watercourse protection measures help to reduce this impact. With regard to the risk of mortality from vehicle collisions, northernroads generally have low traffic intensity, which significantly reduces the importance of this impact.

In some situations, crossings for small or large fauna can be built under transport infrastructures, in order to minimize both habitat fragmentation and the risk of collision, and to improve safety. However, there are many issues associated with these infrastructures, from planning to maintenance and monitoring their effectiveness (Beaulieu, 2018). In the present case, considering the relatively modest use of proposed transportation routes compared to what prevails in southern Quebec, it does not appear justified building crossings specifically for wildlife. Moreover, caribou tend to avoid mainly major roads (paved roads, categories 1 and 2) with high intensity of use, while tourist trails and seasonal roads are used more often (Vistenes et coll. 2008). According to SEPAQ (2013), current wildlife crossing are not being used by the caribou. Regarding the moose, wildlife crossings can reduce collisions if road edges are fenced (Bedard et coll. 2012). However, this could have the effect of change animal movement pattern and increasing the density of moose at the ends of the fences and cause more collisions in those areas. The passages designed for large fauna are also effective and essential from an ecological point of view, but above all for road safety (AECOM 2011). The installation of animal crossings for roads or rails requires a thorough evaluation before proceeding. Several criteria must be evaluated, notably the number of vehicles using the road or rail, the density of wildlife present in the different sectors, the use of the territory by the Cree and Inuit communities, notably for hunting, etc. Also, in areas where the proposed infrastructure are expected to cross projected protected areas (e.g. in), wildlife crossings could be considered to help maintain ecosystem connectivity (see also section 9.3.1). It is therefore recommended to evaluate the critical sectors following the implementation of the road and rail and then to evaluate the costs and benefits of the implementation of wildlife crossings.

Nevertheless, as mentioned in section 4.3.1, the numerous culverts that will be installed on the waterways will be of great benefit to wildlife, especially small fauna

Transportation corridors need to be designed to minimize the impact on aquatic habitat and to allow the free movement of fish. The design of the culverts will therefore have to be adapted to achieve this objective. It is therefore anticipated that a good proportion of the culverts to be installed on the watercourses, which constitute natural movement corridors for small fauna, will also be able to serve as passages for small fauna. For large wildlife, as stated above, the construction of wildlifecrossings is usually accompanied by the installation of a fence over a long distance to direct animals to the crossings. In the context of the proposed infrastructures, such facilities are not considered necessary for now, but such infrastructures are not ruled out in critical sectors (see above). Nevertheless, it is proposed that some bridges be oversized and built over major watercourses to facilitate moose passage. The bridges targeted by such improvements will be located mainly in the southern portion of the study areas, where moose are more abundant.

The clearing of land prior to the development of the infrastructure will result in a **loss of habitat** for mammals. The crossing and redevelopment of watercourses will also cause disturbance to species using the watercourses, in addition to potentially contributing to their silting up, which could result in a degradation of the feeding habitat. Considering the relatively isolated nature of the infrastructures under studycompared to the vastness of the natural territorycrossed by them, this is not a major issue for mammals (with the exception of caribou, see section 8.3.1).

Noise and traffic disturbance associated with construction activities and during the operational phase may affectthe behaviour of some species in the vicinity of disturbed areas. Simple mitigation measures such as limiting the movement of machinery and workers to work areas during construction and maintaining wooded edges along more sensitive habitats such as wetlands and lakes can reduce disturbance.

Access to land generally leads to **increased harvesting pressure** through hunting. It can also encourage poaching. Several species of small wildlife and furbearers are traditionally harvested by indigenous peoples. During consultations with Cree users of the territory, concerns were raised about the opening of the territory to a greater number of users and the impact that this could have on wildlife resources (see Technical Note 3).

7.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

Besides the species hunted by local communities for which data were obtained during the consultations (see Technical Note 3), knowledge of small fauna and fur-bearers in the three study areas is limited to surveys of only part of the areas or intheir vicinity, as well as fragmentary data in public databases. In addition, most of the inventories carried out are more than 10 years old. Thus, targeted inventories of the various groups, particularly species at risk, are recommended at the impact study stage. Among other things, these will make it possible to better document andmitigate the potential impacts of the construction and operation of linear infrastructures on this group of species, particularly about habitat loss. Particular attention should be paid to the potential breeding habitats of species at risk. An update of the species at risk list should also be made in the next steps of the development of the proposed infrastructures, since the species at risk lists are regularly updated by both provincial and federal authorities. With regard to large wildlife, once the road and rail alignments have been established, it could be interesting to validate the presence of moose wintering grounds in a 10 km zone on either side of the alignments using aerial surveys. This information would make it possible to determine the possible disturbance of this species in winter during the construction phase.

8 CARIBOU

8.1 GENERAL DESCRIPTION

The caribou (*Rangifer tarandus*) is a mammal of the deer family with a circumpolar distribution. Some populations of the species have the particularity of migrating over great distances in the spring and fall. The caribou present in Québec all belong to the woodland caribou subspecies (*Rangifer tarandus caribou*), of which there are three ecotypes: migratory, forest and mountain (MFFP, 2022). The first two are present in the study areas, while the mountain ecotype is confined to the Chics-Chocs Mountains in the Gaspé and the Torngat Mountains in the extreme northeast of the province. The caribou feeds on herbaceous plants and shrub leaves, as well as terrestrial lichens, which form the basis of its winter diet. In northern Quebec, this cervid is of particular importance to indigenous peoples (Cree and Inuit in the study area as well as the Naskapi and Innu people east of the region). Several hunting areas and other sites used by caribou (feeding areas, migration corridors) were identified by land users during consultations (see Technical Note 3 on this subject). The woodland (or boreal) caribou has the status of vulnerable species in Québec, while it is considered threatened in the federal government (MFFP, 2022; Government of Canada, 2022). Migratory caribou currently have no specific protection status, although there is currently a moratorium on sports hunting for conservation purposes. The Crees have also voluntarily limited harvesting for the same reason.

8.1.1 DESIGNATED CARIBOU (RANGIFER TARANDUS) UNITS ANDLOCAL POPULATIONS

Within its range, caribou (*Rangifer tarandus*) exhibit a wide range of ecological, genetic, behavioural and morphological variation. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) report established a national consensus regarding the different designable units (DUs) of caribou in Canada (COSEWIC, 2011). A Designated Unit represents a group of individuals that are significantly different from neighbouring units (groups) on a set of evolutionary criteria such as phylogenetics, genetic diversity and structure, morphology, movements, behaviour, life history strategies and distribution.

COSEWIC has established 12 separate DUs for caribou across Canada. Of these, two occur in the study areas: the Eastern Migratory Caribou DU in northern Labrador, Quebec, Ontario and Manitoba (DU 3) and the Boreal Caribou DU, which occurs in the boreal forest of British Columbia and the Northwest Territories, up to Labrador (DU 6). Note that this designable unit is identified with woodland caribou populations across Quebec. The term “woodland” rather than “boreal” was preferred by the authors and is used in this report.

In the study areas, DU 3 refers to two populations: the Leaf River herd (referred to as the LRH) in the north-western portion of the study area, and the George River herd (referred to as the GRH) in the north eastern portion of the study area. The study area is likelyto be frequented by five populations of woodland caribou that are monitored separately throughout Québec. Table 8-1 presents the migratory and woodland caribou populations identified in the study areas. The incursions of migratory caribou during the winter period into sectors used annually by woodland caribou create anoverlap zone between migratory and woodland caribou. It should be noted that the assignment of an individual is made with reference to the membership of a group of caribou during the winter period. It is therefore normal for ranges to overlap, especially when individuals are more mobile during the summer and rutting periods.

Table 8-1 List of Designable Caribou (Rangifer Tarandus) Units and Populations in the Study Areas

DESIGNATABLE UNITS	POPULATION	AREA SA1	AREA SA2	AREA SA3
Migratory caribou (DU 3)	*George River Herd (GRH)*			X
	Leaf River Herd (LRH)	X	X	X
Woodland caribou (boreal)(DU 6)	Assinica	X		
	Caniapiscau			X
	Nottaway	X		
	Recognition	X		X
	Temiscamie			X

8.1.2 MIGRATORY CARIBOU

Migratory caribou live in herds of several thousand individuals and make seasonal movements of hundreds of kilometres between the boreal forest and the tundra (Miller 2003, Festa-Bianchet et coll. 2011). Migratory caribou are characterized by the use of calving grounds where females gather to give birth (Bergerud et coll. 2008, Gunn et coll. 2011). The name of a population (herd) generally refers to the name of a major river associated with the geographic location of the calving ground. Thus, calving grounds are located several hundred kilometers north of La Grande Alliance study area. Migratory caribou from the east travel long distances twice a year. Calving takes place on high tundra plateaus or in sparsely vegetated tundra areas. They spend the summer in these areas. They then migrate south in the fall to spend the winter in the taiga and boreal forest. The following spring, the migrating caribou migrate in the opposite direction and return to calving grounds further north. The selection of lichen-rich feeding grounds may be an important factor in the distribution of caribou in the boreal forest, particularly during winter when lichen may be the only food available (Mayor et al. 2009).

Following the demographic expansion of the Leaf River and George River migratory caribou herds in the 1980s and 1990s, the winter range of the migratory caribou herds has expanded well south of the La Grande Complex reservoirs, resulting in a significant increase in the overlap of their ranges with those of the woodland caribou populations.

Historically, caribou from the Leaf River sub-population (LRH) moved 200 to 300 km and stayed on the tundra throughout the year. However, with the increase in population in the 1980s and 1990s, they began to migrate further south and use the area around the La Grande Complex reservoirs during the winter. For example, the Leaf River subpopulation migrated approximately 1,000 km in 2014, which was the longest known caribou migration (Le Corre et al. 2014). This population has, however, declined since (see section 8.1.2.1 for more details). The migration routes used by the George River subpopulation (GRH) have also changed dramatically since the early 1990s, in parallel with the shift in population size (Le Corre et al. 2014). In this case, the population has declined dramatically from its peak in the early 1990s resulting in a decrease in the extent of migration. As a result, the GRH is now confined farther north as it was historically.

An aerial survey of woodland caribou conducted in 2020 over an area of 144,700 km^2 in the James Bay, Rupert River and La Grande River sectors, as far as the shores of Bienville and Caniapiscau lakes, revealed that only a few groups of migratory caribou were observed during the survey, just south of the La Grande River, west of Robert-Bourassa reservoir (Szor and Gingras, 2020). In the eastern sector, a few groups of migratory caribou were also observed, almost exclusively north of the 54th parallel.

Migratory caribou populations in the east have experienced an unprecedented decline in recent decades (see section 8.1.2.2 for more details). This decline can be attributed to several factors, including the deterioration of certain critical habitats due to grazing andtrampling during a period of overpopulation, hunting, predation, diseases and parasites, as well as the consequencesof land development.

This finding prompted COSEWIC to recommend to Environment Canada in 2017 that the eastern migratory caribou be given "endangered" status, the most severe designation under the Species at Risk Act. This designation has not been implemented to date. However, the sport hunt of migratory caribou from the George River herd (GRH) in Quebec was suspended indefinitely in 2012, and since 2013, a moratorium on all types of harvest has been in effect in Newfoundland and Labrador. A total closure of the migratory caribou sports hunt in Quebec, including the Leaf River Herd (LRH), has been in effect since 2018. The Crees have also voluntarily reduced their collective subsistence harvest for the same reasons cited above.

8.1.2.1 *LEAF RIVER HERD (LRH)*

Population size estimates by the MFFP indicate that the LRH increased until it reached its demographic peak in the early 2000s (at least 500,000 animals in 2002 according to Rasiulis (2015) and as high as 1,193,000 animals in 2001 according to Taillon et al (2016)).. Following this period, it gradually declined until 2008, and then remained relatively stable until 2013, estimated at 430 000. Since 2013, the population has again been insteep decline, reaching an estimated population level of approximately 332,000 caribou in the fall of 2015, and approximately 187,000 in 2018.

8.1.2.2 *GEORGE RIVER HERD (GRH)*

This population consisted of approximately 61,800 individuals in 1963 according to Desmeules and Brassard (1964). The George River population size increased beginning in the late 1960s and peaked at 823,000 ± 102,000 individuals in 1993 (Couturier et al. 1996), then began to decline. In 2012, the population was estimated at 27,600 ± 2,760 individuals based on aerial surveys conducted by the governments of Quebec and Newfoundland and Labrador. This population subsequently continued to decline to 14,200 ± 710 individuals in 2014. The total number of individuals in this population was estimated at 8,938 ± 670 in a 2016 survey. Thus, the George River herd has experienced a significant decline of about 99% since the early 1990s, when it numberedabout 800,000 animals. In July 2020, the herd was estimated to be approximately 8,100 caribou, a 47% increasefrom the 2018 survey, which estimated the population at approximately 5,500. This one-time increase in caribou abundance is believed to be primarily due to a recent improvement in the survival of adult females and calves observed in 2020. However, the situation of the GRH remains very precarious due to its low abundance and its lowproportion of adult caribou in the population. In 2020, this proportion was 27% lower than in 2016, when the population had a comparable demographic level of 8,900 caribous.

8.1.3 WOODLAND CARIBOU

The area crossed by the proposed roads and railways is also likely to be frequented by the woodland caribou, which benefits from a double protection status, one at the federal level (threatened species) under the Species at Risk Act, and the other atthe provincial level (vulnerable species) under the Act respecting threatened and vulnerable species. The terrestrialportion of the study areas is entirely included in the area of application of the Québec recovery plan for woodland caribou, except for a small sector at the northern end of the study area SA2.

8.1.3.1 *FEDERAL CONTEXT*

Following the recommendations of COSEWIC (2002), the woodland caribou was listed as threatened in Canada under the Species at Risk Act in June 2003. In the development of its recovery strategy, Environment Canada has adopted a probabilistic assessment approach of the level of self-sufficiency of populations, based on the capacity of the range to maintain a population of woodland caribou. This approach focuses on the evaluation of three main indicators: population trend, population size and level of disturbance in the range. Thus, a population considered

self-sustaining will have a stable or growing population trend, a population size above the critical level (100 individuals), and a low to moderate level of disturbance in its range.

Environment Canada determined that a disturbance rate of 35% was considered moderate and corresponded to a probability of self-sustainability of 0.60. It should be noted that the 0.60 threshold is a minimum for population maintenance, as the probability of the population not being self-sustaining is significant at 0.40, which corresponds to a habitat disturbance rate of approximately 45%. The probabilistic approach applied by Environment Canada in 2008 (Environment Canada 2008) was updated in 2011 to reflect the availability of new data and analysis methods (Environment Canada 2011). This update demonstrates, with even greater clarity, that 70% of the variation in woodland caribou population recruitment can be explained by a single variable, the rate of habitat disturbance, which includes both anthropogenic and natural disturbances. The definition of "disturbance" used to calculate disturbance rates takes into account both direct habitat loss and functional habitat loss. Direct loss corresponds to the area of habitat destroyed and can be of natural (fire, epidemic, etc.) or anthropogenic (logging or human infrastructure) origin. Functional loss is induced by the avoidance behaviour of the woodland caribou in the face of disturbance and corresponds to a zone, known as the "buffer zone", around human activities. Within the buffer zone, vegetation may be adequate for caribou, but will not be used by the species, as they generally move away from disturbance. Environment Canada (2011) found that a 500 m buffer zone, applied around human disturbances, best explained the relationship between disturbance and caribou demography. Overall, the definition of a disturbance is forest fires (without a buffer zone) and human-caused disturbances (with a 500 m buffer zone).

Habitat loss, degradation and fragmentation, whether natural or human-induced, can increase the predation rateof woodland caribou. Studies have shown that habitat alteration favours the increase in density of other prey (e.g., moose), thus creating an increase in predator populations (e.g., wolves and bears), which increases the predation risk for woodland caribou.

The Woodland Caribou Recovery Strategy designates critical caribou habitat (conservation unit) for each local population based on three local factors: habitat location, habitat area and habitat type. This designation was made basedin part on information provided by provincial governments.

A part of the study area is located within the conservation unit QC6, which also corresponds, in this sector, to the limit of the application area of the Québec Woodland Caribou Recovery Plan. This designated unit QC6, with an area of 621,561 km^2, represents the majority of the woodland caribou's range in Québec. The level ofdisturbance in this unit was assessed at 30%, and the analysis concludes that the population occupying it is likely tobe self-sustaining.

8.1.3.2 *PROVINCIAL CONTEXT*

The woodland caribou was designated vulnerable in Quebec in February 2005 under the Act respecting threatened and vulnerable species (Decree 75, 2005). As a result, Quebec proceeded, within its jurisdiction and obligations, to the development and implementation of a provincial recovery plan for the woodland caribou, prepared by a team of specialists and organizations involved in the protection of this species (Équipe de rétablissement du caribou Forestier). A first recovery plan for woodland caribou in Québec was developed for the 2005-2012 period (Équipe de rétablissement du caribou forestier du Québec, 2008), and a second version was submitted in May 2013 to Québec authorities (Équipe de rétablissement du caribou forestier du Québec, 2013a). The Recovery Team also developed guidelines for the management of woodland caribou habitat, which were tabled in a first version in 2010 (Équipe de rétablissement du caribou forestier du Québec, 2010) and in a revised version in 2013 (Équipe de rétablissement du caribou forestier du Québec, 2013b). Interim protection measures to ensure the maintenance of forest massifs until the implementation of the new strategy for woodland and mountain caribou, scheduled for 2023, have been put into effect by the MFFP in 2019. As previously mentioned, the area of application of the Québec Woodland Caribou Recovery Plan overlaps almost entirely with the study area.

8.1.3.3 *DENSITY, DEMOGRAPHY AND LAND USE*

Woodland caribou live in very low density, varying from 1 to 2 individuals/100 km^2, according to inventories conducted in the 1990s (Courtois, 2003). Since 2000, the MFFP has intensified its efforts to inventory woodland caribou in order to harmonize forestry activities with the preservation of this species. Inventories conducted from 2000 to 2010 in the continuous range of the woodland caribou in Québec have resulted in a count of nearly 3,000 caribou over 190,234 km^2, for an average density of 1.5 caribou/100 km^2 (Équipe de rétablissement du caribou forestier du Québec, 2013a).

More specifically regarding the study area, a report by a working group on woodland caribou recovery of the Comité scientifique du Nord-du-Québec provides relevant scientific knowledge (Rudolph et coll., 2012). This report concludes that, although the Nottaway, Témiscamie and Assinica populations are part of the federal conservation unit QC6, which has been deemed self-sufficient, they would not be considered self-sufficient. No comparable study is available for the other two populations in the study area (Caniapiscau and Reconnaissance). The decline in recruitment and survival of adult females and a level of disturbance greater than that required to ensure population persistence are the main elements that support this conclusion.

8.1.3.4 *HABITAT CONDITIONS FOR WOODLAND CARIBOU*

In recent years, several studies on habitat selection have made it possible to spatialize the areas offering suitable habitat for woodland caribou. In one study, a sector identified as "Jamésie" covering approximately 105,000 km^2, was identified as corresponding to the ranges of local populations (herds) of Nottaway, Temiscamie and Assinica caribou in the area subject to forestry activities (Bastille-Rousseau et coll., 2012). This sector corresponds to the most representative habitat that could be selected by woodland caribou likely to frequent the study area. This study demonstrated that, to meet their annual needs, woodland caribou require a very large home range, often exceeding 1,000 km^2.

The spatial distribution and heterogeneity of habitats play an important role in meeting the needs of woodland caribou over an annual cycle. The importance of large forest areas to meet the needs of caribou, particularly during the winter period, is well known. Several authors acknowledge that, when selecting habitats, woodland caribou have a preference for bogs, mature softwood stands containing lichens and other sites rich in lichens (Équipe de rétablissement du caribou forestier du Québec, 2013b). It is also known to avoid recently disturbed areas. In summer, woodland caribou are mainly found in softwood forests over 50 years old (Courtois et coll., 2008; Courbin et coll., 2009; Hins et coll., 2009), bogs and dry barrens (lichen barrens).

The results of the most recent studies have also shown the importance of maintaining a certain heterogeneity in habitats within the clumps. The protection of ranges is mainly intended to protect winter habitats, which are also often selected during calving and rutting. The probability of occurrence of woodland caribou has been shown to vary from 40 to 48% in 100 km^2 ranges, and from 53 to 62% for 250 km^2 ranges (Lesmerises, 2011). To achieve a 75% probability of occurrence, a minimum area of 500 km^2 is required, while a maximum probability of occurrence is achieved with an area greater than 1,000 km^2. It was mentioned that patches of mature coniferous forests outside forest stands are also highly selected, especially during rutting and rearing of young. The habitat selection analyses in the study by Lesmerises (2011) demonstrated the importance of different environments on the establishment of annual and seasonal home ranges of woodland caribou. She mentions that the results obtained were generally consistent with what has been previously documented in Quebec (Courbin et coll., 2009; Hins et coll., 2009). The main findings regarding habitat selection are as follows:

- Dry barrens have the greatest and most consistent influence on caribou use of an area, both annually and seasonally.
- In winter, caribou seem to select mainly dry bare areas and softwood stands older than 40 years, with no significant distinction between open and closed spruce and fir stands and other softwoods.
- During the winter, wetlands are highly selected in the sectors where they are abundant. These areas were particularly sought after in winter by the caribou of the "Jamésie" sector.
- Softwood stands over 40 years old are also sought after by caribou, both annually and seasonally.

- Open softwood stands (25-40% cover) consisting of spruce and fir stands are generally selected morestrongly than the same closed stands, especially on an annual basis and during the rut.
- Wet barrens were selected mainly during calving and rutting periods, but their use by caribou appears to be limited as selection decreased with increasing availability.

Young softwood stands between 5 and 40 years old, areas of recent fires and cuts, and mixed andhardwood stands are very poorly selected throughout the year

8.2 REGIONAL SPECIFICITIES

8.2.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE)

8.2.1.1 *MIGRATORY CARIBOU*

USE OF THE AREA BY MIGRATORY CARIBOU

Table 8-2 presents the information obtained from the MFFP regarding the number of migratory caribou from the Leaf River and George River populations that frequented the study area SA1 from 1991 to 2021, and the number of telemetry points collected by these collars. The data for this 30-year period covers the periods when the two populations reached their maximum numbers, i.e. 823,000 ± 102,000 individuals in 1993 (Couturier et al., 1996) for the GRH and at least 500,000 individuals in 2002 (Rasiulis, 2015) for the LRH. It thus demonstrates what we consider to be a maximum picture of the use of the territory by these populations.

From 1991 to 1999, only two caribou wearing GPS collars from the George River population (GRH) frequented the area for a collection of only 27 location points. In the decade from 2000 to 2010, 84 migratory caribou frequented the area, two from the GRH and 82 from the LRH, for a total of 1088 location points. In the last decade (2011 to 2021), no caribou from the GRH population frequented the area. However, 149 individuals from the LRH population frequented the area, for a total of 10,178 location points.

Thus, over the past three decades, migratory collared caribou in SA1 have been frequented mainly by individuals from the LRH population and are concentrated in the north-eastern portion of the zone (map 5). It should be noted that the change in the number of occurrence points between periods must be interpreted with caution, since the type and number of collars used have varied over the years.

Table 8-2 Number of Migratory Caribou with Telemetric Collars and Points of Occurrence in Study Area SA1

AREA	MIGRATORY CARIBOU				
	NUMBER	PERIOD			TOTAL [1]
		1991-1999	2000-2010	2011-2021	
SA1	Individuals (population)	2 (2 GRH)	84 (2 GRH - 82 LRH)	149 (149 LRH)	205 (4 GRH et 201 LRH)
	Points ofoccurrence	27	1 088	10 178	11 293

1 Some individuals may have been identified in more than one period. Thus, the total number of individuals may be lowerthan the sum of the number of individuals in each period.

8.2.1.2 *WOODLAND CARIBOU*

USE OF THE AREA BY WOODLAND CARIBOU

Table 8-3 presents the information obtained from the MFFP concerning the number of woodland caribou that frequented the SA1 area from 2015 to 2021 and the number of telemetric points collected by these collars.

Individuals from the Nottaway and Assinica populations occupied mainly the southern portion of the study area, while the Reconnaissance population used mainly the south-eastern portion. The movement pattern of the individuals allows us to identify that there are two main connectivity corridors that require special attention in the context of the study. One is located at the southern end of the study area and a second in the center of the study area (Map 5).

HABITAT CONDITION FOR WOODLAND CARIBOU

This area is part of the central sector of the Quebec Forest Caribou Recovery Plan area, where there is no forest management. Map 5 presents the habitat index model for woodland caribou in the SA1 area and a 20 km band around it. A significant portion of the area offers habitat quality indices ranging from very low (level 0 on the map), mainly associated with the presence of anthropogenic disturbance, to low, mainly associated with the presence of large areas affected by forest fires (maps 3 and 5). The areas with the best habitat indices, near the maximum value of 5 (Map 5), are best represented in the southern portion of the area and generally contain mature forest stands. These are the sectors that appear to have been selected by woodland caribou during their use of the area from 2015 to 2021. Maintaining these areas with good habitat conditions is essential to ensure the recovery or self-sufficiency of the caribou populations that frequent this area

Table 8-3 Number of Telemetrically Collared Woodland Caribou and Occurrence Points in Study Area SA1 by Population from 2015 to 2021

POPULATION	STUDY AREA SA1	
	NUMBER OF INDIVIDUALS	NUMBER OF POINTS OCCURRENCE
Assinica	3	155
Nottaway	11	948
Recognition	4	1 090
All populations	**18**	**2 193**

8.2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

8.2.2.1 MIGRATORY CARIBOU

USE OF THE AREA BY MIGRATORY CARIBOU

Table 8-4 presents the information obtained from the MFFP concerning the number of migratory caribou from the Leaf River and George River populations that frequented SA2 from 1991 to 2021, and the number of telemetric points collected by these collars. The data for this 30-year period covers the periods when the two populations reached their maximum numbers, i.e. 823,000 ± 102,000 individuals in 1993 (Couturier et al., 1996) for the GRH and at least 500,000 individuals in 2002 (Rasiulis, 2015) for the LRH. It thus demonstrates what we consider to be a maximum picture of the use of the territory by these populations.

From 1991 to 1999, seven GPS-collared caribou, including two from theGeorge River population (GRH) and five from the Leaf River population (LRH), frequented the area, collecting only 30 location points. In the decade from 2000 to 2010, 78 migratory caribou, almost exclusively associated with the GRH population, frequented the area, for a total of 1,717 occurrence points. In the last decade (2011 to 2021), 319 collared migratory caribou frequented the area, of which only two were associated with the GRH, for a total record of 45,776 location points. The use of collared migratory caribou in SA2 over the last three decades covers theentire SA2 area (Map 5).

Table 8-4 Number of Migratory Caribou with Telemetric Collars and Points of Occurrence in Study Area SA2

AREA	MIGRATORY CARIBOU				
	PERIOD	PERIOD			TOTAL [1]
		1991-1999	2000-2010	2011-2021	
SA2	Individuals (population)	7 (2 GRH- 5 LRH)	78 (1 GRH- 77 LRH)	319 (319 LRH)	355 (3 GRH - 352- LRH)
	Points of occurrence	30	1 717	45 776	47 523

1 Some individuals may have been identified in more than one period. Thus, the total number of individuals may be lowerthan the sum of the number of individuals in each period.

8.2.2.2 WOODLAND CARIBOU

USE OF THE AREA BY WOODLAND CARIBOU

Information obtained from the MFFP regarding woodland caribou that frequented SA2 for the period 2015-2021 indicates that no telemetrically collared woodland caribou frequented SA2 during this period.

HABITAT CONDITION FOR WOODLAND CARIBOU

This area is part of the northern sector of the Quebec Woodland Caribou Recovery Plan. In the northern sector of its range, the woodland caribou benefits from an environment where human disturbance is relatively limited, but where the fire cycle is shorter, and fires cover larger areas. This area is characterized by the seasonal presence of migratory caribou in winter (Québec Woodland Caribou Recovery Team, 2013a). Map 5 presents the habitat index model for woodland caribou in the SA2 area and in a 20 km band around it. This area is strongly represented by indices of relatively low habitat quality associated mainly with the presence of large non-forested areas. This area has a very

low proportion of mature forest massifs offering good quality areas for woodland caribou. In addition, the use of this area by migratory caribou may create a form of competition for foodresources during the winter. Finally, the intensive hunting of migratory caribou in this area during the last few decades may have contributed to the decline of the woodland caribou populations that occupied it.

8.2.3 STUDY AREA 3 (SA3): ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

8.2.3.1 MIGRATORY CARIBOU

USE OF THE AREA BY MIGRATORY CARIBOU

Table 8-5 presents the information obtained from the MFFP on the number of migratory caribou from the Leaf and Georges River populations that frequented study area SA3 from 1991 to 2021, and the number of telemetric points collected by these collars. The data for this 30-year period covers the periods when the two populations reached their maximum numbers, i.e. 823,000 ± 102,000 individuals in 1993 (Couturier et al., 1996) for the GRH and at least 500,000 individuals in 2002 (Rasiulis, 2015) for the LRH. It thus demonstrates what we consider to be a maximum picture of the use of the territory by these populations.

From 1991 to 1999, 16 collared caribou frequented the area, including 10 associated withthe GRH and 6 with the LRH, for a total of 291 location points collected. In the decade from 2000 to 2010, 41 migratory caribou frequented the area, six from the GRH and 36 from the LRH, for a total of 453 location points. In the last decade (2011 to 2021), no caribou from the GRH population frequented the area, however 34 individuals from the LRH population did, for a total of 1411 location points. The use of collared migratory caribou in Zone 3 (SA3) over the last three decades has been mainly by individuals from the LRH population and is concentrated in the north-western portion of the zone (Map 5).

Table 8-5 Number of Migratory Caribou with Telemetric Collars and Points of Occurrence in Study Area SA3

AREA	MIGRATORY CARIBOU				
	PERIOD	PERIOD			TOTAL [1]
		1991-1999	2000-2010	2011-2021	
SA3	Individus (population)	16 (10 GRH – 6 LRH)	42 (6 GRH - 36 LRH)	34 (34 LRH)	86 (16 GRH et 70 LRH)
	Points d'occurrence	291	453	1 411	2 155

1 Some individuals may have been identified in more than one period. Thus, the total number of individuals may be lowerthan the sum of the number of individuals in each period.

8.2.3.2 WOODLAND CARIBOU

USE OF THE AREA BY WOODLAND CARIBOU

Table 8-6 presents the information obtained from the MFFP concerning the number of woodland caribou that frequented study area SA3 from 2015 to 2021, and the number of telemetric points collected by these collars. Individuals from three woodland caribou populations frequented the area during this period: Témiscamie, Reconnaissance and Caniapiscau. Individuals from the Témiscamie and Reconnaissance populations occupied mainly the southern and eastern portions of the study area, while the Caniapiscau population made incursions into the north-eastern sector (Map 5). The movement pattern of the individuals also identifies a connectivity corridor that runs across the southern end of Study Area SA3.

Table 8-6 Number of Telemetrically Collared Woodland Caribou and Occurrence Points in Study Area SA3 for each Population from 2015 to 2021

POPULATION	STUDY AREA SA3	
	NUMBER OFINDIVIDUALS	NUMBER OF POINTSOF OCCURRENCE
Caniapiscau	6	939
Recognition	10	3 818
Temiscamie	13	6 242
All populations	**29**	**10 999**

HABITAT CONDITION FOR WOODLAND CARIBOU

This area is part of the central sector of the Quebec Woodland Caribou Recovery Plan area (Map 5). In this sector, there is no forest management, which limits habitat disturbance of a human nature. (Québec Woodland Caribou Recovery Team, 2013a).

Map 5 presents the habitat index model for woodland caribou in Zone 3 (SA3) and a 20 km band around it. A significant portion of the area has high habitat quality indices represented by large clumps of mature coniferous forest. Areas with low habitat quality indices are generally linear anthropogenic structures (roads, power lines). The sectors offering the best habitat indices appear to have been selected by woodland caribou during their use of the area from 2015 to 2021 (Map 5). Maintaining these sectors, which offer good habitat conditions, is essential toensure the recovery or self-sufficiency of the caribou populations that frequent this area

8.3 ISSUES AND RECOMMENDATIONS

8.3.1 ISSUES AND CONSTRAINTS TO DEVELOPMENT

The caribou is an emblematic species for the Cree on which their traditional way of life and subsistence has been based for thousands of years. In addition, this species has a special protection status and is particularly sensitive to linear proposed infrastructure (railways and roads). The construction and operation of these infrastructures can thus have significant effects on the habitat conditions of this species. In this context, caribou are particularly sensitive to the proposed infrastructures, especially in the case of woodland caribou. The latter occupies SA1 and SA3 on an annual basis and benefits from a double protection status. Conversely, migratory caribou have no particular protection status andare present in the study areas only in winter, when they are looking for food resources (e.g., lichen). It is therefore less likely to be affected by the infrastructures under study. The main issues in relation to woodland caribou are **habitat loss and degradation**, **habitat fragmentation**, **disturbance by noise and light,** and the **risk of collision** with vehicles. These various issues are described below, and mitigation or avoidance avenues are proposed

8.3.1.1 *HABITAT LOSS, DEGRADATION AND FRAGMENTATION*

CONCERNS

Habitat loss, degradation and fragmentation, whether natural or human-induced, can increase the predation rateof woodland caribou. Studies have shown that habitat alteration favours the increase in density of other prey (e.g., moose), thus creating an increase in predator populations (e.g., wolves and bears), which increases the predation risk for woodland caribou.

Woodland caribou are negatively affected not only by the destruction or modification of their habitat, but also by excessive habitat fragmentation (Courtois, 2003). Linear structures such as roads and railways can act as a barrier to movement and fragment habitat (Saint-Laurent et coll., 2012). Several authors mention that by acting as a barrier to movement, the road leads to a loss of functional habitat, in addition to leading to its fragmentation (Renaud et coll., 2010). The effect of a road or other linear structure as a barrier to caribou movement or the fragmentation of its functional habitat is proportional to the volume of traffic on it. In the short term, Mahoney and Shaefer (2002) state that it is the construction of the road and its use by vehicles, rather than the physical structure itself, that would actually have negative impacts on caribou, especially during crucial phases of their life cycle (winter and calving). Studies have clearly shown that woodland caribou accelerate as they approach a road they have to cross (Leblond et coll., 2013). The type of road influences the response of woodland caribou, who avoid mainly major roads (paved roads, categories 1 and 2) with high intensity of use, while tourist trails and seasonal roads are used more often (Vistenes et coll., 2008). This road avoidance response is intensified in female caribou during calving and calf rearing. One study mentions that the impact of roads on woodland caribou is less significant during the summer period (June 21-September 14) in non-suckling females (Saint-Laurent et coll., 2014)

IMPACT ASSESSMENT

SA1 and SA3 are the most densely occupied by woodland caribou populations. In their southern portions, there are very narrow connectivity corridors between the areas occupied by caribou. In addition, in the case of SA3, it should be noted that the eastern portion of the study area is used much more than the central and western portions. Activities during the construction phase are likely to generate significant effects in terms of direct habitat loss (deforestation) and disturbance. During the operational phase, veryintense road or rail activity could also generate habitat fragmentation (loss of functional habitat) and even the isolation of groups of caribou on either side of the infrastructure. Zone SA3 is considered the most sensitive zone for woodland caribou, since the proposed road will be the first linear infrastructure to cross this territory. In the case of Zone SA1, the proposed rail line will generally be located near the Billy-Diamond Road, which already contributes to thedegradation of woodland caribou habitat on both sides of the road

AVOIDANCE AND MITIGATION MEASURES

One avoidance measure is to limit construction or transportation activities in sectors frequented by woodland caribou during the periods when caribou are most vulnerable, i.e., winter, calving and post-calving. The development of these sections should therefore be carried out during the rutting period, between May 20 and September 15. As far as possible, rail transport should be concentrated during the same period. With respect to the choice of road alignment, the eastern portion of SA3, which is used more by woodland caribou, should be avoided by the future road alignment if possible. InSA1, where the quality of woodland caribou habitat is often lower due to existing anthropogenic disturbances, the rail line should be located as close as possibleto existing infrastructures (e.g., Billy-Diamond Highway) so as not to further contribute to habitat degradation

8.3.1.2 *NOISE AND LIGHT DISTURBANCES*

CONCERNS

Studies have shown that a sustained and repeated level of noise and light disturbance can cause avoidance of certain areas and reduce use of suitable woodland caribou habitat. The recovery strategy for the boreal population of woodland caribou (*Rangifer tarandus*) in Canada identifies this threat as a low to moderate concern in relationto the recovery of the species, consistent with population and distribution objectives.

There are no scientific studies that document the effect of light on woodland caribou. Work has been done in the past to study the impact of noise on animals. Among the noises studied, two types have often been considered: road traffic noise and air traffic noise over the parks (Radle, 1998; Kaseloo, 2006). The impact of noise on animals depends on the noise level of the ambient (residual) noise, the noise level of the disturbance noise and its significance for the animal. With repeated exposure, all vertebrates become habituated or adapt their behaviour (e.g., noise associated with danger).

In a study dealing with the impact of noise on caribou, Harrington and Veitch (1991) investigated the noise generated by low-flying hunting aircraft on the behaviour of caribou in Labrador. The reaction often observed was a startle reflex (scaring) and that caribou do not become accustomed to this type of noise. These reactions can pose a threat to caribou during the calving period (injuries, separations, etc.). Research has shown that for woodland caribou, increased movement in response to noise disturbance can significantly increase their calf's exposure to predators, and thus become more vulnerable to the negative effects of noise during the calving period (Harrington and Veitch, 1991).

IMPACT ASSESSMENT

Woodland caribou movements in the proposed infrastructures' areas of influence or along the developed access roads could bealtered by artificial lighting, noise, dust, vibrations and human presence.

AVOIDANCE AND MITIGATION MEASURES

Concentrating construction activities in the areas most frequented by caribou, outside of the periods when caribou are most vulnerable, i.e., winter, calving and post-calving, would also help prevent the effects that may be caused. It is also important to ensure that all motorized equipment is equipped with efficient mufflers in good condition to minimize noise disturbance. Where possible, transport with heavy vehicles should be carried out in convoys (several trucks) to limit traffic, if possible, to fixed periods rather than individually throughout the day.

8.3.1.3 *COLLISIONS WITH VEHICLES*

CONCERN

In some areas, woodland caribou are subject to fatal collisions with road vehicles or trains. Nevertheless, at a national level, according to the recovery strategy for the boreal population of woodland caribou (*Rangifer tarandus*) in Canada, vehicle collisions are not perceived as a significant threat to caribou, which naturally tend to stay away from roads. The road avoidance strategy appears to provide adequate protection for woodland caribou from direct road mortality.

Migratory caribou that travel extensively in search of food resources during the winter months are more likely to use roads and are therefore more vulnerable to collisions. However, migratory caribou generally travel in groups and are thus easier to see for drivers.

IMPACT ASSESSMENT

The probability of a collision with a caribou is very low. The increase in traffic will be an even greater deterrent inthe exceptional event that caribou want to approach the area. However, there is a possibility of collisions with caribou, particularly migratory populations.

AVOIDANCE AND MITIGATION MEASURES

Despite the low probability of caribou being found in the immediate vicinity of the road or railway, it would be appropriate to set up a communication system to inform vehicle or train drivers of any sightings or signs of caribou on these access routes. Road signs or user awareness signs indicating the potential presence of caribou and the risk of road collisions could be installed in each road direction. In addition, in the event that the MFFP detects the presence of caribou near the road, using radio collars, it could inform users by implementing a specific procedure agreed upon beforehand with the main regional partners using the road.

Training activities for employees and subcontractors during the construction and operation phases should include a module on woodland caribou. The objective of this training would be to make them aware of the precariousness of the woodland caribou and to develop their ability to distinguish possible signs of its presence. Finally, carrying out transport activities during the day can limit the risk of collisions, which occur mainly at night.

8.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

The information used to draw up a portrait of the caribou in the study areas is derived from inventory and telemetric monitoring data, both for migratory caribou and woodland caribou. This information in addition to those collected during the consultations (see Technical Note 3), therefore provides a good picture of the use of the study areas by this species. It may nevertheless be worthwhile to validate the presence of woodland caribou wintering grounds within a 10 km zone on either side of the routes in order to determine the impact on this species during the winter. A winter aerial survey would provide this information but would not significantly alter the general picture of the use of the territory by woodland caribou during their annual life cycle.

In a subsequent phase of assessing the proposed infrastructures' foreseeable effects, it would be relevant to analyze the actual rate of habitat disturbance and the available habitats in general, but especially for the critical periods of the woodland caribou's annual life cycle (winter, calving). These analyses should be carried out considering the study area, including a 20 km strip around its periphery. They will provide a better picture of the availability of habitat for this species and of the sectors that are essential for ensuring these functions in its life cycle.

Moreover, CNG is involved in the development and implementation of management plans under the Species at Risk Act for woodland caribou. This plan will also have to be taken in account in the future steps of La Grande Alliance, when the document will be published. Also, the woodland and mountain caribou strategy, scheduled for release in June 2023, will also need to be considered in the next stages of the development of the proposed infrastructures. However, this strategy is aimed at the territory where the forest is commercially harvested which is located south of the study area.

9 TERRESTRIAL PROTECTED AREAS

9.1 GENERAL DESCRIPTION

The projected protected areas located in the study areas are shown on Map 6. Three proposed biodiversity reserves and eight territorial reserves for protected area purposes (RTFAP) are found in the study areas. None of these have a definitive legal status at the time of publication of this report, although we assume that this will in fact occur at some point in the future.

Biodiversity reserves are protected areas created to promote the maintenance of biodiversity on land and, more specifically, the representativeness of the various natural regions of Quebec (MELCC, 2022a). Territorial reserves for protected area purposes (RTFAP) allow for the temporary recognition of a territory as protected until it is granted official legal status. Furthermore, the management arrangements for this type of status respect international standards for a protected area. This means that they can be listed in the Quebec Register of Protected Areas. The primary objective of these designations is nature conservation. A brief description of the objectives and issues identified for each of these areas in relation to the proposed infrastructures are summarized in Table 9-1.

9.2 REGIONAL SPECIFICITIES

9.2.1 STUDY AREA 1 (SA1): BILLY-DIAMOND HIGHWAY RAILWAY – RUPERT – LA GRANDE

Study Area 1 crosses two proposed biodiversity reserves and three RTFAP. These are the proposed Waskaganish and Paakumshumwaau-Maatuskaau biodiversity reserves and the RTFAP Namewaakamiishtikw-Piskuchitishu-Siipii, Coldwater-Juneshew-Sibi and Waskaganish. These areas partially touch the study area (western portion), with the exception of the proposed Paakumshumwaau-Maatuskaau biodiversity reserve, which is located in the north-central portion of the study area and is crossed by the Billy-Diamond highway.

It is mainly in the SA1 zone that the proposed roads and railways are likely to be in close proximity to projected protected areas, due to the close proximity of the Billy-Diamond Road to several proposed protected areas. The road crosses some of these areas, sometimes within a narrow corridor corresponding roughly to the right-of-way, that aims to exclude the road from the protected area. Since the proposed rail line will be located near the Billy-Diamond Highway, it will also run very close to, and even within, some proposed protected areas.

9.2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR – LA GRANDE – WHAPMAGOOSTUI/KUUJJUARAPIK

Two RTFAP are located in the SA2. The eastern portion of the RTFAP Lac-Burton-Rivière-Roggan-et-la-Pointe-Louis-XIV is located in the center of the study area, while the Rivière-Kanaawpscow-et-Lac-Kukamaw reserve is located in the south, where it is divided into three distinct blocks. These two RTFAP could be avoided by the proposed infrastructure. It should be noted, however, that the preliminary road alignment between La Grande River and Whapmasgoostui / Kuujjuarapik that was studied in the early 2010s passed slightly inside the eastern boundary of the RTFAP Lac-Burton-Rivière-Roggan-et-la-Pointe-Louis-XIV over a distance of approximately 45 km (Poly-Géo, 2013).

It should also be noted that the Tursujuq national park is located along the Hudson Bay coast, at the northern end of , opposite the marine extension of . However, no infrastructure is planned in this area. Since this park will not be affected by the proposed infrastructures, it is not discussed further in this section.

9.2.3 STUDY AREA 3 (SA3): ROUTE 167 - RENARD MINE – TRANS-TAIGA ROAD

There are three proposed protected area located partly within the SA3 study area. These are the RTFAP Aawiitakuch and Pipunishiwin Saahkamiishtiku and the proposed Hirondelle biodiversity reserve which is located in the southern portion of the study area. All of these areas could be avoided by the infrastructures under study.

Table 9-1 Summary Description and Issues Identified for the Projected Protected Areas Located in the Study Area

AREA	PROTECTED AREA		OBJECTIVES	ISSUES
	DESIGNATION	NAME		
SA1	Projected biodiversity reserve	Waskaganish	— Protection of a mosaic of habitats representative of the natural regions of the James Bay Coastal Plain and the Lower Rupert Plain. — Preservation of the biodiversity of aquatic and terrestrial ecosystems. — Acquisition of additional knowledge about the natural heritage.	— The territory is located within the range of the Nottaway population of woodland caribou.
	Territorial reserves for protected area purposes (RTFAP)	Waskaganish	— Protect a sample of penned bogs, a remarkable ecosystem found nowhere else in Quebec. — Protect, in part, two occurrences of yellow rail and one occurrence of bald eagle	— The territory is located within the range of the Nottaway population of woodland caribou.
	Projected biodiversity reserve	Paakumshumwaau-Maatuskaau	— To protect a representative sample of the coastline structured by a hydrographic system characterized by east-west oriented rivers and part of the Opinaca River lowlands. — Six traplines of the Cree community of Wemindji are partially included in the proposed biodiversity reserve. The protection of this territory follows a proposal from the Cree community of Wemindji, which wished to conserve the watersheds of the Vieux Comptoir and Peuplier rivers, a territory traditionally used by the Cree Nation for more than 3500 years.	— The James Bay Road crosses the eastern end of the protected area, while the Wemindji Road crosses its northern part.
	Territorial reserves for protected area purposes (RTFAP)	Namewaakamiishtikw-Piskuchitishu-Siipii	— Provide the community of Eastmain with protected areas on these trapping grounds. — Configuration developed from the catchments of the rivers Conn and Pêche.	— Cree tallymen and members of the Eastmain community have expressed a strong interest in protecting the Conn and La Pêche watersheds because of their historical and cultural significance. — The lake sturgeon, a species likely to be designated as threatened or vulnerable in Quebec, is also found there.
	Territorial reserves for protected area purposes (RTFAP)	Coldwater-Juneshew-Sibi	— Provide the community of Eastmain with protected areas on its trapping grounds.	— Cree tallymen and members of the Eastmain community have expressed a strong interest in protecting the entire Rivière à l'Eau Froide watershed. — It contains many important cultural sites, including present-day and ancestral camps, as well as many routes used to travel through the area. It also contains quality habitats essential for the subsistence of both terrestrial and aquatic wildlife species.
SA2	Territorial reserves for protected area purposes (RTFAP)	Burton River Lake - Roggan and Point -Louis-XIV	— Ensure the protection of sites of interest, including Louis XIV Point, which has climatic, floral and wildlife characteristics unique to this latitude. — Preserve part of the Sakami Moraine, one of the largest moraine complexes in Northern Quebec.	— Presence of plant communities typical of the erect shrub tundra normally found 200 km further north. Inland, the area has one of the most remarkable drumlin fields in Quebec. Close to the shore stretches of sand are sometimes taken up by the winds to create imposing dunes.
	Territorial reserves for protected area purposes (RTFAP)	Kanaawpscow River and Kukamaw Lake	— Contributes to the achievement of the representativeness objectives for the Rivière à la Baleine undulating plain territorial zone. — It also responds to the need expressed by the Cree community of Chisasibi for a large, protected area within which there are many significant cultural features, such as hunting camps, traditional travel routes and archaeological sites.	— There are also occurrences of several endangered wildlife species, such as lake sturgeon, bald eagle and harlequin duck. — This RTFAP is separated into three adjacent sectors, so as to exclude a stretch of river and a corridor for the possible passage of hydroelectric transmission lines.
SA3	Projected biodiversity reserve	Hirondelle	— Protection of representative ecosystems of the Noacocane and Nichicun Lake Buttons Natural Region and the Orillat Lake Buttes physiographic complex	— N/A
	Territorial reserves for protected area purposes (RTFAP)	Aawiitakuch	— Contribution to the achievement of the representativeness objectives of the Caniapiscau Depression territorial zone. — To the west, the decaying moraine and Rogen moraine terrain is representative of the Rogen Plain area. — To the east, the Thin Till Hills contribute to the preservation objectives of the Caniapiscau Depression Territorial Area.	— Culturally, the territory is home to an important site with many family camps. It should be noted that this territory is part of the wintering area of the Leaf River migratory caribou herd. — The territory is cut by the Trans-Taiga road.
			—	—
	Territorial reserves for protected area purposes (RTFAP)	Pipunishiwin Saahkamiishtiku	— Represent the territorial area of the Rogen Plain.	— This territory is part of the wintering area of the Leaf River migratory caribou herd.

Source: MELCCC, 2022a

9.3 ISSUES AND RECOMMENDATIONS

9.3.1 ISSUES AND CONTRAINTS TO DEVELOPMENT

Protected areas are a major constraint to the study and the selected routes will have to be located outside them. If it is impossible to avoid them completely, this issue should be discussed as soon as possible with the responsible authorities. It should be remembered that all the projected protected areas in the area crossed by the future routes do not yet have a definitive status. It is therefore possible that there will be some flexibility in the final delimitation of these areas, so as to take into account La Grande Alliance, provided that conservation objectives are not compromised. On the other hand, in the case of zone SA3, it would be advantageous for the chosen route to pass to the west of the RTFAP Aawiitakuch, thus avoiding the creation of a potential barrier between two distinct blocks within this reserve (Map 6).

Moreover, as stated in section 7.3.1, when critical areas for the implementation of wildlife crossings will be assessed, ecosystem connectivity in proposed protected areas crossed by the proposed infrastructures (e.g. in) will be among the factors considered.

9.3.2 GAPS IN AVAILABLE INFORMATION AND RECOMMENDATIONS

The authorities responsible for protected areas will have to be consulted quickly in order to understand the possible avenues for making the proposedinfrastructures compatible with the protected areas that are likely to be crossed or skirted by the proposed alignments. Such an issue is anticipated in the SA1 area but could also occur in either of the other two study areas depending on the preliminary alignments selected. In these discussions with the responsible authorities, the possibility that new protected areas may be established in the next few years should also be discussed to ensure that the proposed alignments are taken into account. During the next stages of the development of the proposed infrastructures, the presence of wildlife sites of interest in the study areas will also be verified, as specific measures could apply.

10 WILDLIFE MANAGEMENT

The terrestrial portions of the study areas are located entirely in hunting zone 22, while they are divided between fishing zones 22 north and 22 south (Map 4). However, the land regime defined by the James Bay and Northern Québec Agreement (JBNQA) provides for the division of the territory into Category I, II and III lands (Map 4). Category I lands comprise just over 14,000 km^2 in and around Aboriginal communities and are administered solely by the latter. These lands are reserved for the exclusive use of Aboriginal communities, including hunting, fishing and trapping rights. Category II lands cover approximately 70,000 km^2 and 82,000 km^2, belonging to the Cree and the Inuit respectively. These lands are part of Québec's public domain, but the Aboriginals have exclusive hunting, fishing and trapping rights. Thus, sport hunting and fishing cannot be practised by non-Natives on Category I and II lands, unless they are given explicit permission by local authorities to harvest within their Category I or II lands.

Finally, Category III lands represent all the lands in the territory outside of Category I and II lands, generally found further away from the communities. These lands represent approximately 80% of all lands within Eeyou Istchee. Crees have harvesting rights over the entire territory, including the exclusive right to harvest specific species listed in Schedule 2 of Chapter 24 of the JBNQA (most notably lake sturgeon, beaver and black bear). Sport hunting and fishing is also allowed for non-Natives on Category III lands, as long as they comply with JBNQA and other applicable laws and regulations. However, in the particular case of a temporary labour force, the Hunting, Fishing and Trapping Coordinating Committee, which is responsible for reviewing, managing, supervising and regulating the Hunting, Fishing and Trapping Regime as defined in Section 24 of the JBNQA, has the ability to designate any area within Category III lands for which an influx of workers may adversely affect sports fishing and hunting species within that area, to create a special management zone to further manage harvesting (see section 28.8.11 of JBNQA). This was the case with the Weh-Sees Indohoun area designated within Eastmain-1 hydroelectric projet area. See section 10.5 for more details on this particular case.

In the study areas, Category II lands are found only in study areas SA1 and SA2, while Category I lands are present only in study area SA2, in the area of the communities of Whapmagoostui and Kuujjuarapik (Table 10-1).

Table 10-1 Total and Relative Area Occupied by Category I and II Lands in the three Study Areas

STUDY AREA	TOTAL AREA (KM^2)	AREA OCCUPIED BY CATEGORY I LAND (KM^2) (%)	AREA OCCUPIED BY CATEGORY II LAND (KM^2) (%)
SA1	15,374	0 (0 %)	4,446 (28.9 %)
SA2	12,398[1]	335 (2.7 %)	7,935 (64.0 %)
SA3	15,157	0 (0 %)	0 (0 %)
Total	42,929	335 (0.8 %)	12,381 (28.8 %)

1 The marine portion of the SA2 area is excluded

The following sections provide an overview of the regulatory framework applicable to the harvesting of various wildlife groups. For a more detailed description of the species harvested in the study area, particularly by the Cree communities, see Technical Note 3, which is based on consultations with users of the territory.

10.1 ICHTYOFAUNA

In Québec, sport fishing is regulated by the Loi sur la conservation et la mise en valeur de la faune and by the federal Fisheries Act, particularly through the Québec Fishery Regulations. SA2 and SA3 are located entirely within Fishing Zone 22 North, while the southern end of Study Area SA1 also extends into Fishing Zone 22 South. Although regulatory exceptions apply to several water bodies, in general, sport angling is permitted in these two zones (outside of Category I and II lands) for pike, walleye, brook trout, yellow perch and lake trout. In the case of Zone 22 North, landlocked salmon fishing is also permitted, but this species is not present in the study areas.

Among these sports species, the most sought-after in Eeyou Istchee are walleye (*Sander vitreus*), lake trout (*Salvelinus namaycush*), brook trout (*Salvelinus fontinalis*), northern pike (*Esox lucius*) and, to a certain extent, yellow perch (*Perca flavescens*) (CRRNTBJ, 2010b). Fishing for other fish species is prohibited in Areas 22 North and 22 South. Fishing for Arctic char (*Salvelinus alpinus*) is only permitted in fishing areas 23 and 24, which are located beyond the northern boundary of the study area.

In addition to these sport species, other fish species are exclusively fished by Cree communities.. These include lake sturgeon (*Acipenser fulvescens*), lake whitefish (*Coregonus clupeaformis*), lake cisco (*Coregonus artedi*), round menomini (*Prosopium cylindraceum*), lakers (*Hiodon* sp.), suckers (*Catostomus* sp.) and burbot (*Lota lota*). Many of these species are culturally valued as well as being important for the subsistence economy.

10.2 AVIAN FAUNA

The harvesting of birdlife in the three study areas falls into three main categories, small game, game birds and subsistence hunting, all of which are governed by specific legal provisions.

Small wildlife bird species include ptarmigan, grouse and ruffed grouse. The harvesting of these species is regulated by the Loi sur la conservation et la mise en valeur de la faune and its associated regulations administered by the provincial government, the Ministère des Forêts, de la Faune et des Parcs (MFFP). According to CRRNTBJ (2010b), this hunt is relatively popular near cities and towns. It should be noted that the hunting of blackbirds, i.e.

American crow, common grackle, european starling, red-winged blackbird (*Agelaius phoeniceus*) and brown-headed cowbird (*Molothrus ater*) is also under provincial jurisdiction. Often considered unwelcome birds, hunting is permitted at certain times of the year. It should be noted that all of these species are present in the study area, but in limited numbers.

Game birds are represented by waterfowl, i.e., geese, ducks (with the exception of the harlequin duck, for which hunting is prohibited), snipe, woodcock, coots, scaup and mourning dove (*Zenaida macroura*). Harvesting is governed by the Migratory Birds Convention Act, 1994, administered by the federal government, the Canadian Wildlife Service of Environment Canada. It should be noted, however, that the American coot and mourning dove are not very numerous in the area and that the American gallinule is absent.

Subsistence hunting of migratory birds is permitted for Crees, for whom this harvest is of significant importance, particularly along the James Bay coast. Canada goose is by far the most sought after bird species by Crees and non-Crees alike (NRTSB, 2010b) but it is mostly practised by Crees who have access to the resource in priority. When the populations are too low, only Native people can hunt migratory birds, unless they decide to allocate a portion to non-natives through recognized outfitters. The traditional Canada goose hunt is a major spring event, but is also important in the fall, especially in northeastern James Bay. Canada Geese are an important wildlife food resource for Cree people living in communities along the James Bay coasts. According to Giroux et al. (2022), changes in the relative abundance of each goose population may affect hunting success because each population is differently susceptible to hunting within the territory due to differences in migratory behaviour. This aspect is addressed in the technical note, which deals with the sensitive areas identified in the indigenous communities. Snow geese (*Anser caerulescens*) and, to a lesser extent, brant (*Branta bernicla*) are also harvested by coastal Cree communities. Snow geese harvesting is more popular in Waskaganish while brant harvesting is more common in Wemindji and Chisasibi.

10.3 SMALL FAUNA AND FUR-BEARING ANIMALS

The harvesting of small wildlife and fur-bearers in the three study areas is governed by specific legal provisions for hunting and trapping activities.

10.3.1 HUNTING

In Quebec, small game (mammal) hunting includes snowshoe hare, coyote and wolf, woodchuck, raccoon, and silver, cross and red fox. In hunting Zone 22, which covers the study area, only hare hunting is permitted. It takes place from September 1 to April 30 (Government of Québec, 2022b). Firearms, air guns and bows are permitted. The use of crossbows is prohibited in hunting Zone 22. There is no bag limit for hare.

10.3.2 TRAPPING

Trapping fur-bearers is a traditional activity practised by the Cree. Exclusive trapping rights apply throughout the Cree trapline area, which are subdivisions within the beaver reserves. In addition, the exploitation of certain species is exclusive to Aboriginal beneficiaries of northern agreements. These species are presented in Table 10-2. It should be noted that no catch limits are imposed on them or even a trapping period. It is important to mention that this exclusivity applies within the beaver reserves. Non-aboriginals may therefore trap on lands registered in the UGAFs if they are holders of such rights.

Only the polar bear is subject to an administrative agreement as it is subject to the precautionary principle. These measures aim to prohibit hunting between 1er June and 31 August, to protect females with cubs and cubs less than two years old, to avoid disturbing females in dens and to mark hides with tags provided by the Quebec government.

Table 10-2 List of Furbearer Species Trapped by Indigenous People

SPECIES	SPECIAL FEATURES	SPECIES	SPECIAL FEATURES
Grey wolf	Exclusive to indigenous people north of the 55th parallel.	Hermine	Exclusive to indigenous people
Arctic fox	Exclusive to indigenous people	River otter	Exclusive to indigenous people
Red fox	Exclusive to indigenous people	American marten	Exclusive to indigenous people
Canada beaver	Exclusive to indigenous people	Striped skunk	Exclusive to indigenous people
Muskrat	Exclusive to indigenous people	Pekan	Exclusive to indigenous people
American porcupine	Exclusive to indigenous people	American mink	Exclusive to indigenous people
Canadian lynx	Exclusive to indigenous people	Woodchuck	Exclusive to indigenous people
Long-tailed weasel	Exclusive to indigenous people	Polar bear	Exclusive to indigenous people
Pygmy weasel	Exclusive to indigenous people	Black bear	Exclusive to indigenous people north of 50e parallel
Wolverine	Exclusive to indigenous people	Woodchuck	Exclusive to indigenous people

Source : NRTSC (2010)

10.4 LARGE WILDLIFE

In hunting zone 22, which covers the study area, large wildlife hunting refers to caribou, moose, muskox, polar bear and black bear. In general, hunting, fishing and trapping activities in Québec have been governed since 1983 by the Act respecting the conservation and development of wildlife (LCMVF). This law establishes various prohibitions relating to the conservation of wildlife resources. However, in 1989 the Government of Québec adopted the *Act respecting hunting and fishing rights in the James Bay and New Québec territories* to implement Section 24 of the *James Bay and Northern Québec Agreement* (JBNQA). The hunting, fishing and trapping regime established by this Act is subject to the principle of conservation as defined in the JBNQA. This law specifies, among other things, that sport hunting of polar bears is prohibited and that their harvest is reserved exclusively for beneficiaries of the JBNQA.

As mentioned in section 8.1.2, the sport hunting of migratory caribou in Québec, including the Leaf River Herd (LRH), has been prohibited since 2018. The harvest of migratory caribou is reserved for the exclusive use of aboriginal people under their priority right to harvest for food or subsistence purposes. The hunting of woodland caribou in Quebec has been prohibited for all since its designation as a vulnerable species in February 2005. It should be noted, however, that woodland caribou are likely to be harvested in areas where their range overlaps with that of migratory caribou. Black bear harvesting is reserved for the exclusive use of Aboriginals in Cree traplines north of the 50th parallel. The latter mainly use trapping to capture the animal (Lamontagne et coll., 2006). Sport hunting of muskoxen is prohibited in Zone 22. However, Aboriginals have the right to harvest this species.

Moose is the only large wildlife species for which sport hunting is permitted in the study areas (hunting Zone 22). For the 2023 season, hunting will be exclusively with bows from September 2 to September 10 and with firearms, crossbows and bows from September 16 to October 9. Harvesting of bulls, cows and calves is permitted (Government of Québec, 2022b). Moose are also harvested by Cree communities.

There are a lot of concerns related to the moose population. There was a survey conducted covering zone 17 and the southern part of zone 22 which confirmed the decline of moose population particularly in zone 17. Consequently, sports hunting was closed, and moose conservation Guidelines were put in place, subsequently putting more pressure on zone 22. There are concerns related to road development and opening access to more sports hunters.

Finally, under Section 68 of the Wildlife Conservation and Development Act, and its Notifiable Animals Regulation, certain animals found injured or dead must be reported to a wildlife officer and, if required by the officer, surrendered for forfeiture.

10.5 ISSUES AND RECOMMENDATIONS

The proposed infrastructureswill create accesses to the territory which could increase hunting and fishing pressure. Therefore, wildlife populations could be affected. However, as described in previous sections, these activities are governed by laws and regulations. Moreover, Cree and Inuit populations hunt and fish for subsistence and also have exclusive access to certain parts of the territory. Also, as stated at the beginning of this chapter, a special management zone may be created on Category III lands when a temporary labour force may affect wildlife by increasing the pressure on hunting and fishing resources, allowing for a better management of the wildlife ressources.

A good example is the case of the Eastmain and Eastmain1-A/Sarcelle/Rupert diversion hydroelectric projet. In that particular case, the Weh-Sees Indohoun (WSI) area was designated within the study area. Management of the zone was provided by Weh-Sees Indohoun Corporation composed of Cree and Hydro-Quebec representatives, which managed access rights within the territory in close collaboration with affected land users. The workers were initially distributed in two main camps: Eastmain (up to 2 500 workers) and Nemaska (up to 400 workers). According to the monitoring of sports hunting and fishing activities by workers for the 2002-2006 period, few workers engaged in sport hunting, while sport fishing was a much more popular activity (Nove Environnement, 2008). Between 2002

and 2006, some 9,900 fishing trips were conducted on the territory managed by the WSI Corporation, 79% of which were made by Eastmain-1 project workers. Unsurprisingly, the water bodies most frequented by anglers were the most accessible, i.e. those near campsites or along roads. Species caught were almost exclusively limited to three species: walleye (75% of catches), brook trout (15%) and northern pike (10%). It should also be noted that during the 2002-2006 monitoring period, no conflicts between workers and Cree users regarding land use were reported and the majority of tallymen were satisfied with the measures taken by the WSI Corporation to control sport fishing and hunting activities (Nove Environnement, 2008). Fishing activities intensified in the following years with a peak between 2008 and 2011. The WSI Corporation was then dissolved in 2014, after the end of construction phase, but the regulations in the WSI remained in place until 2016 because of concerns on the potential residual impacts of the project, as a result of the permanent access created (CNG, 2020). The Cree Nation Government (CNG) undertook the operation and monitoring of the Weh-Sees Indohoun special management zone for 2015 and 2016. The special management zone and its regulations were abolished by the Government of Quebec in April 2018. Overall, the WSI special management zone has proven to be a great model permitting a balanced approached between development and conservation. Similar management approaches should be a part of the Cree Nation future strategies towards sustainable development in Eeyou Istchee (CNG, 2020).

11 STUDY AREA 2 (SA2): SUMMER 2022 FIELD CAMPAIGN

This chapter outlines the information collected in the summer of 2022 following that the proposed roadway of La Grande to Whapmagoostui/Kuujjuarapik was moved to the feasibility stage during the cours of the study. A photo-interpretation of the vegetation, wetlands and watercourses was carried out over a 1-km wide corridor along the proposed alignment. In addition, a preliminary field campaign was carried out to sample vegetation, wetlands and aquatic habitats. This new information made it possible to refine our understanding of the surrounding environment and potential issues and constraints to be considered for the proposed alignment.

Map 7 in Appendix A presents the proposed road alignments that guided the photo-interpretation and the field campaign Along with the sites where inventories were conducted..

11.1 PHOTO-INTERPRETATION

11.1.1 METHODOLOGY

The photo-interpretation performed allowed the identification and delineation of the different wetland types and vegetation clusters along the proposed road alignments. This exercise was carried out using 2D satellite images in a one-kilometer wide corridor along the proposed road alignment, as well as the proposed alternative alignments under study. The results of this photo-interpretation were considered in the initial selection of target sites for field characterization. The field observations were also used in a second step to improve the photo-interpretation locally. The following categories were considered:

- Wetlands:
  - Shallow water
  - Marshes
  - Tree swamp
  - Shrub swamp
  - Treed peatland
  - Open bog
- Land vegetation
  - Deciduous/Mixed
  - Conifer
  - Herbaceous/Mosses/Lichens
- Non-vegetated environments:
  - Anthropic
  - Body of water

A summary photo-interpretation of the watercourses was also carried out prior to the fieldwork. At this stage, it was possible to specify the location of the main watercourses crossed by the proposed road. In several cases, it was also possible to identify typical habitats for aquatic fauna, which depend on the slope of the watercourse and the flow facies. Table 11-1 presents the different typical habitats considered in relation to flow facies and typical substrate.

Habitats characterized by faster flow are presented at the beginning of the table, while slower flowing habitats are presented at the end.

Table 11-1 Description of Typical Aquatic Habitats According to Flow Facies and Characteristic Substrate

HABITAT TYPE	FLOW FACIES	DOMINANT SUBSTRATE[1]	SUBDOMINANT SUBSTRATE[2]
Waterfall	Waterfall (Ct)	R	B^x
Cascade	Cascade (Ca)	R/B^x	B
Rapid 1	Rapid (Ra)	B/B^x	G/R
Rapoid 2	Rapid (Ra)	G	C/G/R
Weir 1	Weir (Se)	G/B	C
Weir 2	Weir (Se)	G/C	B/V
Weir 3	Weir (Se)	C/V	G/S
Channel 1	Channel (Ch)	G/B	C
Channel 2	Channel (Ch)	C/V	S/G
Channel 3	Channel (Ch)	V/S	C
Basin 1	Basin (Ba)	V/S	B/G/C
Basin 2	Basin (Ba)	V/S	B/G/C
Lake	Lake (L)	V/S	B/G/C

1 Substrate particle size classes: R (Bedrock) = Parent rock, B^x (metre-sized boulder) = > 1000 mm, B (Boulder) = 250-1000 mm, G (Cobble) = 64-250 mm, C (C) = 32-64 mm, V (Gravel) = 4-32 mm, S (Sand) = 0,125-4 mm, L (Silt) = < 0.125 mm.

11.1.2 FLORA AND WETLANDS

The photo-interpretation carried out over a width of 1 km along the proposed road alignments provides a very accurate picture of the major natural habitat types crossed by the proposed infrastructures. Table 11-1 presents the total and relative surface area of the habitat types observed in the photo-interpreted area, which covers nearly 300 km^2. The results of the photo-interpretation are also presented on maps 8 to 17 in Appendix A.

Table 11-2 Total and Relative Area of Different Vegetation Groups Identified by Photo-interpretation along the Proposed Alignments

STUDY AREA	TOTAL AREA (km^2)	RELATIVE AREA (%)
Wetlands		
Shallow water	0.02	0.01
Marsh	0.10	0.03
Tree swamp	7.84	2.63
Shrub swamp	1.51	0.51
Treed peatland	45.70	15.35
Open peatland	28.42	9.54

STUDY AREA	TOTAL AREA (km²)	RELATIVE AREA (%)
Sub-total - Wetlands	**83.58**	**28.07**
Terrestrial vegetation		
Deciduous/Mixed	1.39	0.47
Conifer	124.85	41.93
Herbaceous/Moss/Lichen [1]	66.40	22.30
Sub-total - Terrestrial vegetation	**192.64**	**67.70**
Non-vegetated areas		
Anthopogenic	0.21	0.07
Waterbody	21.30	7.15
Sub-total - Non-vegetated areas	**21.51**	**7.23**
TOTAL	**297.74**	**100**

Source: WSP, 2022.

1 This category is generally dominated by lichens, with or without sparse trees and shrubs. This category also includes rocky areas where herbaceous vegetation is sporadically present.

Compared to the information presented in Chapter 3, which is based on general information sources, the photo-interpretation performed indicates that wetlands are much more abundant in the area SA2 than what the CanVec data indicate. In fact, along the proposed alignments (1 km wide corridor), approximately 28% of the area is occupied by wetlands, of which nearly 90% is peatland. This proportion tends to increase as one progresses northward in the study area. Conversely, areas dominated by continuous forest diminish as one moves northward, to the benefit of vast open areas dominated by lichen and peatlands.

11.1.3 ICHTHYOFAUNA AND FISH HABITAT

Prior to the summer 2022 field visit, photo-interpretation was also used to refine the location of selected streams and identify typical aquatic habitats for stream segments crossed by the study road alignments. The results of this photo-interpretation are presented on maps 8 through 17 in Appendix A. This exercise reveals that the most frequently observed habitat type is Channel 3. More generally, it is noted that the streams crossed are often characterized by slow flow (channel or basin facies), reflecting a relatively flat topography. Faster flow facies such as falls, cascades, rapids and weirs are also reported in places along the alignment, but are much less frequent.

These results indicate that there are relatively few obstacles to fish migration on the rivers crossed. On the other hand, it should be noted that most of the valued fish species in the study area prefer to spawn in fast-flowing water (lotic habitats), particularly at the foot of rapids or on weirs. However, such habitats are not abundant along the study alignment.

11.2 FIELD CAMPAIGN

11.2.1 METHODOLOGY

A field campaign was carried out from August 3 to 12, 2022, in order to obtain a clearer picture of the receiving environment crossed by the proposed Whapmagoostui/Kuujjuarapik road, particularly with respect to wetlands, vegetation and aquatic habitats. Prior to the field campaign, potential inventory sites were identified so that the surveys would target habitats that are representative of the area being crossed and would be distributed along the proposed alignments. The sites had initially been positioned directly on the proposed alignments, but during the field campaign, several sites had to be moved for accessibility reasons.

With respect to vegetation and wetlands, field work targeted a total of 68 inventory stations located in significant habitats near the sites targeted for aquatic habitat characterization. For each station, the natural habitat type was first characterized briefly prior to an exhaustive inventory of plant species. The relative importance of each plant species was also assessed at each site. During this inventory, particular attention was paid to the potential presence of special status species or invasive exotic species. These surveys thus provide a representative portrait of the flora typical of the area crossed by the proposed infrastructures.

For aquatic habitats, the field campaign collected data on a total of 34 different sites corresponding to streams of varying size. On these sites, a characterization of the aquatic habitat was carried out and the main physico-chemical characteristics of the water were measured in situ using a multiparameter YSI probe (temperature, pH, dissolved oxygen, conductivity). Particular attention was paid to the presence of potential spawning grounds or obstacles to fish migration. In addition, a water sample was filtered at each site using an environmental DNA sampling device. Either 1.2 or 5 µm filters were used depending on water turbidity. The filters were then analyzed in a laboratory (Nature Metrics) to identify fish species with trace amounts of DNA in the water. In addition to these data collected at all sites visited, a number of sites were also scientifically fished to supplement the data obtained from the environmental DNA analysis.

The following methods were used for this purpose:

- Mini-hoop net (3 sites)
- Electrofishing (6 sites)
- Angling (22 sites)

Finally, throughout the field campaign, the presence of other wildlife species and signs of wildlife presence were noted.

11.2.2 FLORA AND WETLANDS

Detailed results of the vegetation and wetland field campaign are presented in Appendix E and F. Appendix E presents the main characteristics of each of the inventory stations, as well as the list of plant species identified on each of them. Appendix F contains the vegetation inventory sheets that allow the identification of wetlands. These sheets are accompanied by photos of each of the inventoried sites. The location of each of the vegetation inventory stations is shown on maps 18 to 23 in Appendix A.

The inventory carried out made it possible to visit all the main types of floral habitats present in area SA2. Thus, for terrestrial environments, inventory stations were located in the following types of environment:

- Forest habitats:
  - Black spruce-lichen forest
  - Black spruce-moss stand
  - White spruce stand
  - Jack pine forest
  - Aspen stand
- Open habitats:
  - Regeneration
  - Acrubland
  - Lichen heath
  - Coastal meadow
  - Outcrops
  - Bolder fields

For wetlands, inventory stations were located in the following habitat types:

- Peatland:
  - Treed bog
  - Riparian bog
  - Wooded fen
  - Riparian fen
  - Shrub fen
  - Herbaceous fen
  - Reticulated fen
- Swamps:
  - Tree swamp
  - Shrub swamp
- Saltmarsh
- Shallow water

A total of 241 plant species were identified at the 68 stations inventoried (41 wetland stations and 27 terrestrial stations). A summary of the results is presented in Table 11-2. These results are presented by sector, from south to north. It should be noted that the Hudson Bay sector is located at the northern end of the proposed road, between the Great Whale River and the Hudson Bay coast. As mentioned in section 3.2.2, this sector has distinctive characteristics (limestone soils, maritime influence, shorelines, bare rocky hills that are sometimes steep and unstable) that are not found in sectors further south. It is thus the sector with the best potential for plant species of precarious status. For this reason, the number of sites surveyed was proportionally higher in this sector. Thus, 13% of the inventoried stations (9/68) are located in this sector, although it represents only about 5% of the length of the proposed road.

Table 11-3 Total and Relative Area of Different Vegetation Groups Identified by Photo-interpretation along the Proposed Alignments

SECTOR OF AREA SA2	NUMBER OF INVENTORY STATIONS	NUMBER OF PLANT SPECIES INVENTORIED
South sector [1]	19	93
Central sector [2]	23	146
North sector [3]	17	123
Hudson Bay sector [4]	9	107
TOTAL	68	241

1 Area between the La Grande River and the area where several road alignments are being studied.
2 Central area where several road alignments are being studied.
3 Area between the river where several road alignments are being studied and the Great Whale River.
4 Area between the Great Whale River and Hudson Bay.

In general, the species observed are common and typical of the flora of northern Quebec. The low species diversity is explained not only by the cold climate of the sampled area, but also by the generally flat topography which limits the diversity of habitats present. However, the small area along Hudson Bay has a more rugged topography and a greater diversity of habitats.

In total, only six tree species were identified: black spruce (*Picea mariana*), white spruce (*Picea glauca*), jack pine (*Pinus banksiana*), tamarack (*Larix laricina*), trembling aspen (*Populus tremuloides*), and string birch (*Betula cordifolia*). Black spruce is by far the most frequently identified tree species in the study area. It should be noted that the trees are generally small, especially when they are isolated. Forest stands are generally sparse.

In terms of shrubs, 49 species were identified, excluding the arborescent species mentioned above that are also found in the shrub stage. Labrador tea (*Rhododendron groenlandicum*), dwarf birch (*Betula glandulosa*), balsam myrtle (*Myrica gale*) and narrow-leaved blueberry (*Vaccinium angustifolium*) are among the most frequently recorded shrubs.

In terms of herbaceous plants, 186 different species were identified in study area SA2 (Appendix E). The moss and lichen stratum was not identified to species. It should be noted, however, that this plant layer often covers a considerable proportion of the soil at the sites surveyed.

No plant species of precarious status have been identified despite the significant inventory effort made. It should also be noted that no invasive exotic species were identified. However, two plant species recently removed from the list of species of precarious provincial status were observed. These species are :

- Robinson's hawkweed (*Hieracium robinsonii*): Herbaceous plant of the Asteraceae family identified at station B16.1 (central area).
- Raup's paintbrush (*Castilleja raupii*) : Herbaceous plant of the Orobanchaceae family identified at station A25.4 (Hudson Bay area).

It should also be noted that one orchid species was recorded beyond the northern limit of its known range. It is the unifoliate green adder's-mouth (*Malaxis unifolia*) identified at station B13.1 (central sector).

11.2.3 ICHTHYOFAUNA AND FISH HABITAT

The location of the aquatic habitat characterization stations is presented on maps 18 to 23 in Appendix A, while the sheets attached in Appendix G detail all the information collected at each characterization site. Several photos of the characterized sites also accompany these sheets, providing visual support for the data collected.

Generally, the aquatic habitats visited in the summer of 2022 were primarily characterized by slow-flowing facies (e.g., channel, pond, lake), as this type of habitat is more prevalent along the proposed road. However, a few stream segments with faster flow (e.g., rapid, riffle) were also visited, so that the sites characterized were representative of the different habitat types present in the study area. Since a majority of the sites visited had slow flow, the dominant substrate was generally quite fine (e.g. sand, clay, organic matter), but coarser substrate (e.g. boulders, cobbles, pebbles, gravel) was also identified at several sites, particularly in the rapid areas.

In addition, the streams characterized in the summer of 2022 ranged in size, in order to collect information on both small and large streams. Thus, the width of the characterized aquatic habitats is distributed as follows across the 34 characterized sites:

- 0 - ≤ 2 m: 6 sites.
- > 2 - ≤ 5 m: 5 sites
- > 5 - ≤ 10 m: 8 sites.
- > 10 - ≤ 20 m: 5 sites.
- > 20 m: 3 sites.
- Variable (e.g. lakes): 4 sites.
- - Undetermined (e.g., streams with groundwater flow): 3 sites.

The habitats surveyed were generally not optimal for spawning. A potential spawning site was identified at only one site, Station A11. Nevertheless, about half of the sites characterized still offered moderate to high potential for at least one other habitat function, i.e. rearing, feeding or resting. As for barriers to fish migration, only three were identified during the field campaign: two waterfalls (stations A13 and A14) and one culvert (station B1). A limiting waterfall for fish passage may also be present upstream of survey station B13 based on aerial observations.

As for the physico-chemical parameters, the data collected at the 34 inventory stations are summarized in Table 11-3 and detailed for each site on the sheets in Appendix G. The parameters measured are generally compatible with adequate water quality for aquatic fauna. The average dissolved oxygen concentration is near 10 mg/L, which is relatively high. Only one station has a dissolved oxygen concentration below 7 mg/L, station A22A, where dissolved oxygen is as low as 1.8 mg/L, which is very low and limiting for fish. As shown on the sheets in Appendix G, this station is an intermittent, sometimes subsurface stream that flows through a bog and is not fish habitat. This site also had the lowest pH measured, consistent with the presence of a bog. Specific conductivity was generally low at the sites visited, with an average of about 25 µS/cm. However, one site stood out for this parameter. This is station A25A, which has by far the highest conductivity, with 140 µS/cm. This very high value is explained by the proximity of this station to Hudson Bay and the resulting saline influence.

Table 11-4 Physico-Chemical Parameters Measured in Situ at the 34 Sampling Stations Visited

PARAMETERS	AVERAGE	MEDIAN	MINIMUM (STATION)	MAXIMUM (STATION)
Temperature (°C)	13.9	14.3	5.6 (A22A)	17.1 (A1A, BB9A)
Ph	6.19	6.22	5.29 (A22A)	7.77 (B12A)
Dissolved oxygen (mg/L)	9.7	10.1	1.8 (A22A)	11.4 (A23A)
Specific conductivity (µS/cm)	24.7	19.0	11.2 (BB9A)	140.5 (A25A)

In terms of fish species diversity in the streams crossed, the environmental DNA analyses and the fisheries carried out led to the identification of 14 different species, which are listed in Table 11-4, for each of the inventory stations presented from south to north. To this total, six taxa could not be identified to species in the environmental DNA analyses, the report of which is attached in Appendix H. Using the list of species potentially present in SA2 presented in Table 4-2, however, the following assumptions can be made about these six taxa:

- *Margariscus* sp.: Most likely corresponds to the pearl dace (*Margariscus margarita*).
- *Rhinichthys* sp.: Most likely corresponds to the longnose dace (*Rhinichthys cataractae*).
- *Esox* sp.: Most likely corresponds to the northern pike (*Esox lucius*).
- *Coregonus* sp.: Probably includes two species, lake whitefish (*Coregonus clupeaformis*) and lake cisco (*Coregonus artedi)*
- Salmonidae sp.: Probably corresponds to brook trout (*Salvelinus fontinalis*) in most cases.
- *Cottus* sp.: Most likely includes two species, mottled sculpin (*Cottus bairdi*) and slimy sculpin (*Cottus cognatus*).

Taking into account the above and also considering the fact that northern pike and brook trout are already part of the list of 14 species identified, the total number of species in the sampled streams would thus increase to 20. These are common species typical of northern Quebec and no species of precarious status was identified. It should be noted that the presence of fish was detected in almost all of the stations inventoried, i.e. 31 out of 34. Only stations B1A, A22A and A24A were found to be fishless.

The most frequently reported species are lake mullet (*Couesius plumbeus*), white sucker (*Catostomus commersoni*), northern pike (*Esox lucius*), brook trout (*Salvelinus fontinalis*), threespine stickleback (*Gasterosteus aculeatus*) and ninespine stickleback (*Pungitius pungitius*). Also interesting is the fact that the species diversity decreases towards the north, while four species were identified only in the southern part of the surveyed area. These are the blackspot shiner (*Notropis hudsonius*), the omisco (*Percopsis omiscomaycus*), the walleye (*Sander vitreus*) and, to a lesser extent, the yellow perch (*Perca flavescens*). Also of note is the presence of capelin (*Mallotus villosus*), a marine species, at station A25A. The presence of this species in the environmental DNA results may seem surprising, but it can be explained by the fact that station A25A is located a few meters from the mouth of a small river that flows into Hudson Bay. Finally, it should be noted that lake sturgeon (*Acipenser fulvescens*), a species of precarious status considered to be potentially present in the large rivers of the southern part of SA2, was not identified during the inventory.

The sheets attached in Appendix G contain the results of the fisheries and environmental DNA analyses, as well as other data collected on each of the streams. These sheets are also accompanied by photos that provide a good overview of the characteristics of the inventoried streams. We can see that the larger streams generally have a greater diversity of species. Smaller streams, on the other hand, have a lower diversity and are sometimes colonized only by brook trout, as in the case of streams at stations A21A and A23A. It is therefore not surprising that the presence of fish was not reported at all at station B1A, which corresponds to a small shallow stream crossed by a road at the southern end of the study area. The same is true for station A22A which corresponds to a succession of pools interspersed with segments where the flow is underground through a bog. It should be noted that the oxygen concentration is limiting for fish at this site. These results are reminders that the culverts to be installed as part of the proposed infrastructures should not systematically ensure fish passage. A systematic characterization of the watercourses crossed by the proposed road will be necessary in order to orient the design of the structures and to optimize the location of the crossing sites when possible.

Table 11-5 Fish Species Surveyed in Summer 2022

ESPÈCES [1,2]	SOUTH AREA [3]										CENTRAL AREA [4]									NORTH AREA [5]											HUDSON [6]	
	A0 1A	A0 2A	A0 3A	B0 4A	B0 5A	A0 5A	A0 6A	B0 7A	B0 8A	B B0	B1 1A	A1 1A	B1 2A	B1 3A	A1 2A	A0 9A	B1 6A	A1 0A	A1 3A	A1 4A	A1 5A	A1 6A	B2 2A	A1 7A	B2 3A	A1 9A	B2 4A	A2 0A	A2 1A	A2 3A	A2 5A
Cyprinidae																															
Lake Mulet (*Couesius plumbeus*) (COPL)		A	A	A	A	A	A	A	A			A	A	A	A	A-F		A				A	A	A							
Méné à tache noire (*Spottail shiner*) (NOHU)			A																												
Margariscus sp.										A												A		A		A					
Rhinichthys sp.		A	A																												
Catostomidae																															
Longnose sucker (*Catostomus catostomus*) (CACA)			A						A			A	A	A	A	A-F		A													
White sucker (*Catostomus commersonii*) (CACO)	A-F	A	A	A	A	A	A	A	A		A	A-F	A	A	A	A-F	A	A	A	A		A	A	A	A	A					
Esocidae																															
Northern pike (*Esox lucius*) (ESLU)	A-F	A-F	A		A	A	A	A	A		A-F	A-F	A	A	A	A	A	A									A	A			
Esox sp.	A		A			A					A	A	A		A	A		A													
Salmonidae																															
Brook trout (*Salvelinus fontinalis*) (SAFO)							A	A				A-F		A-F					A-F	A-F	A	A-F	A-F	A	A	A-F		A	A	A-F	
Lake trout (*Salvelinus namaycush*) (SANA)												A								A		A									
Coregonus sp.								A				A		A					A	A		A	A								
Salmonidae sp.	A		A		A	A		A	A		A	A	A	A	A	A		A	A	A		A	A								
Percopsidae																															
Trout perch (*Percopsis omiscomaycus*) (PEOM)	A	A	A																												
Lotidae																															
Burbot (*Lota lota*) (LOLO)												A	A	A		A		A													
Gasterosteidae																															
Threespine stickleback (*Gasterosteus aculeatus*) (GAAC)			A			A	A	A	A			A				A-F		A	A	A	A	A	A	A	A	A					
Ninespine stickleback (*Pungitius pungitius*) (PUPU)	A		A		A	A	A	A	A		A	A		A	A	A-F		A	A	A	A	A	A	A	A	A		A			A-F
Cottidae																															
Cottus sp.	A	A	A	A	A	A	A	A	A		A	A		A	A-F	A		A		A		A	A			A	A	A			
Percidae																															
Yellow perch (*Perca flavescens*) (PEFL)	A	A	A		A	A	A	A	A		A	A	A			A-F		A													
Walleye (*Sander vitreus*) (SAVI)		A	A		A	A		A	A																						
Osmeridae																															
Capelin (*Mallotus villosus*) (MAVI)																															A

1 A = Presence confirmed by environmental DNA analysis. A-F = Presence confirmed by environmental DNA analysis and experimental fisheries.
2 Environmental DNA analyses failed to detect any fish species at three stations, B1A (undetermined width, southern sector), A22A (undetermined width, northern sector), and A24A (2 m width, Hudson Bay sector).
3 Area between the La Grande River and the area where several road alignments are being studied (the width of each watercourse is shown in parentheses).
4 Central area where several road alignments are studied (the width of each stream is shown in parentheses).
5 Area between the river where several road alignments are studied and the Great Whale River (the width of each river is presented in brackets).
6 Area between the Great Whale River and Hudson Bay (the width of each stream is shown in parentheses).

11.2.4 TERRESTRIAL AND AVIAN FAUNA

Throughout the flora and fauna inventories, particular attention was paid to signs of terrestrial and avian fauna. The following lines briefly present the main findings at the various inventory sites, from south to north. These findings are also reported on the sheets in Appendices F and G.

- A3: Presence of caribou and bear droppings.
- B4: Observation of a common garter snake.
- B5: Observation of a common loon on the lake during the entire characterization.
- B8: Numerous caribou plumes were found in an open wetland. This area appears to be heavily used by large wildlife. It may also be a popular hunting site.
- BB9: Presence of a black bear den in the slope of a mountain, in loose substrate.
- B11: Signs of beaver presence (old dam).
- A12: Observation of a bald eagle in flight.
- A9: Numerous caribou tracks and droppings. A plume was also found near the landing site.
- B16: Signs of beaver presence (old lodge and felled trees).
- A10: Signs of beaver presence (cut wood).
- A17: Presence of caribou tracks.
- A20: Observation of a wood frog.
- A22: Presence of muskox droppings.

These various findings indicate that the study area is used by wildlife, particularly large ruminants, beaver and black bear. The numerous caribou plumes seen at site B8 probably indicate the presence of a hunting site in this sector. In fact, migratory male caribou shed their antlers in November, while females keep them throughout the winter until the birth of their young in May. It is therefore unlikely that a large number of plumes would have naturally occurred at the same site, since migratory caribou frequent the SA2 study area in winter. It should be noted that woodland caribou are not found in this area.

Finally, it should also be noted that the field campaign led to the fortuitous discovery of an archaeological site in the vicinity of station B7, some 500 m west of the proposed road. In total, four sites revealing the probable presence of former temporary installations (tents) were discovered in the vicinity of the helicopter landing site.

11.3 MAIN FINDINGS

Based on the above, the main findings from the information gathered in the summer of 2022 in area SA2 are as follows:

- Vegetation and wetlands:
  - The vegetation of the study area is generally not very diversified (241 species recorded on the 68 inventoried stations distributed in the various types of habitats crossed).
  - No special-status plant species or invasive alien species were identified during the inventory.
  - Wetlands were found to be significantly more abundant than originally anticipated, occupying nearly 30% of the area crossed by the proposed road.
  - The wetlands along the proposed road are dominated by several types of bogs and are not exceptional to the typical wetlands of the region.

- Aquatic Habitats:
  - Due to the low topography along the proposed road, the streams crossed generally have lentic flow, resulting in a low presence of barriers to fish migration.
  - The presence of fish was evidenced at the majority of the sites surveyed (31 out of 34 stations) although some streams were found to be fishless.
  - The data collected indicate the presence of some 20 species of fish in the sampled streams, with diversity decreasing as they move northward.
  - Field work did not confirm the presence of lake sturgeon, a species of precarious status considered potentially present in large streams in the southern part of SA2.
- Terrestrial and Avian Fauna:
- There is a significant presence of large ruminants along the proposed road.

These results highlight the importance of optimizing the road alignment in the next stages to minimize encroachment into wetlands as much as possible. In addition, all watercourses crossed will have to be systematically characterized, on both sides of the crossing sites, so that the location of the crossing sites is optimized when required and that the crossing structures are adequately designed. Since there are few natural barriers to fish migration and the majority of streams support fish, most crossings will need to be designed to ensure free passage of fish.

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APPENDIX

A MAPS

APPENDIX

A-1 MAP 1: MORPHO-SEDIMENTARY ZONES

Route Billy-Diamond highway

Chemin de Chisasibi road

Route Transtaïga / Trans-Taiga road

Wemindji

Chemin de Wemindji road

Eastmain

Chemin d'Eastmain road

Waskaganish

Chemin de Waskaganish road

Route du Nord

Baie James / James Bay

Baie Dead Duck

Baie Paint Hills

Baie Moar

Baie du Vieux-Comptoir

Baie Boatswain

Baie de Rupert

Réservoir Robert-Bourassa

B-610 B-600 B-590 B-580 B-570 B-560 B-550 B-540 B-530 B-520 B-510 B-500 B-490 B-480 B-470 B-460 B-450 B-440 B-430 B-420 B-410 B-390 B-380 B-370 B-360 B-350 B-340 B-330 B-320 B-310 B-300 B-290 B-280 B-270 B-260 B-250 B-240 B-230 B-220

Dépôts sédimentaires / Sedimentary Deposit

- A — Alluvion non différenciée / Alluvial deposit or alluvium (undifferentiated)
- Ap — Alluvion actuelle / Recent alluvial deposit
- C — Dépôt de versant non différencié / Undifferentiated slope deposit
- Co — Dépôt d'éboulis / Rockfall deposit
- Ed — Sédiment éolien / Eolian sediment
- Gs — Sédiment d'épandage proglaciaire subaérien / Subaerial outwash sediment
- Gs — Sédiment d'épandage proglaciaire subaquatique / Subaquatic outwash sediment
- Gx — Sédiment juxtaglaciaire / Ice-proximal sediment
- GxT — Sédiment de la moraine frontale / Frontal moraine sediment
- H — Dépôt anthropogénique / Antropogenic deposit
- LGa — Sédiment glaciolacustre fin d'eau profonde / Deep-water fine-grained glaciolacustrine sediment
- LGb — Sédiment glaciolacustre littoral et prélittoral / Coastal and pre-coastal glaciolacustrine sediment
- LGd — Sédiment glaciolacustre deltaïque/prodeltaïque / Deltaic and prodeltaic glaciolacustrine sediment
- MGa — Sédiment glaciomarin fin d'eau profonde / Deep-water fine-grained glaciomarine sediment
- MGb — Sédiment glaciomarin littoral et prélittoral / Coastal and pre-coastal glaciomarine sediment
- MGd — Sédiment glaciomarin deltaïque et prodeltaïque / Deltaic and prodeltaic glaciomarine sediment
- O — Sédiment organique non différencié / Undifferentiated organic sediment
- R — Roche en place non différenciée / Undifferentiated bedrock
- T — Till non différencié / Undifferentiated till
- Tf — Till de fusion ou d'ablation / Melt-out or ablation till

Limite / Limit

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

Composante projet / Project Component

Chemin de fer projeté / Proposed railway

Note: Les alignements proposés ne sont pas finaux / The proposed alignments are not final

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LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III / Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Carte 1 - ZE1 Zones morpho-sédimentaires

MAP 1 - SA1 Morpho-sedimentary Zones

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
SIGEOM, Système d'information géominière, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : C. Lefebvre-Fortier
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : G. Beauchamp
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TERRITOIRE DU NUNAVUT /
NUNAVUT TERRITORY

Baie d'Hudson /
Hudson Bay

Kuujjuarapik
Whapmagoostui

Chisasibi

Chemin de Chisasibi road

Route Billy-Diamond highway

Réservoir Robert-Bourassa

Dépôts sédimentaires / Sedimentary Deposit

- A — Alluvion non différenciée / Alluvial deposit or alluvium (undifferentiated)
- Ap — Alluvion actuelle / Recent alluvial deposit
- C — Dépôt de versant non différencié / Undifferentiated slope deposit
- Co — Dépôt d'éboulis / Rockfall deposit
- Ed — Sédiment éolien / Eolian sediment
- Go — Sédiment d'épandage proglaciaire subaérien / Subaerial outwash sediment
- Ga — Sédiment d'épandage proglaciaire subaquatique / Subaquatic outwash sediment
- Gx — Sédiment juxtaglaciaire / Ice-proximal sediment
- Gxf — Sédiment de la moraine frontale / Frontal moraine sediment
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- MGd — Sédiment glaciomarin deltaïque et prodeltaïque / Deltaic and prodeltaic glaciomarine sediment
- O — Sédiment organique non différencié / Undifferentiated organic sediment
- R — Roche en place non différenciée / Undifferentiated bedrock
- T — Till non différencié / Undifferentiated till
- Tf — Till de fusion ou d'ablation / Melt-out or ablation till

Limite / Limit

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

Composante projet / Project Component

- Route projetée / Proposed road
- Variante de la route projetée / Proposed road alternative
- Chemin de fer projeté / Proposed railway

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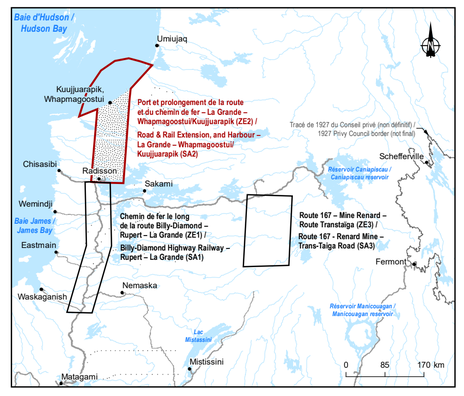

LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 1 - ZE2
Zones morpho-sédimentaires

MAP 1 - SA2
Morpho-sedimentary Zones

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
SIGEOM, Système d'information géominière, 2021

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Lambert, NAD83

Février / February 2023

Préparation / Prepared by : C. Lefebvre-Fortier
Dessin / Drawn by : D. Gagné
Approbation / Approved by : G. Beauchamp

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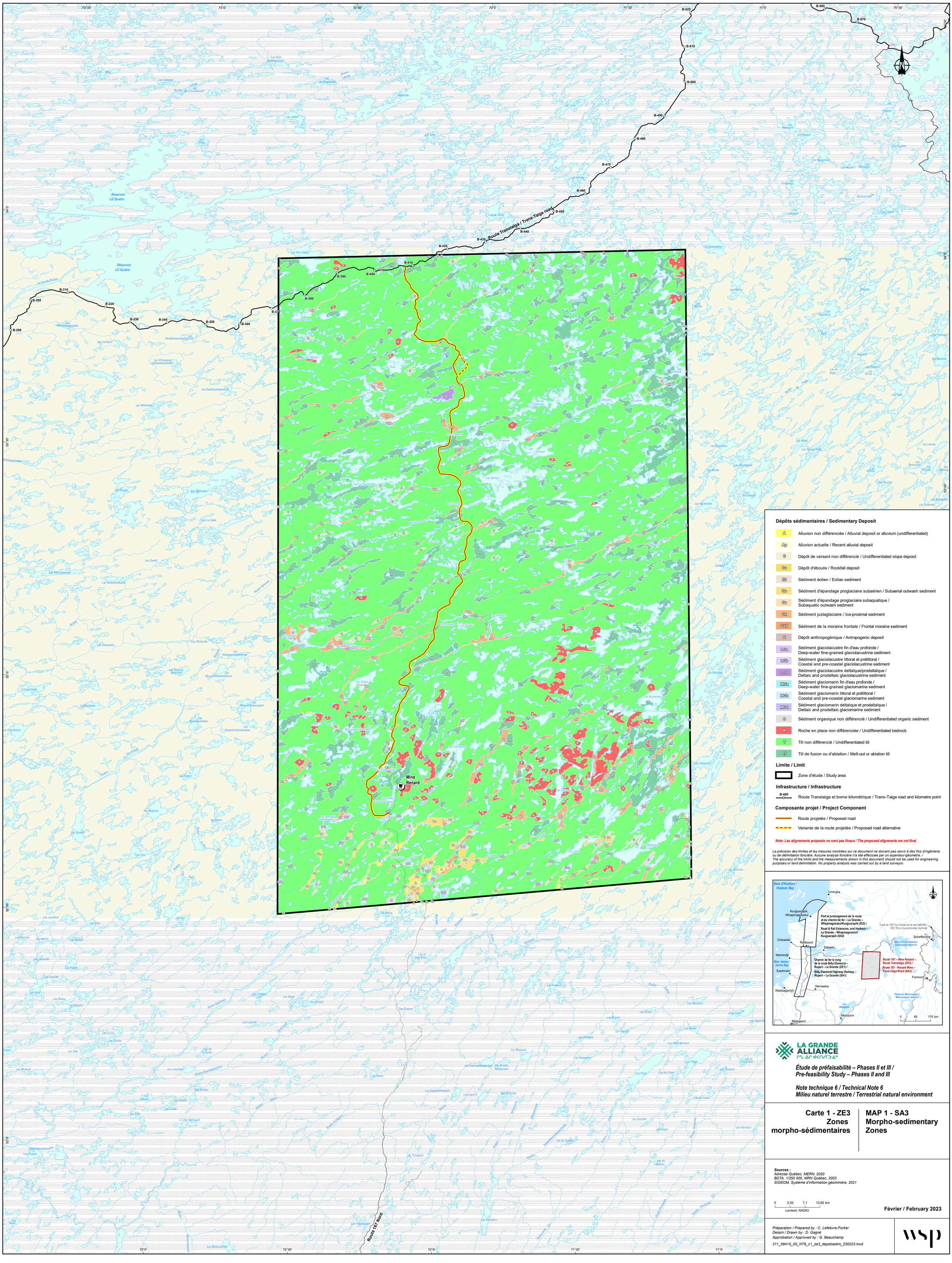
B-290
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B-420
B-430
B-440
B-450
B-460
B-470
B-480
B-490
B-500
B-510
B-520
B-560
B-570
Route Transtaïga / Trans-Taiga road
Réservoir LG Quatre
Mine Renard
Route 167 Nord
Dépôts sédimentaires / Sedimentary Deposit
A Alluvion non différenciée / Alluvial deposit or alluvium (undifferentiated)
Ap Alluvion actuelle / Recent alluvial deposit
C Dépôt de versant non différencié / Undifferentiated slope deposit
Co Dépôt d'éboulis / Rockfall deposit
Ed Sédiment éolien / Eolian sediment
Go Sédiment d'épandage proglaciaire subaérien / Subaerial outwash sediment
Gs Sédiment d'épandage proglaciaire subaquatique / Subaquatic outwash sediment
Gx Sédiment juxtaglaciaire / Ice-proximal sediment
GxF Sédiment de la moraine frontale / Frontal moraine sediment
H Dépôt anthropogénique / Antropogenic deposit
LGa Sédiment glaciolacustre fin d'eau profonde / Deep-water fine-grained glaciolacustrine sediment
LGb Sédiment glaciolacustre littoral et prélittoral / Coastal and pre-coastal glaciolacustrine sediment
LGd Sédiment glaciolacustre deltaïque/prodeltaïque / Deltaic and prodeltaic glaciolacustrine sediment
MGa Sédiment glaciomarin fin d'eau profonde / Deep-water fine-grained glaciomarine sediment
MGb Sédiment glaciomarin littoral et prélittoral / Coastal and pre-coastal glaciomarine sediment
MGd Sédiment glaciomarin deltaïque et prodeltaïque / Deltaic and prodeltaic glaciomarine sediment
O Sédiment organique non différencié / Undifferentiated organic sediment
R Roche en place non différenciée / Undifferentiated bedrock
T Till non différencié / Undifferentiated till
Tf Till de fusion ou d'ablation / Melt-out or ablation till
Limite / Limit
Zone d'étude / Study area
Infrastructure / Infrastructure
B-400 Route Transtaïga et borne kilométrique / Trans-Taiga road and kilometre point
Composante projet / Project Component
Route projetée / Proposed road
Variante de la route projetée / Proposed road alternative
Note: Les alignements proposés ne sont pas finaux / The proposed alignments are not final
La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.
Baie d'Hudson / Hudson Bay
Baie James / James Bay
Umiujaq
Kuujjuarapik, Whapmagoostui
Port et prolongement de la route et du chemin de fer – La Grande – Whapmagoostui/Kuujjuarapik (ZE2) / Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/ Kuujjuarapik (SA2)
Tracé de 1927 du Conseil privé (non définitif) / 1927 Privy Council border (not final)
Chisasibi
Radisson
Schefferville
Sakami
Wemindji
Eastmain
Chemin de fer le long de la route Billy-Diamond – Rupert – La Grande (ZE1) / Billy-Diamond Highway Railway – Rupert – La Grande (SA1)
Route 167 – Mine Renard – Route Transtaïga (ZE3) / Route 167 - Renard Mine – Trans-Taiga Road (SA3)
Fermont
Nemaska
Waskaganish
Mistissini
Matagami
0 85 170 km
LA GRANDE ALLIANCE
Étude de préfaisabilité – Phases II et III / Pre-feasibility Study – Phases II and III
Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment
Carte 1 - ZE3 Zones morpho-sédimentaires
MAP 1 - SA3 Morpho-sedimentary Zones
Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
SIGEOM, Système d'information géominière, 2021
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Lambert, NAD83
Février / February 2023
Préparation / Prepared by : C. Lefebvre-Fortier
Dessin / Drawn by : D. Gagné
Approbation / Approved by : G. Beauchamp
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APPENDIX

A-2 *MAP 2: CATCHMENT AREA AND HYDROGRAPHY*

Route Billy-Diamond highway

Chemin de Chisasibi road

Chemin de Wemindji road

Chemin d'Eastmain road

Route Transtaïga / Trans-Taiga road

Chemin de Waskaganish route

Route du Nord

Route Billy-Diamond highway

Wemindji

Eastmain

Waskaganish

Baie James / James Bay

Hydrographie : EBTA, 1/250 000, MRN Québec; CanVec, RNCan, 1/50 000

Réservoir Robert-Bourassa

La Grande Rivière

Réservoir Opinaca

Rivière Achazi

Rivière Aquatuc

Rivière à la Truite

Rivière Caillet

Caillet, Rivière

Rivière Necopastic

Rivière Comb

Rivière Suaganstuc

Rivière Maquatua

Rivière Clergue

Rivière du Peuplier

Rivière du Vieux Comptoir

Passe Castor

Rivière au Castor Est

Rivière Sakami

Rivière Conn

Rivière Opinaca

Rivière Eastmain

Rivière à l'Eau Froide

Rivière Jolicoeur Nord-Est

Rivière Jolicoeur

Rivière Enistuwach

Rivière Wachiskw

Rivière Pontax

Rivière à la Truite

Rivière la Pêche

Rivière au Mouton

Petite rivière Missisicabi

Rivière Broadback

Rivière Machisakahikanistikw

Rivière Rupert

Rivière Natouacamisie

Rivière Colomb

Rivière Ouasouagami

Ruisseau Kanishusachiweyach

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B-240
B-230
B-220

Bassin versant / Watershed

Niveau 1 / Level 1

Niveau 2 / Level 2

Limite / Limit

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

Composante projet / Project Component

Chemin de fer projeté / Proposed railway

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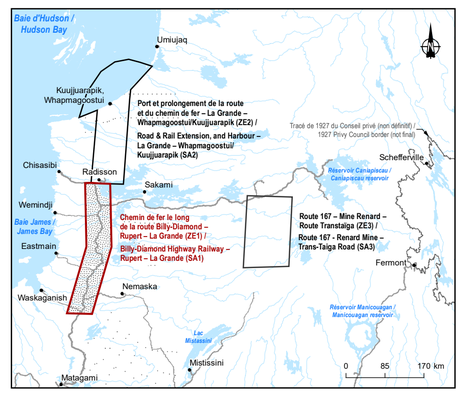

LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III / Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Carte 2 - ZE1 Bassin versant et hydrographie

MAP 2 - SA1 Watershed and Hydrography

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
CanVec, RNCan, 1/50 000, 2017
Bassin versant : Centre d'expertise hydrique du Québec

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : C. Lefebvre-Fortier
Dessin / Drawn by : D. Gagné
Approbation / Approved by : G. Beauchamp

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TERRITOIRE DU NUNAVUT /
NUNAVUT TERRITORY

Baie d'Hudson /
Hudson Bay

Passage de Manitounuk / Manitounuk Sound

Kuujjuarapik /
Whapmagoostui

Hydrographie : BDTA, 1/250 000, MRN Québec
Hydrographie : CanVec, RNCan, 1/50 000

Le Goulet
Petite rivière de la Baleine
Rivière Guérin
Rivière Boutin
Rivière Second
Rivière Coats
Rivière Denys
Baleine, Grande rivière de la Baleine
Rivière Roggan
La Grande Rivière
Rivière Corbin
Rivière Kapsaouis
Ruisseau Uskutim Apimichitach
Rivière Piagochioui
Rivière Guillaume
Rivière Aquatuc
Rivière à la Truite
Rivière Achazi
Rivière Caillet
Rivière Necopastic
Ruisseau Sucker
Rivière Vaquelin
Décharge du lac Burton
Rivière au Phoque
Décharge du lac Apichatinachits
Réservoir Robert-Bourassa

Chisasibi
Radisson
Chemin de Chisasibi road
Route Billy-Diamond Highway
B-590
B-600
B-610
B-620

Bassin versant / Watershed

- Bassin de niveau 1
- Bassin de niveau 2

Territoire / Territory

- Territoire du Nunavut / Nunavut Territory

Limite / Limit

- Zone d'étude / Study area

Infrastructure / Infrastructure

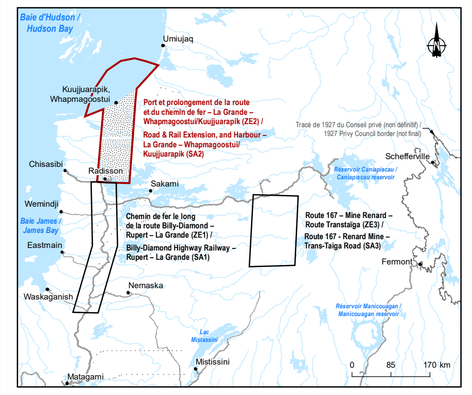
- B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

Composante projet / Project Component

- Route projetée / Proposed road
- Variante de la route projetée / Proposed road alternative
- Chemin de fer projeté / Proposed railway

Note: Les alignements proposés ne sont pas finaux / The proposed alignments are not final

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 2 - ZE2 Bassin versant et hydrographie

MAP 2 - SA2 Watershed and Hydrography

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
CanVec, RNCan, 1/50 000, 2017
Bassin versant : Centre d'expertise hydrique du Québec

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : C. Lefebvre-Fortier
Dessin / Drawn by : D. Gagné
Approbation / Approved by : G. Beauchamp

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wsp

Hydrographie : EDTA, 1/250 000, MRN Québec; RNCan, 1/50 000

Hydrographie : CanVec, RNCan, 1/50 000

Route Transtaïga / Trans-Taïga road

Route 167 Nord

Mine Renard

La Grande Rivière

Rivière de Pontois

Rivière Sakami

Rivière Témiscamie

Rivière Péribonka

Réservoir LG Quatre

Rivière Griault

Baie d'Hudson / Hudson Bay

Baie James / James Bay

Umiujaq

Kuujjuarapik, Whapmagoostui

Chisasibi

Radisson

Sakami

Wemindji

Eastmain

Waskaganish

Nemaska

Matagami

Mistissini

Schefferville

Fermont

Port et prolongement de la route et du chemin de fer – La Grande – Whapmagoostui/Kuujjuarapik (ZE2) / Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/ Kuujjuarapik (SA2)

Chemin de fer le long de la route Billy-Diamond – Rupert – La Grande (ZE1) / Billy-Diamond Highway Railway – Rupert – La Grande (SA1)

Route 167 – Mine Renard – Route Transtaïga (ZE3) / Route 167 - Renard Mine – Trans-Taiga Road (SA3)

Tracé de 1927 du Conseil privé (non définitif) / 1927 Privy Council border (not final)

Réservoir Caniapiscau / Caniapiscau reservoir

Réservoir Manicouagan / Manicouagan reservoir

0 85 170 km

LA GRANDE ALLIANCE

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Bassin versant / Watershed

Niveau 1 / Level 1

Niveau 2 / Level 2

Limite / Limit

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 Route Transtaïga et borne kilométrique / Trans-Taiga road and kilometre point

Composante projet / Project Component

Route projetée / Proposed road

Variante de la route projetée / Proposed road alternative

Note: Les alignements proposés ne sont pas finaux / The proposed alignments are not final

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.

Étude de préfaisabilité – Phases II et III / Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Carte 2 - ZE3 Bassin versant et hydrographie

MAP 2 - SA3 Watershed and Hydrography

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
CanVec, RNCan, 1/50 000, 2017
Bassin versant : Centre d'expertise hydrique du Québec

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : C. Lefebvre-Fortier
Dessin / Drawn by : D. Gagné
Approbation / Approved by : G. Beauchamp
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APPENDIX

A-3 *MAP 3: FLORISTIC PORTRAIT*

Chemin de Chisasibi road
Route Billy-Diamond highway
Route Transtaïga / Trans-Taiga road
Chemin de Wemindji road
Wemindji
Chemin d'Eastmain road
Eastmain
Chemin de Waskaganish road
Waskaganish
Route du Nord
Baie James / James Bay
Réservoir Robert-Bourassa
Réservoir Opinaca

B-610 B-600 B-590 B-580 B-570 B-560 B-550 B-540 B-530 B-520 B-510 B-500 B-490 B-480 B-470 B-460 B-450 B-440 B-430 B-420 B-410 B-400 B-390 B-380 B-370 B-360 B-350 B-340 B-330 B-320 B-310 B-300 B-290 B-280 B-270 B-260 B-250 B-240 B-230 B-220

FG02/CH02 FG09/CH09 FG10/CH10 FG14/CH14

VC01/CH33 VC02/CH34 VC03/CH35 VC04/CH36 VC05/CH37 VC06/CH38 VC08/CH40 VC09 VC10 VC11 VC12 VC13 VC14 VC15 VC16 VC17 VC18 VC19 VC20 VC21 VC22 VC23 VC24 VC25 VC27 VC28 VC29 VC30 VC31 VC32 VC33 VC34 VC36

RE02 RE03 RE03A RE04 RE05

R01 R01A R02 R02A R03 R04 R05 R06 R07 R08 R09 R10 R11 R12 R13 R14 R17

N01 N02 N03 N04 N05 N06 N07 N09 N14 N23

78°30' 78°0' 77°30' 77°0' 76°30' 79°0'
53°30' 53°0' 52°30' 52°0' 51°30' 51°0'

Végétation / Vegetation

- Limite de la forêt commerciale / Commercial forest boundary
- Secteur propice aux espèces floristiques rares ou à statut précaire / Suitable habitat for rare or protected plant species
- Milieu humide / Wetland

Sous-zones de végétation / Vegetation sub-zones

- Forêt boréale fermée / Closed boreal forest
- Forêt boréale ouverte / Open boreal forest
- Toundra forestière / Forest tundra

Domaines bioclimatiques / Bioclimatic domains

- Pessière à mousses / Spruce stand with moss
- Pessière à lichens / Spruce stand with lichens
- Toundra forestière / Forest tundra

Historique des feux de forêt / Past forest fire

- 1991 à / to 2005
- 2006 à / to 2020

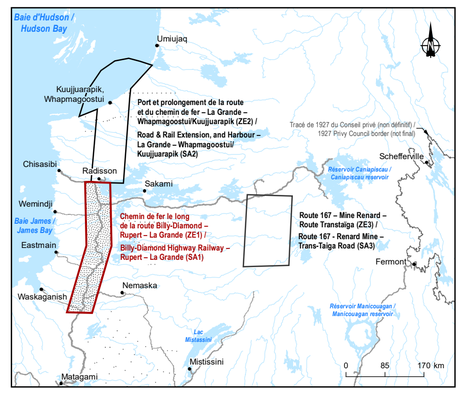
Limites / Limits

- RE02 — Terrain de piégeage / Trapline
- Zone d'étude / Study area

Infrastructure / Infrastructure

- B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 3 - ZE1
Portrait floristique

MAP 3 - SA1
Flora

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MERN Québec, 2002
Terrain de piégeage / traplines, 2020
Milieux humides / Wetlands, CanVec+, 1/50 000, RNCan, 2021
Données végétation / Vegetation data, Forêt Ouverte, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : B. Aubé-Maurice
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : B. Aubé-Maurice
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wsp

Baie d'Hudson / Hudson Bay

Kuujjuarapik
Whapmagoostui

Chisasibi

Radisson

Route Billy-Diamond highway

Chemin de Chisasibi road

B-590
B-600
B-610
B-620

GW01
GW02
GW03
GW04
GW05
GW06
GW08
GW10
GW11
GW12
GW20
GW21
GW22
GW24
GW25

FG01/CH01
FG02/CH02
FG03/CH03
FG04/CH04
FG05/CH05
FG06/CH06
FG07/CH07
FG08/CH08
FG09/CH09
FG10/CH10
FG11/CH11
FG12/CH12
FG13/CH13
FG14/CH14
VC01/CH33
VC02/CH34
VC03/CH35
VC04/CH36

Réservoir Robert-Bourassa

79°30' 79°0' 78°30' 78°0' 77°30' 77°0' 76°30'
56°0' 55°30' 55°0' 54°30' 54°0' 53°30'

Végétation / Vegetation

- Limite de la forêt commerciale / Commercial forest boundary
- Secteur propice aux espèces floristiques rares ou à statut précaire / Suitable habitat for rare or protected plant species
- Milieu humide / Wetland

Sous-zones de végétation / Vegetation sub-zones	Domaines bioclimatiques / Bioclimatic domains
Forêt boréale fermée / Closed boreal forest	Pessière à mousses / Spruce stand with moss
Forêt boréale ouverte / Open boreal forest	Pessière à lichens / Spruce stand with lichens
Toundra forestière / Forest tundra	Toundra forestière / Forest tundra

Historique des feux de forêt / Past forest fire

- 1991 à / to 2005
- 2006 à / to 2020

Limites / Limits

- RE02 — Terrain de piégeage / Trapline
- Zone d'étude / Study area

Infrastructure / Infrastructure

- B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.

LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 3 - ZE2
Portrait floristique

MAP 3 - SA2
Flora

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MERN Québec, 2002
Terrain de piégeage / traplines, 2020
Milieux humides / Wetlands, CanVec+, 1/50 000, RNCan, 2021
Données végétation / Vegetation data, Forêt Ouverte, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : B. Aubé-Maurice
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : B. Aubé-Maurice

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Route Transtaïga / Trans-Taiga road

Mine Renard

Végétation / Vegetation

- Limite de la forêt commerciale / Commercial forest boundary
- Secteur propice aux espèces floristiques rares ou à statut précaire / Suitable habitat for rare or protected plant species
- Milieu humide / Wetland

Sous-zones de végétation / Vegetation sub-zones	Domaines bioclimatiques / Bioclimatic domains
Forêt boréale fermée / Closed boreal forest	Pessière à mousses / Spruce stand with moss
Forêt boréale ouverte / Open boreal forest	Pessière à lichens / Spruce stand with lichens
Toundra forestière / Forest tundra	Toundra forestière / Forest tundra

Historique des feux de forêt / Past forest fire

- 1991 à / to 2005
- 2006 à / to 2020

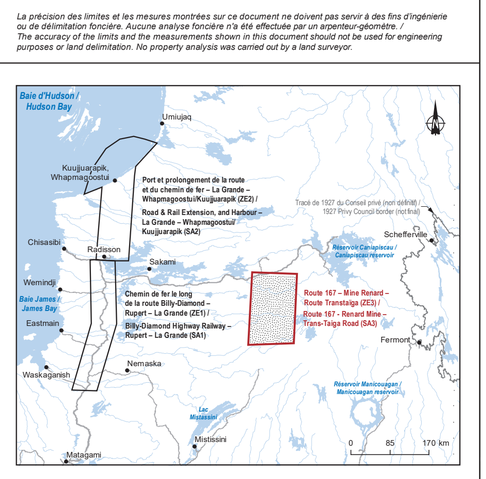
Limites / Limits

- RE02 — Terrain de piégeage / Trapline
- Zone d'étude / Study area

Infrastructure / Infrastructure

- B-400 — Route Transtaïga et borne kilométrique / Trans-Taiga road and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 3 - ZE3 Portrait floristique

MAP 3 - SA3 Flora

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MERN Québec, 2002
Terrain de piégeage / traplines, 2020
Milieux humides / Wetlands, CanVec+, 1/50 000, RNCan, 2021
Données végétation / Vegetation data, Forêt Ouverte, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : B. Aubé-Maurice
Dessin / Drawned by : J.-M. Tremblay
Approbation / Approved by : B. Aubé-Maurice

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APPENDIX

A-4 *MAP 4: WILD PORTRAIT*

Zone 22

Zone 22 nord / north

Zone 22 sud / south

Route Billy-Diamond highway

Route Transtaiga / Trans-Taiga road

Route du Nord

Chemin de Chisasibi road

Chemin de Wemindji road

Chemin d'Eastmain road

Chemin de Waskaganish road

Baie James / James Bay

Wemindji

Eastmain

Waskaganish

Réservoir Robert-Bourassa

Réservoir Opinaca

VC01/CH33

VC02/CH34

VC03/CH35

VC04/CH36

VC05/CH37

VC06/CH38

VC08/CH40

VC09

VC10

VC11

VC12

VC13

VC14

VC15

VC16

VC17

VC18

VC19

VC20

VC21

VC22

VC23

VC24

VC25

VC27

VC28

VC29

VC30

VC31

VC32

VC33

VC34

VC36

FG02/CH02

FG09/CH09

FG10/CH10

FG14/CH14

RE02

RE03

RE03A

RE04

RE05

R01

R01A

R02

R02A

R03

R04

R05

R06

R07

R08

R09

R10

R11

R12

R13

R14

R17

N01

N02

N03

N04

N05

N06

N07

N09

N14

N23

B-610

B-600

B-590

B-580

B-570

B-560

B-550

B-540

B-530

B-520

B-510

B-500

B-490

B-480

B-470

B-460

B-450

B-440

B-430

B-420

B-410

B-400

B-390

B-380

B-370

B-360

B-350

B-340

B-330

B-320

B-310

B-300

B-290

B-280

B-270

B-260

B-250

B-240

B-230

B-220

79°0'

78°30'

78°0'

77°30'

77°0'

76°30'

53°30'

53°0'

52°30'

52°0'

51°30'

51°0'

Zone de chasse / Hunting area
(la zone d'étude est complètement à l'intérieur de la zone de chasse 22 / study area is completely inside hunting area 22)

Zone de pêche sportive / Sport fishing area

Zone importante pour la conservation des oiseaux (ZICO) / Important bird area (IBA)

Terres autochtone / Aboriginal Lands

Terre de catégorie I / Category I land

Terre de catégorie II (terres publiques avec droits de chasse, pêche et trappe exclusif aux autochtones) / Category II land (public land with exclusive hunting, fishing and trapping rights for Aboriginals)

Limites / Limits

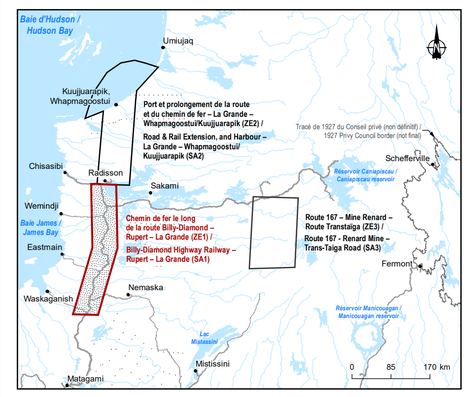
RE02 — Terrain de piégeage / Trapline

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 4 - ZE1
Portrait faunique

MAP 4 - SA1
Fauna

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Terrain de piégeage / traplines, 2020
Données végétation / vegetation data, Forêt Ouverte, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : B. Aubé-Maurice
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : B. Aubé-Maurice
211_08415_00_NT6_c4_ze1_faune_230223.mxd

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Baie d'Hudson / Hudson Bay

Kuujjuarapik
Whapmagoostui

Zone 22

Zone 22 nord / north

Chisasibi

Radisson

Chemin de Chisasibi road

Route Billy-Diamond highway

B-590 B-600 B-610 B-620

GW01 GW02 GW03 GW04 GW05 GW06 GW08 GW10 GW11 GW18 GW20 GW21 GW22 GW24 GW25

FG01/CH01 FG02/CH02 FG03/CH03 FG04/CH04 FG05/CH05 FG06/CH06 FG07/CH07 FG08/CH08 FG09/CH09 FG10/CH10 FG11/CH11 FG12/CH12 FG13/CH1 FG14/CH14

VC01/CH33 VC02/CH34 VC03/CH35 VC04/CH36

79°30' 79°0' 78°30' 78°0' 77°30' 77°0' 76°30' 78°30' 78°0' 77°30' 77°0' 76°30'

56°0' 55°30' 55°0' 54°30' 54°0' 53°30'

Zone de chasse / Hunting area
(la zone d'étude est complètement à l'intérieur de la zone de chasse 22 / study area is completely inside hunting area 22)

Zone de pêche sportive / Sport fishing area

Zone importante pour la conservation des oiseaux (ZICO) / Important bird area (IBA)

Terres autochtone / Aboriginal Lands

Terre de catégorie I / Category I land

Terre de catégorie II (terres publiques avec droits de chasse, pêche et trappe exclusif aux autochtones) / Category II land (public land with exclusive hunting, fishing and trapping rights for Aboriginals)

Limites / Limits

RE02 Terrain de piégeage / Trapline

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.

Baie d'Hudson / Hudson Bay
Umiujaq
Kuujjuarapik, Whapmagoostui
Port et prolongement de la route et du chemin de fer – La Grande – Whapmagoostui/Kuujjuarapik (ZE2) / Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/ Kuujjuarapik (SA2)
Tracé de 1927 du Conseil privé (non définitif) / 1927 Privy Council border (not final)
Chisasibi
Radisson
Schefferville
Réservoir Caniapiscau / Caniapiscau reservoir
Sakami
Wemindji
Baie James / James Bay
Chemin de fer le long de la route Billy-Diamond – Rupert – La Grande (ZE1) / Billy-Diamond Highway Railway – Rupert – La Grande (SA1)
Route 167 – Mine Renard – Route Transtaiga (ZE3) / Route 167 - Renard Mine – Trans-Taiga Road (SA3)
Eastmain
Fermont
Nemaska
Waskaganish
Réservoir Manicouagan / Manicouagan reservoir
Lac Mistassini
Mistissini
Matagami
0 85 170 km

LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 4 - ZE2
Portrait faunique

MAP 4 - SA2
Fauna

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Terrain de piégeage / traplines, 2020
Données végétation / vegetation data, Forêt Ouverte, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : B. Aubé-Maurice
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : B. Aubé-Maurice
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Zone 22

Zone de chasse / Hunting area
(la zone d'étude est complètement à l'intérieur de la zone de chasse 22 / study area is completely inside hunting area 22)

Zone 22 nord / north

Zone de pêche sportive / Sport fishing area

Zone importante pour la conservation des oiseaux (ZICO) / Important bird area (IBA)

Terres autochtone / Aboriginal Lands

Terre de catégorie I / Category I land

Terre de catégorie II (terres publiques avec droits de chasse, pêche et trappe exclusif aux autochtones) / Category II land (public land with exclusive hunting, fishing and trapping rights for Aboriginals)

Limites / Limits

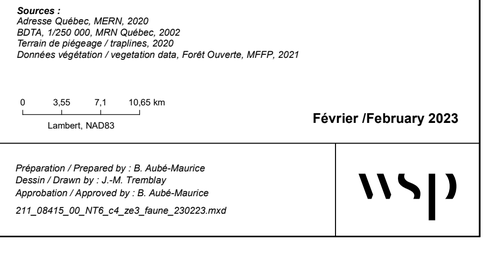
RE02 — Terrain de piégeage / Trapline

Zone d'étude / Study area

Infrastructure / Infrastructure

B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 4 - ZE3
Portrait faunique

MAP 4 - SA3
Fauna

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Terrain de piégeage / traplines, 2020
Données végétation / vegetation data, Forêt Ouverte, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février /February 2023

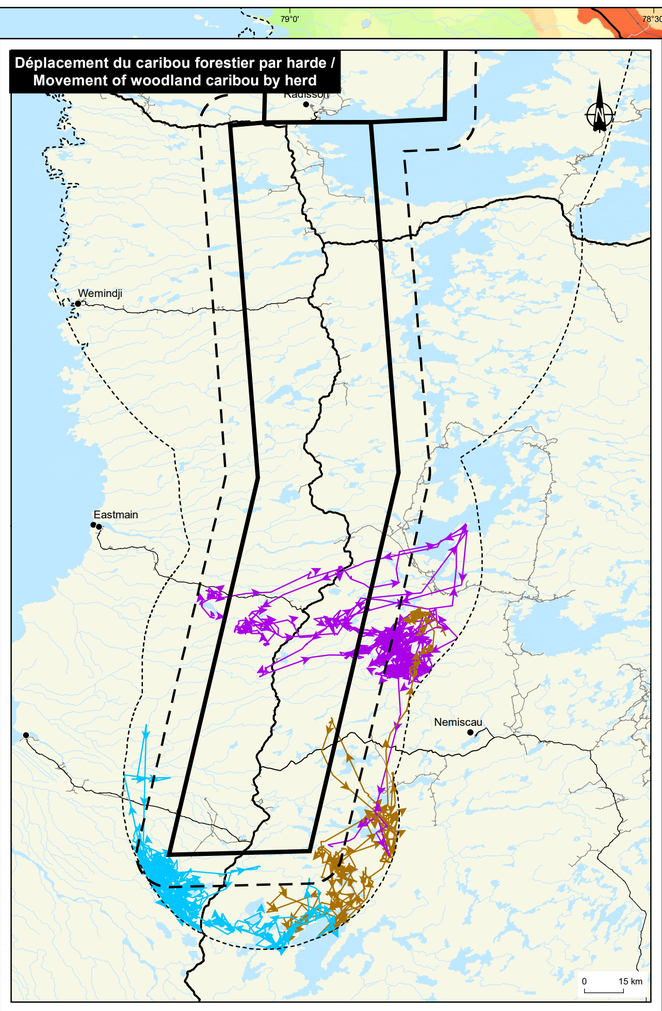
Préparation / Prepared by : B. Aubé-Maurice
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : B. Aubé-Maurice

211_08415_00_NT6_c4_ze3_faune_230223.mxd

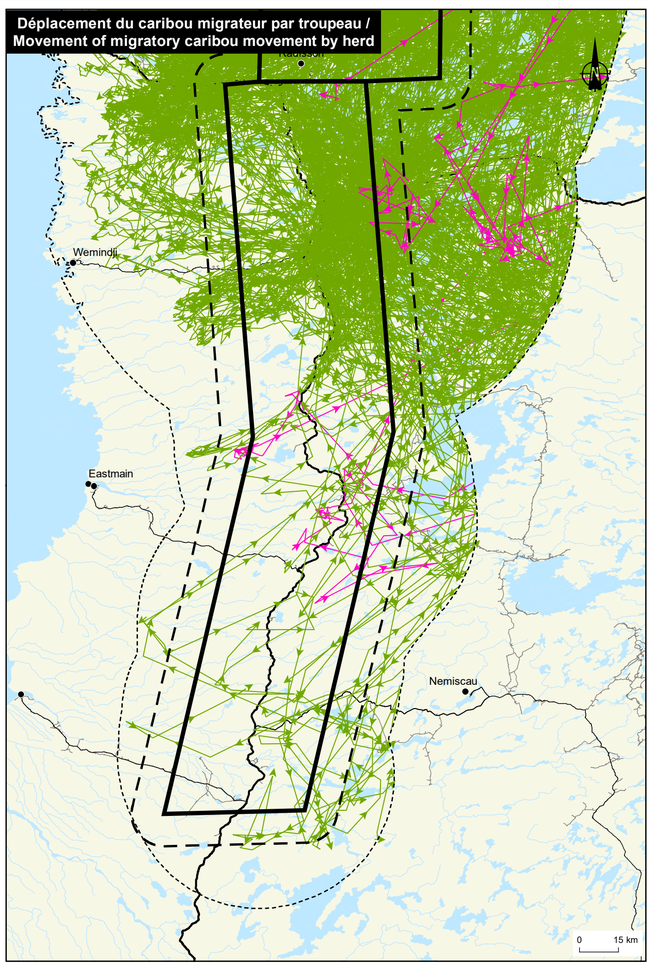
wsp

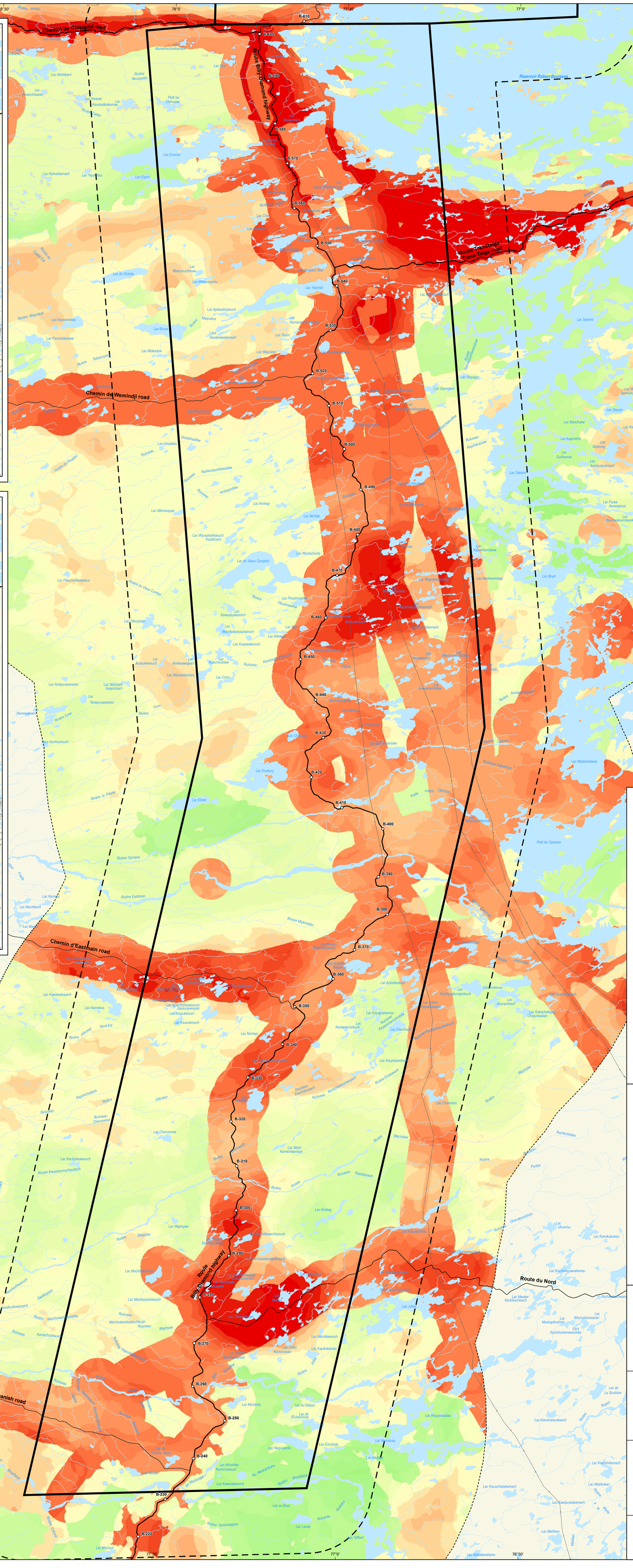
A-5 MAP 5: CARIBOU

Déplacement du caribou forestier par harde / Movement of woodland caribou by herd



Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd




Chemin de Chisasibi road
Route Billy-Diamond highway
Route Transtaiga
Trans-Taiga Road
Chemin de Wemindji road
Chemin d'Eastmain road
Route Billy-Diamond highway
Route du Nord
Chemin de Waskaganish road
B-610
B-600
B-590
B-580
B-570
B-560
B-550
B-540
B-530
B-520
B-510
B-500
B-490
B-480
B-470
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B-430
B-420
B-410
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B-360
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B-340
B-330
B-320
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B-280
B-270
B-260
B-250
B-240
B-230
B-220
Réservoir Robert-Bourassa
Lac Kamissis
Lac Aminstikuch
Lac Bonfait
Lac Kawapakamich
Lac Amikap
Lac De Vaux
Lac Sakami
Lac Kawawiyakamaw
Lac Gauchet
Lac de Villaret
Lac Watis Apimiskotat
Lac Deprés
Lac Hallouin
Lac Laguiche
Lac Kawawachikamaw
Lac Marjoulet
Lac Masschaw
Lac Aapamitich
Lac Debeney
Lac Guillaumat
Lac Amistuskutimuch
Lac Labbios
Lac Kauskaschikaskw
Lac Dupargo
Lac Piyaw Awawapisut
Lac Kaumawachikanikamaw
Lac Kanamasiusi
Lac Kawaputanans
Lac Janin
Lac Kamukuchakanj Akonashiwapakamach
Lac Achikw Innaian
Lac Yaliwanikaw
Lac Mwakw Kachikachisech
Lac Boyd
Lac Piskuschanikap
Lac Puchichakamasi
Lac Kasakukamach
Lac Menouow
Lac Opinaca
Lac Ell
Baie Kapichin
Lac Mistamiskwas
Lac Kamakuskach
Lac Wapistan
Lac Uspwakan
Lac Shipogan
Lac Wapistan
Lac Mistuskuchimaw
Lac Wikwaspinu
Lac Yesinski
Lac Apikwahipanuch
Lac Kaskamikaw
Lac Pamichikamaw
Lac Bruce
Lac Taylor
Lac Miskadow
Lac Duncan
Lac Esprit
Lac Kamiskamach
Lac Yayatinau
Lac Atchikami
Lac Nowasi
Lac Kauskatikakamaw
Petit lac Chirusaw
Lac Duncan
Lac Kamachachikamach
Lac Kamachachikamach
Lac Kamissis
Lac Kamissis
Lac Kamissis

Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd

Kuujjuarapik
Whapmagoostui
Radisson
0 15 km

Baie d'Hudson / Hudson Bay

Kuujjuarapik
Whapmagoostui

Chemin de Chisasibi road
Billy-Diamond Highway
Route Billy-Diamond

Habitat du caribou / Caribou Habitat

Indice de qualité de l'habitat / Habitat Suitability Index Model

- 0 (valeur minimale; habitat de faible qualité / lowest value; low quality habitat)
- 1
- 2
- 3
- 4
- 5 (valeur maximale; habitat de bonne qualité / highest value; good quality habitat)

Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd

- Rivière-aux-Feuilles (TRAF)
- Rivière Georges (TRG)

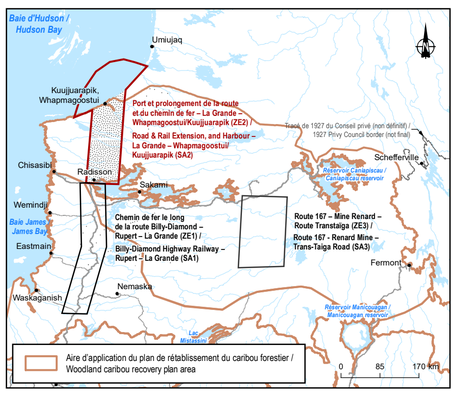
Limites / Limits

- Zone d'étude / Study area
- Zone d'étude (caribou) / Study area (caribou)
- Zone d'extraction des données du MFFP / MFFP data extraction area

Infrastructure / Infrastructure

- B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 5 - ZE2
Caribou

MAP 5 - SA2
Caribou

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Données caribou, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : A. Chabot
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : A. Chabot
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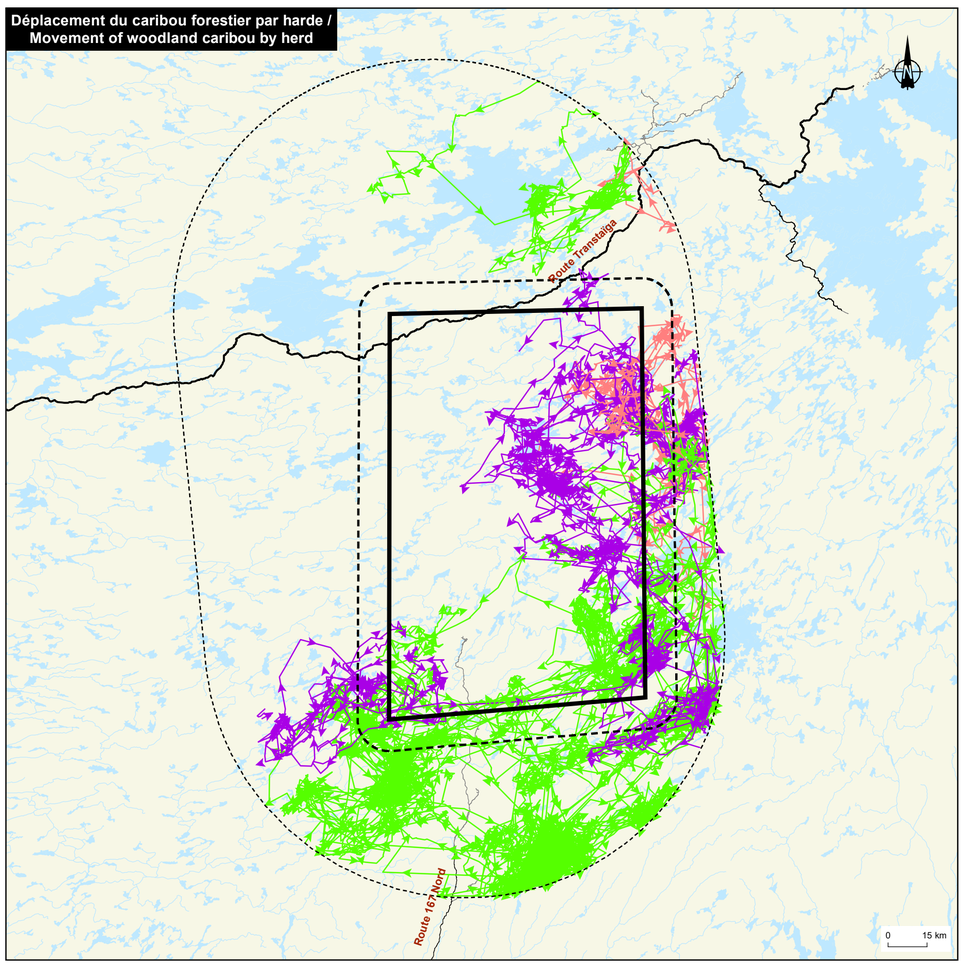
wsp

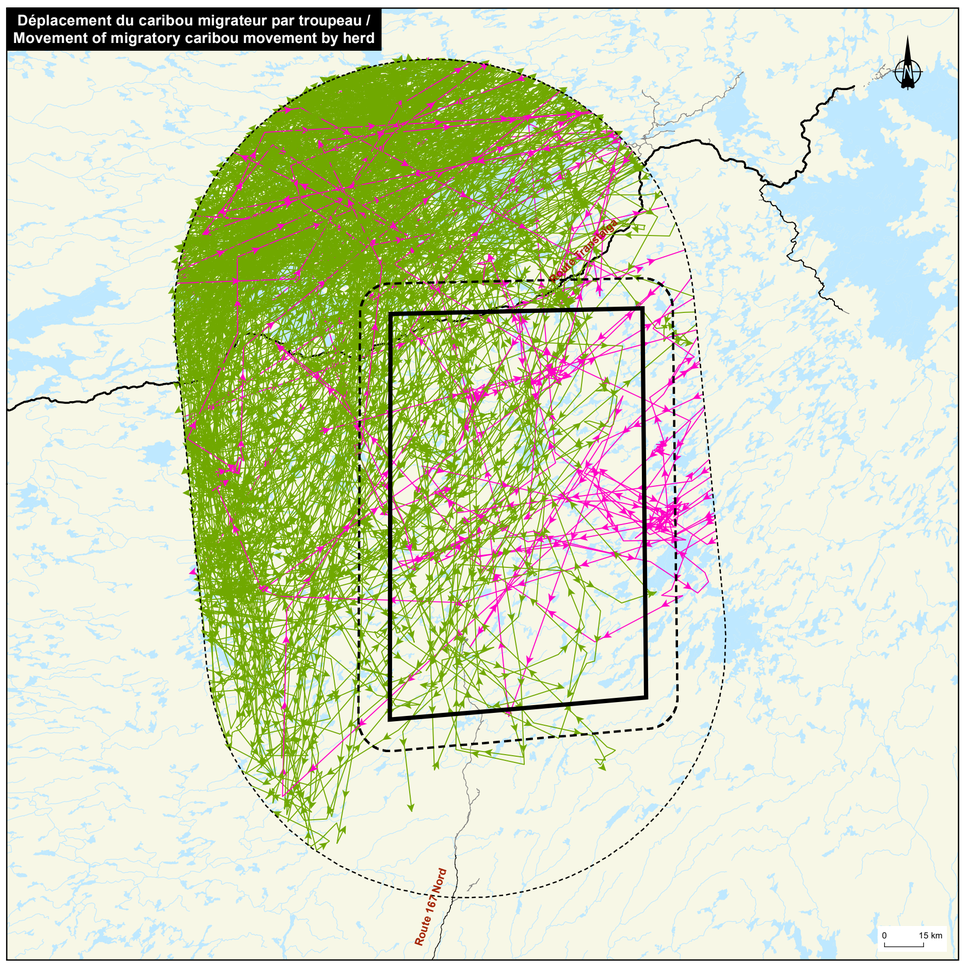
Route Transtaïga / Trans-Taiga road

Mine Renard

Déplacement du caribou forestier par harde / Movement of woodland caribou by herd



Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd



Habitat du caribou / Caribou Habitat

Indice de qualité de l'habitat / Habitat Suitability Index Model

- 0 (valeur minimale; habitat de faible qualité / lowest value; low quality habitat)
- 1
- 2
- 3
- 4
- 5 (valeur maximale; habitat de bonne qualité / highest value; good quality habitat)

Déplacement du caribou forestier par harde / Movement of woodland caribou by herd

- Caniapiscau
- Reconnaissance
- Temiscamie

Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd

- Rivière-aux-Feuilles (TRAF)
- Rivière Georges (TRG)

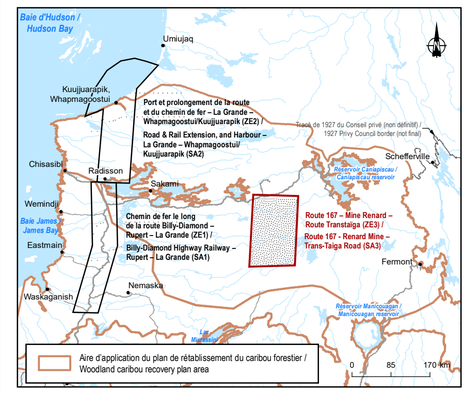
Limites / Limits

- Zone d'étude / Study area
- Zone d'étude (caribou) / Study area (caribou)
- Zone d'extraction des données du MFFP / MFFP data extraction area

Infrastructure / Infrastructure

- B-400 — Route Transtaïga et borne kilométrique / Trans-Taiga road and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 5 - ZE3 Caribou | **MAP 5 - SA3 Caribou**

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Données caribou, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : A. Chabot
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : A. Chabot

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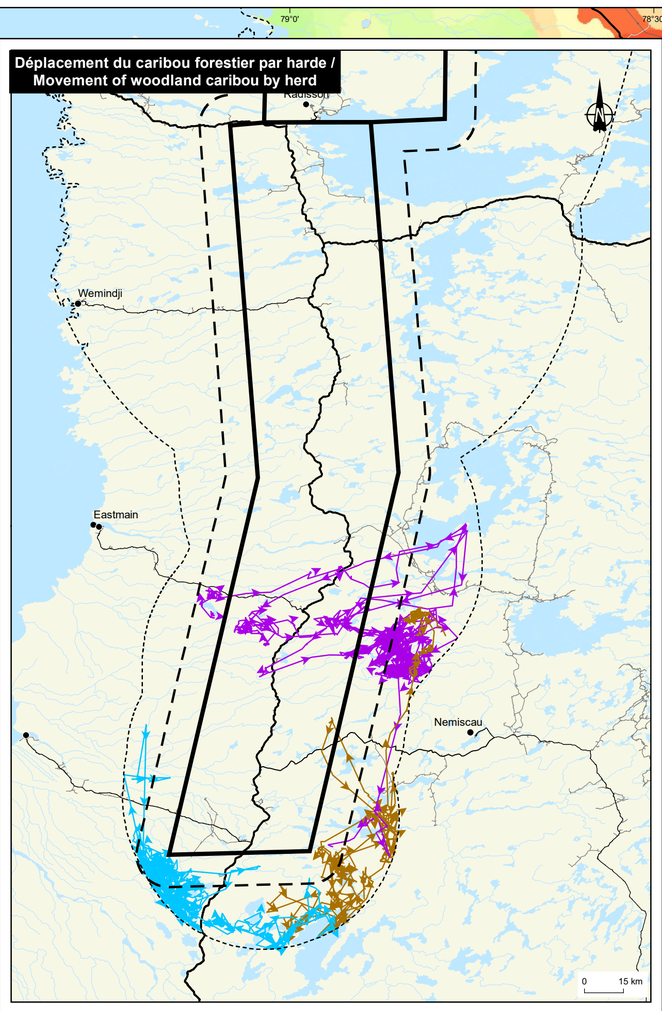
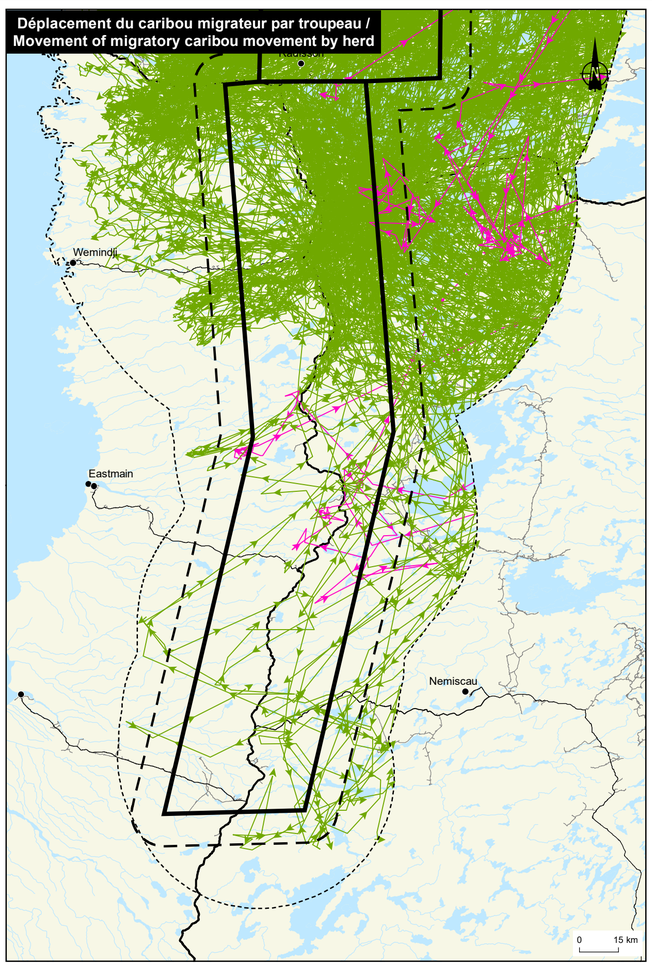
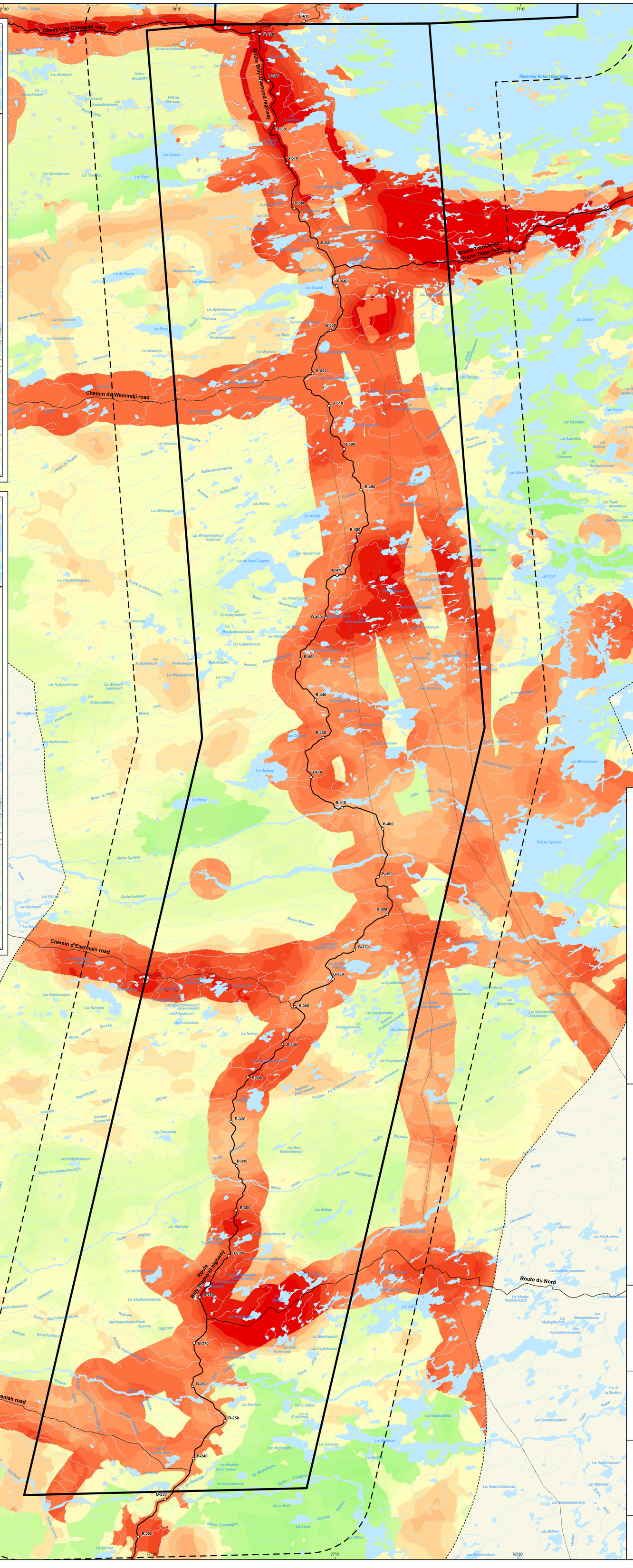
A-6 *MAP 6: PROTECTED AREAS*

Déplacement du caribou forestier par harde / Movement of woodland caribou by herd



Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd




Chemin de Chisasibi road
Route Billy-Diamond highway
Route Transtaiga
Trans-Taiga Road
Chemin de Wemindji road
Chemin d'Eastmain road
Route Billy-Diamond highway
Route du Nord
Chemin de Waskaganish road
B-610
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B-240
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Réservoir Robert-Bourassa
Lac Kamissis
Lac Aminstikuch
Lac Bonfait
Lac Kawapakamich
Lac Amikap
Lac De Vaux
Lac Sakami
Lac Kawawiyakamaw
Lac Gauchet
Lac de Villaret
Lac Watis Apimiskotat
Lac Deprés
Lac Hallouin
Lac Laguiche
Lac Kawawachikamaw
Lac Marjoulet
Lac Masschaw
Lac Aapamitich
Lac Debeney
Lac Guillaumat
Lac Amistuskutimuch
Lac Labbios
Lac Kauskaschikaskw
Lac Dupargo
Lac Piyaw Awawapisut
Lac Kaumawachikanikamaw
Lac Kanamasiusi
Lac Kawaputanans
Lac Janin
Lac Kamukuchakanj Akonashiwapakamach
Lac Achikw Innaian
Lac Yaliwanikaw
Lac Mwakw Kachikachisech
Lac Boyd
Lac Piskuschanikap
Lac Puchichakamasi
Lac Kasakukamach
Lac Menouow
Lac Opinaca
Lac Ell
Baie Kapichin
Lac Mistamiskwas
Lac Kamakuskach
Lac Wapistan
Lac Uspwakan
Lac Shipogan
Lac Wapistan
Lac Mistuskuchimaw
Lac Wikwaspinu
Lac Yesinski
Lac Apikwahipanuch
Lac Kaskamikaw
Lac Pamichikamaw
Lac Bruce
Lac Taylor
Lac Miskadow
Lac Duncan
Lac Esprit
Lac Kamiskamach
Lac Yayatinau
Lac Atchikami
Lac Nowasi
Lac Kauskatikakamaw
Petit lac Chirusaw
Lac Duncan
Lac Kamachachikamach
Lac Kamachachikamach
Lac Kamissis
Lac Kamissis
Lac Kamissis

Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd

Kuujjuarapik
Whapmagoostui
Radisson
0 15 km

Baie d'Hudson / Hudson Bay

Kuujjuarapik
Whapmagoostui

Chemin de Chisasibi road
Billy-Diamond Highway
Route Billy-Diamond

Habitat du caribou / Caribou Habitat

Indice de qualité de l'habitat / Habitat Suitability Index Model

- 0 (valeur minimale; habitat de faible qualité / lowest value; low quality habitat)
- 1
- 2
- 3
- 4
- 5 (valeur maximale; habitat de bonne qualité / highest value; good quality habitat)

Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd

- Rivière-aux-Feuilles (TRAF)
- Rivière Georges (TRG)

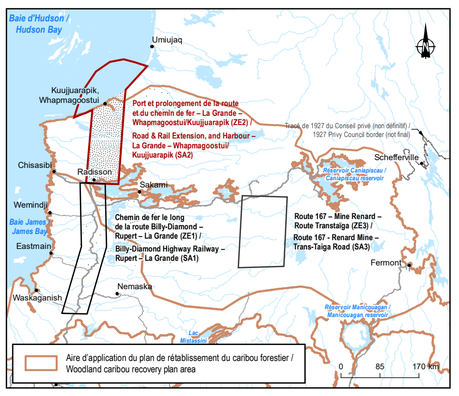
Limites / Limits

- Zone d'étude / Study area
- Zone d'étude (caribou) / Study area (caribou)
- Zone d'extraction des données du MFFP / MFFP data extraction area

Infrastructure / Infrastructure

- B-610 — Route Billy-Diamond et borne kilométrique / Billy-Diamond highway and kilometre point

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / The accuracy of the limits and the measurements shown in this document should not be used for engineering purposes or land delimitation. No property analysis was carried out by a land surveyor.



LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 5 - ZE2
Caribou

MAP 5 - SA2
Caribou

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Données caribou, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : A. Chabot
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : A. Chabot
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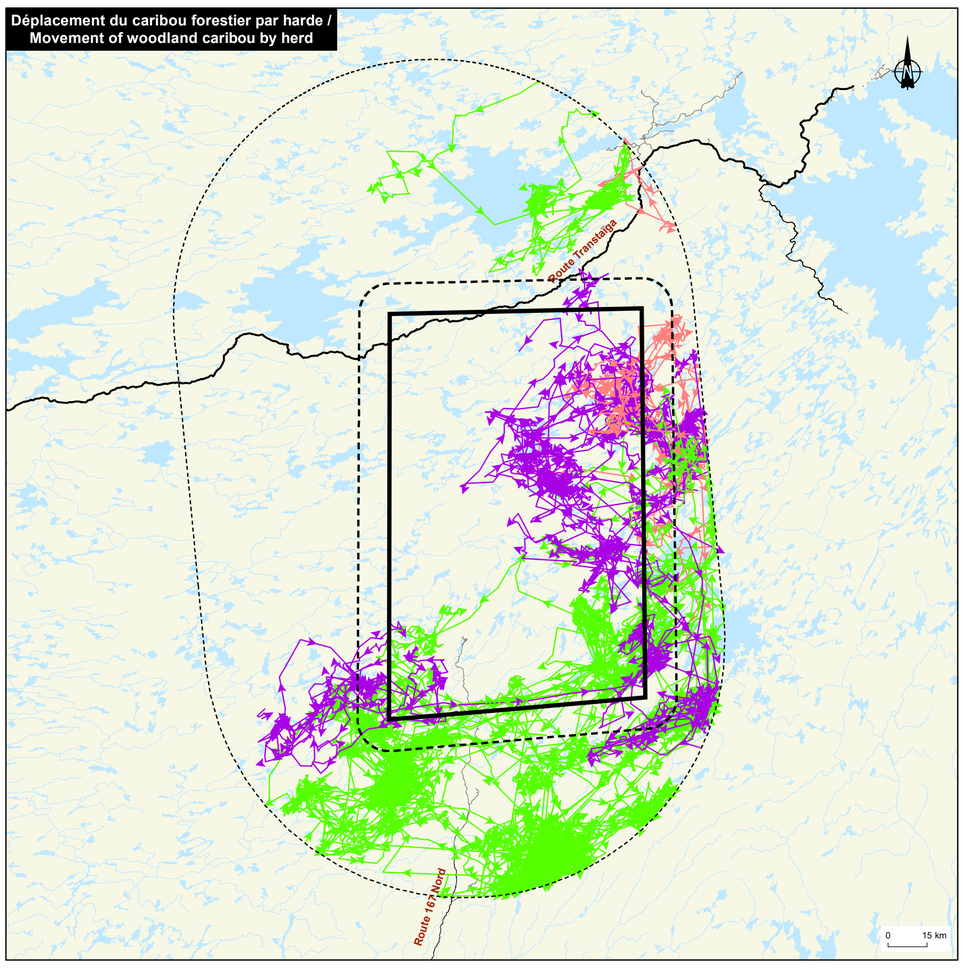
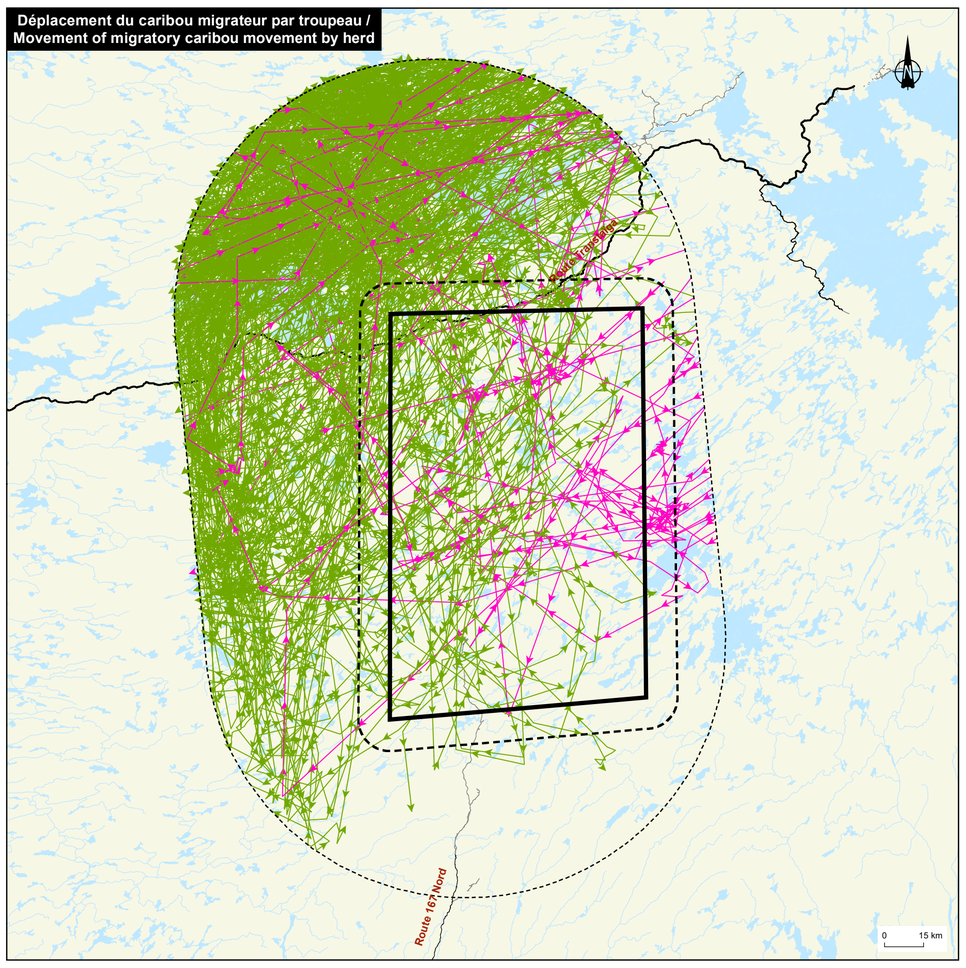
Route Transtaïga / Trans-Taiga road

Mine Renard

Déplacement du caribou forestier par harde / Movement of woodland caribou by herd



Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd



Habitat du caribou / Caribou Habitat

Indice de qualité de l'habitat / Habitat Suitability Index Model

- 0 (valeur minimale; habitat de faible qualité / lowest value; low quality habitat)
- 1
- 2
- 3
- 4
- 5 (valeur maximale; habitat de bonne qualité / highest value; good quality habitat)

Déplacement du caribou forestier par harde / Movement of woodland caribou by herd

- Caniapiscau
- Reconnaissance
- Temiscamie

Déplacement du caribou migrateur par troupeau / Movement of migratory caribou movement by herd

- Rivière-aux-Feuilles (TRAF)
- Rivière Georges (TRG)

Limites / Limits

- Zone d'étude / Study area
- Zone d'étude (caribou) / Study area (caribou)
- Zone d'extraction des données du MFFP / MFFP data extraction area

Infrastructure / Infrastructure

- B-400 — Route Transtaïga et borne kilométrique / Trans-Taiga road and kilometre point

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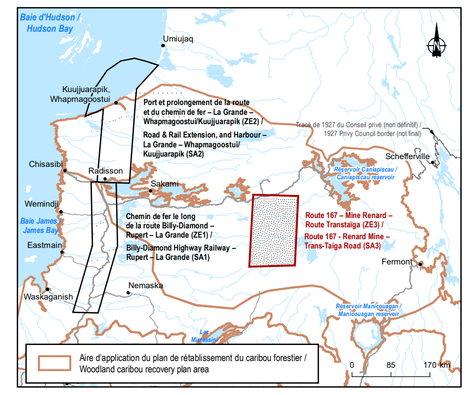

LA GRANDE ALLIANCE

Étude de préfaisabilité – Phases II et III
Pre-feasibility Study – Phases II and III

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial Environment

Carte 5 - ZE3 Caribou | **MAP 5 - SA3 Caribou**

Sources :
Adresse Québec, MERN, 2020
BDTA, 1/250 000, MRN Québec, 2002
Données caribou, MFFP, 2021

0 3,55 7,1 10,65 km
Lambert, NAD83

Février / February 2023

Préparation / Prepared by : A. Chabot
Dessin / Drawn by : J.-M. Tremblay
Approbation / Approved by : A. Chabot

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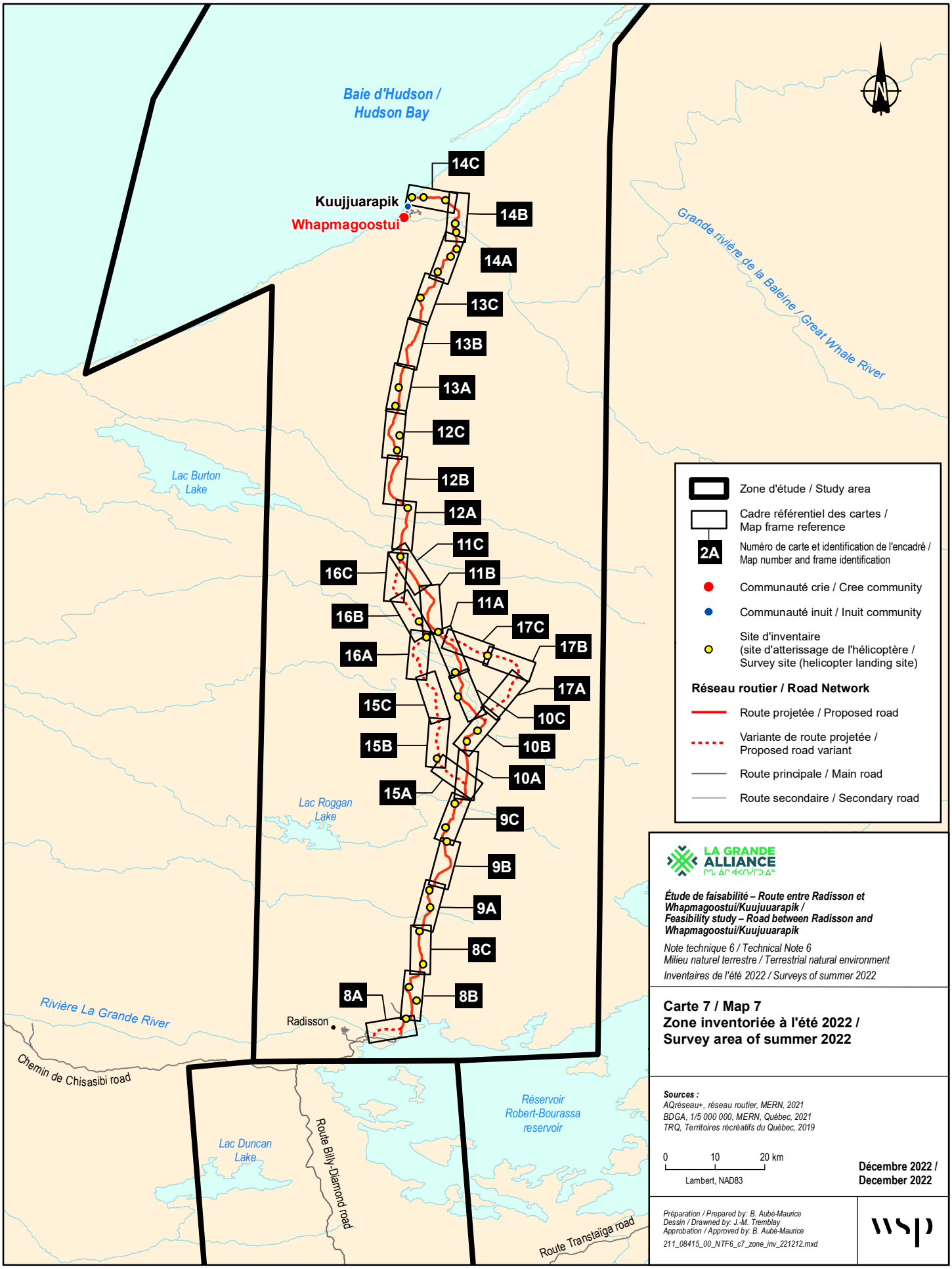
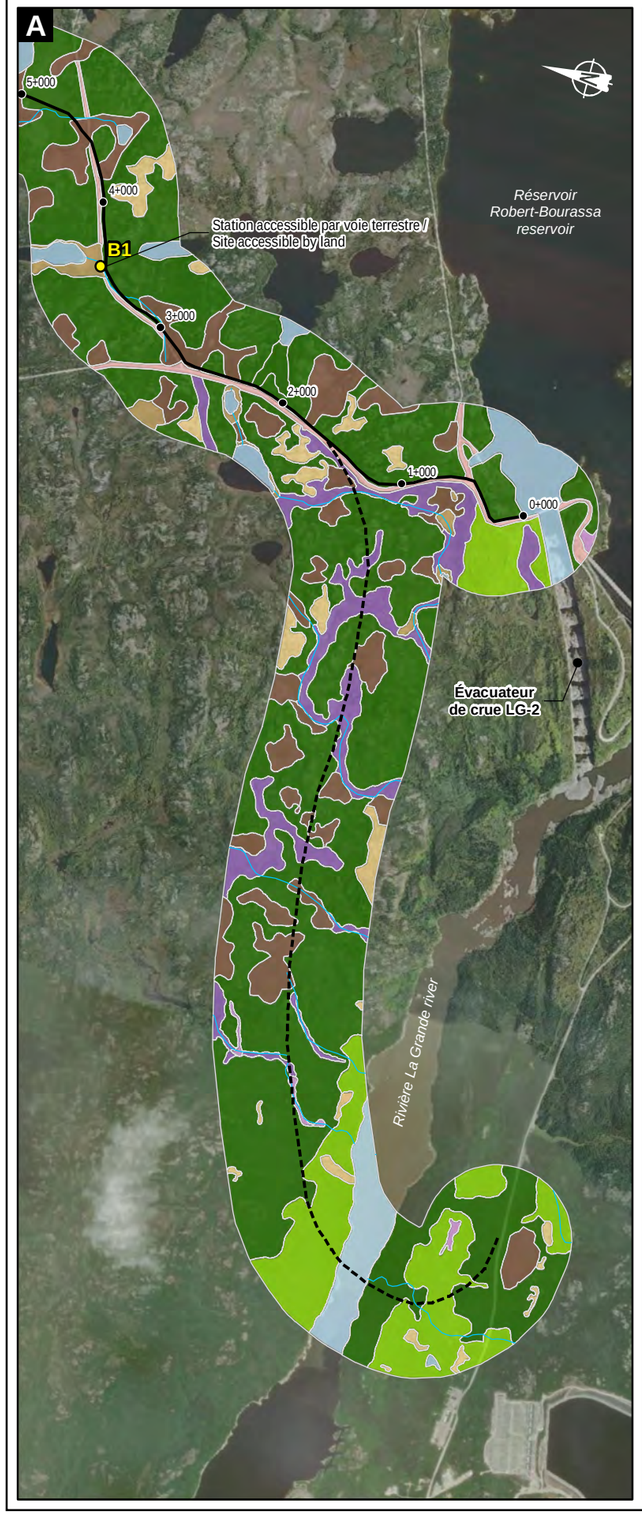
APPENDIX

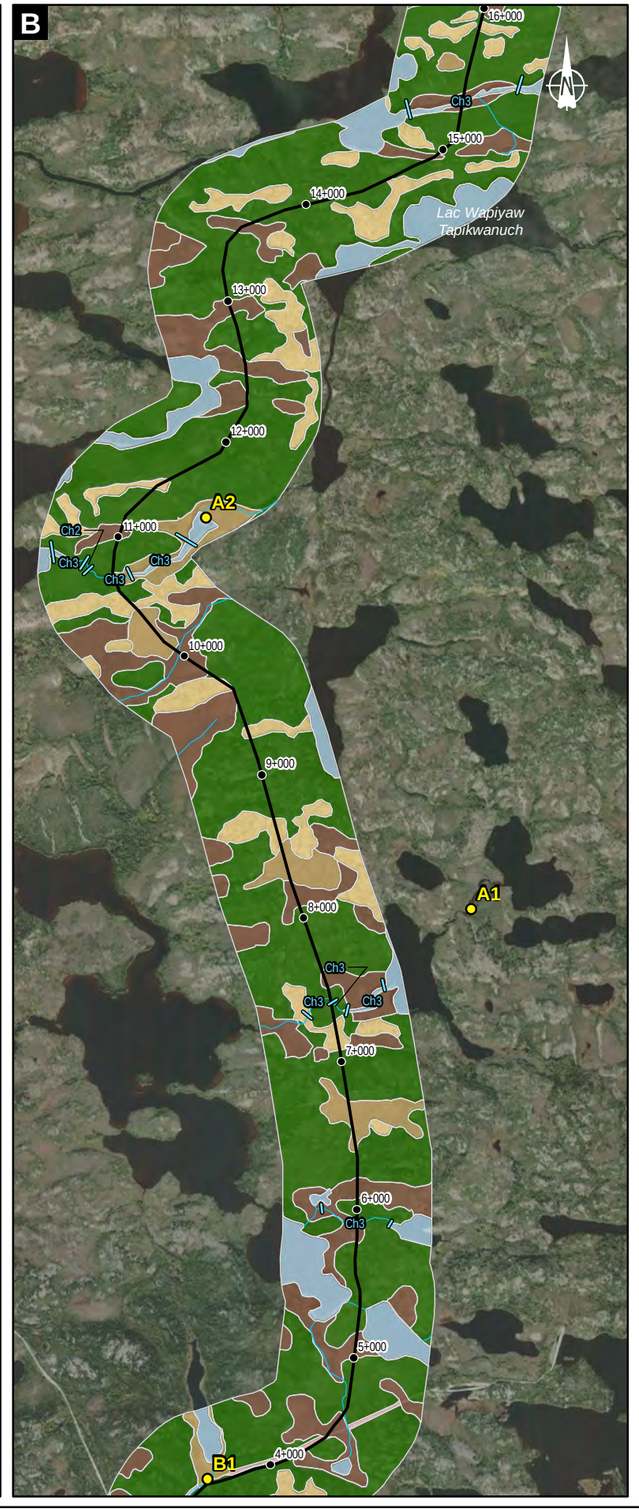
A-7 *MAP 7: SURVEY AREA OF SUMMER 2022*

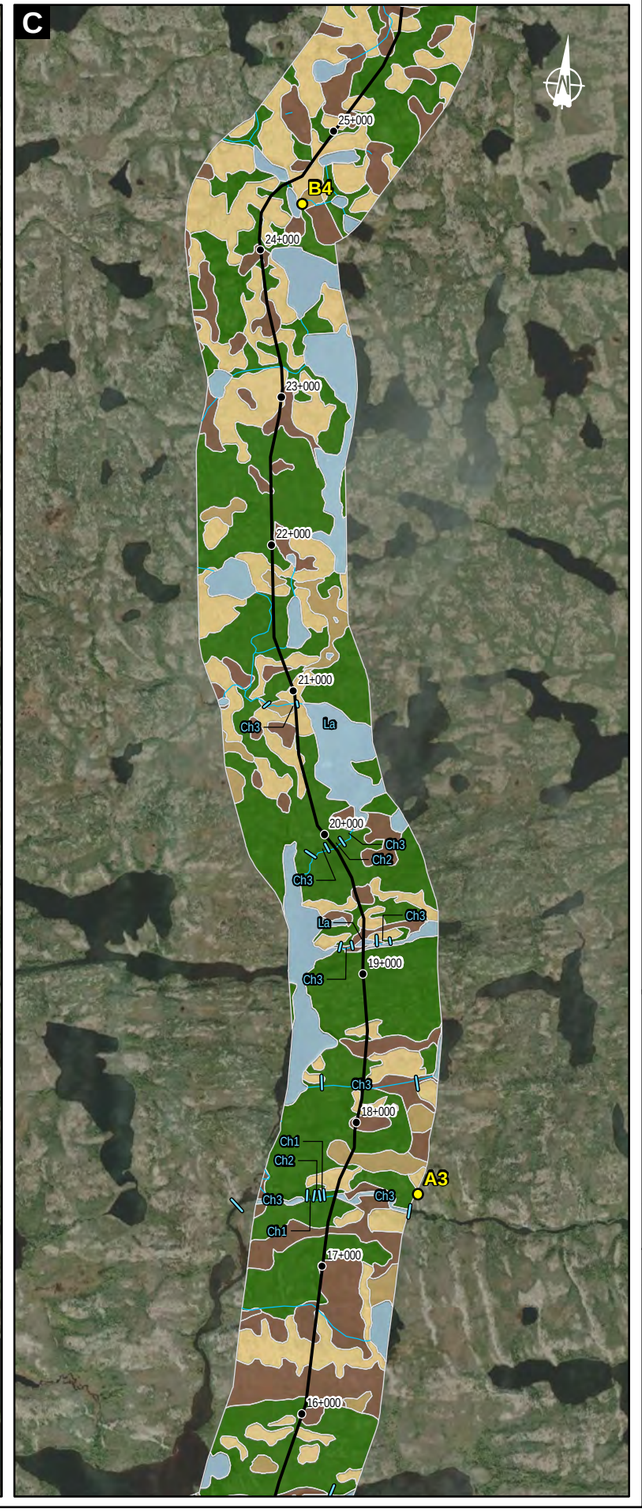

Baie d'Hudson / Hudson Bay
Kuujjuarapik
Whapmagoostui
Grande rivière de la Baleine / Great Whale River
Lac Burton Lake
Lac Roggan Lake
Lac Duncan Lake
Rivière La Grande River
Chemin de Chisasibi road
Radisson
Route Billy-Diamond road
Réservoir Robert-Bourassa reservoir
Route Transtaïga road
14C
14B
14A
13C
13B
13A
12C
12B
12A
11C
11B
11A
17C
17B
17A
10C
10B
10A
9C
9B
9A
8C
8B
8A
16C
16B
16A
15C
15B
15A
Zone d'étude / Study area
Cadre référentiel des cartes / Map frame reference
2A
Numéro de carte et identification de l'encadré / Map number and frame identification
Communauté crie / Cree community
Communauté inuit / Inuit community
Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)
Réseau routier / Road Network
Route projetée / Proposed road
Variante de route projetée / Proposed road variant
Route principale / Main road
Route secondaire / Secondary road
LA GRANDE ALLIANCE
Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik
Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment
Inventaires de l'été 2022 / Surveys of summer 2022
Carte 7 / Map 7
Zone inventoriée à l'été 2022 / Survey area of summer 2022
Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/5 000 000, MERN, Québec, 2021
TRQ, Territoires récréatifs du Québec, 2019
0 10 20 km
Lambert, NAD83
Décembre 2022 / December 2022
Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay
Approbation / Approved by: B. Aubé-Maurice
211_08415_00_NTF6_c7_zone_inv_221212.mxd
wsp

APPENDIX

A-8 MAP 8 TO 17: PHOTO-INTERPRETATION OF 2022







Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
- Marais / Marsh
- Marécage arborescent / Tree swamp
- Marécage arbustif / Shrub swamp
- Tourbière boisée / Treed peatland
- Tourbière ouverte / Open peatland

Végétation terrestre / Terrestrial vegetation

- Feuillus/Mélangé / Deciduous/Mixed
- Résineux / Conifer
- Herbacée-Mousse-Lichen / Herbaceous-Moss-Lichen

Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
- Plan d'eau / Waterbody

Habitat aquatique / Aquatic habitat

- Limite de segment homogène d'habitat / Boundary of aquatic habitat segment
- Les seuils (Se) et le pied des rapides (Ra) sont les faciès les plus propices à la fraie des poissons / The sills (Se) and the foot of rapids (Ra) are the most suitable habitats for fish spawning

Description des habitats types / Typical habitat description

Habitat type	Faciès d'écoulement / Flow facies	Substrat dominant / Dominant substrate	Substrat sous-dominant / Subdominant substrate
Chute / Fall	Ct	R	B^x
Cascade	Ca	R/B^x	B
Rapide 1 / Rapids 1	Ra1	B/B^x	G/R
Rapide 2 / Rapids 2	Ra2	G	C/G/R
Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
Lac / Lake	La	V/S	B/G/C

Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^x	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
B	Bloc / Block	250 à/to 1000 mm	S	Sable / Sand	0,125 à/to 4 mm
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Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 8 / Map 8
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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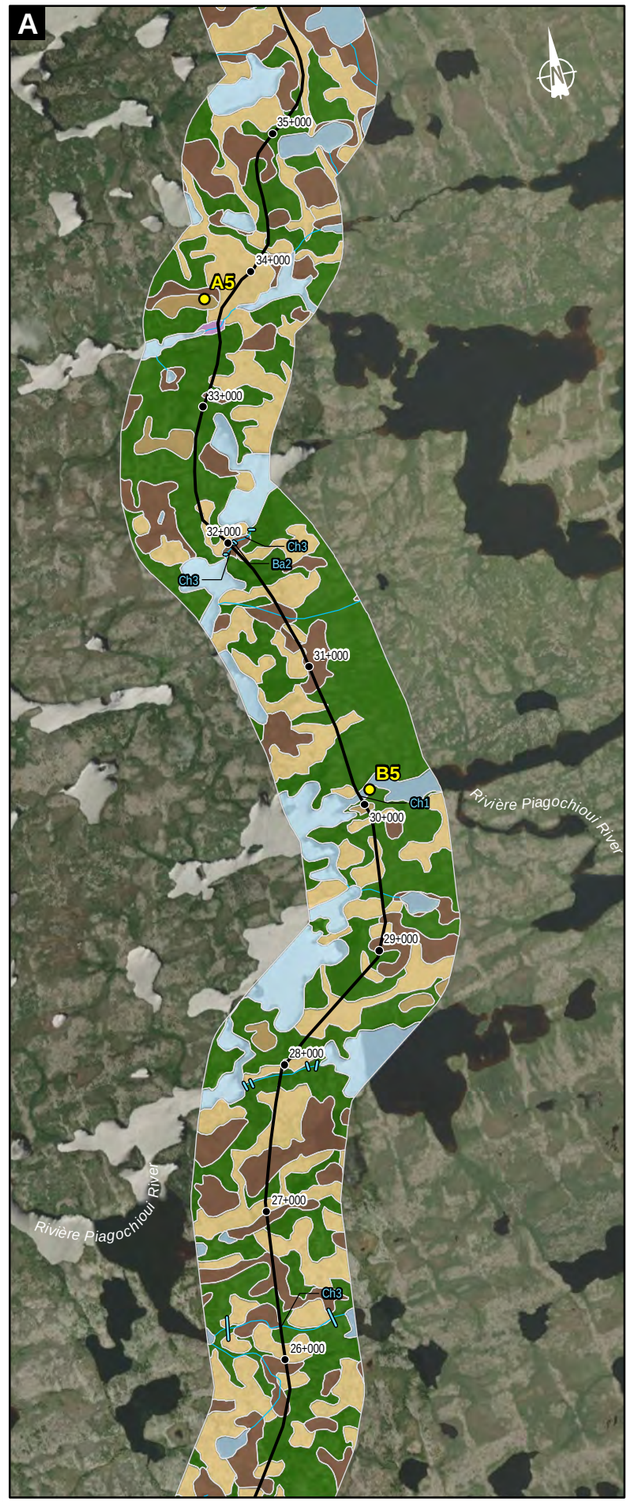

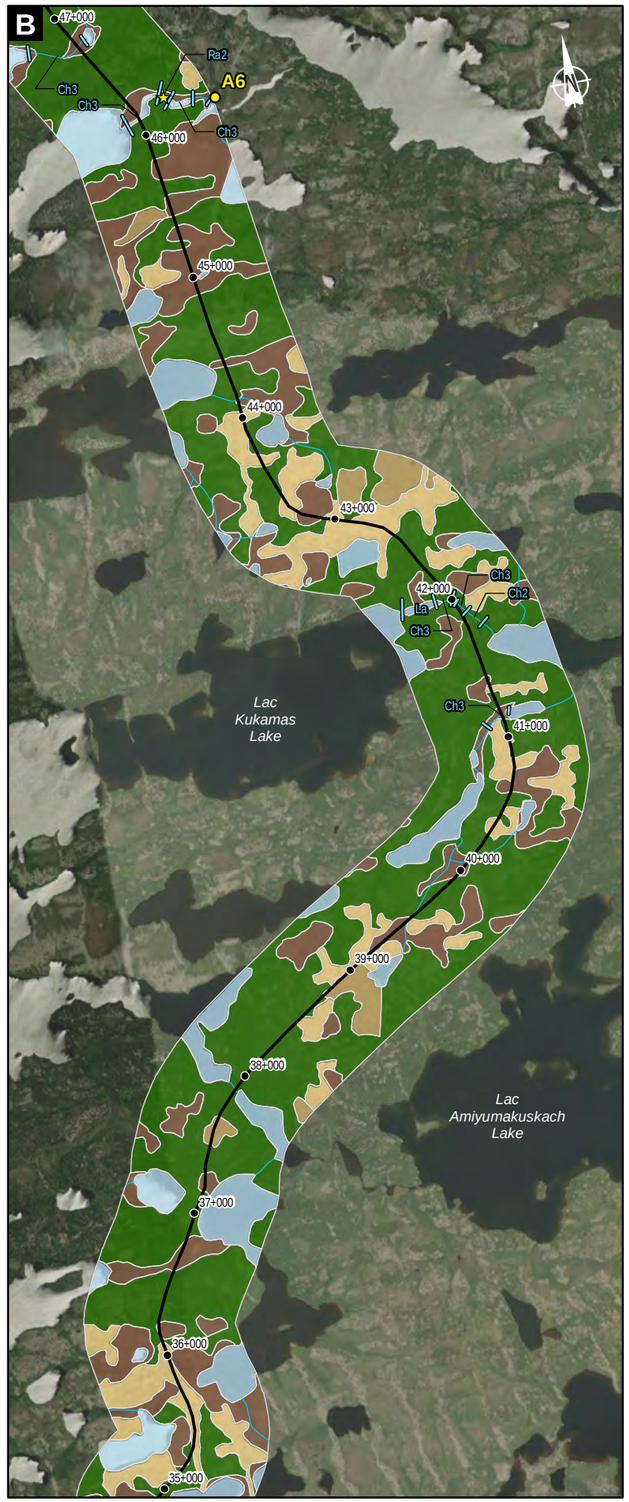

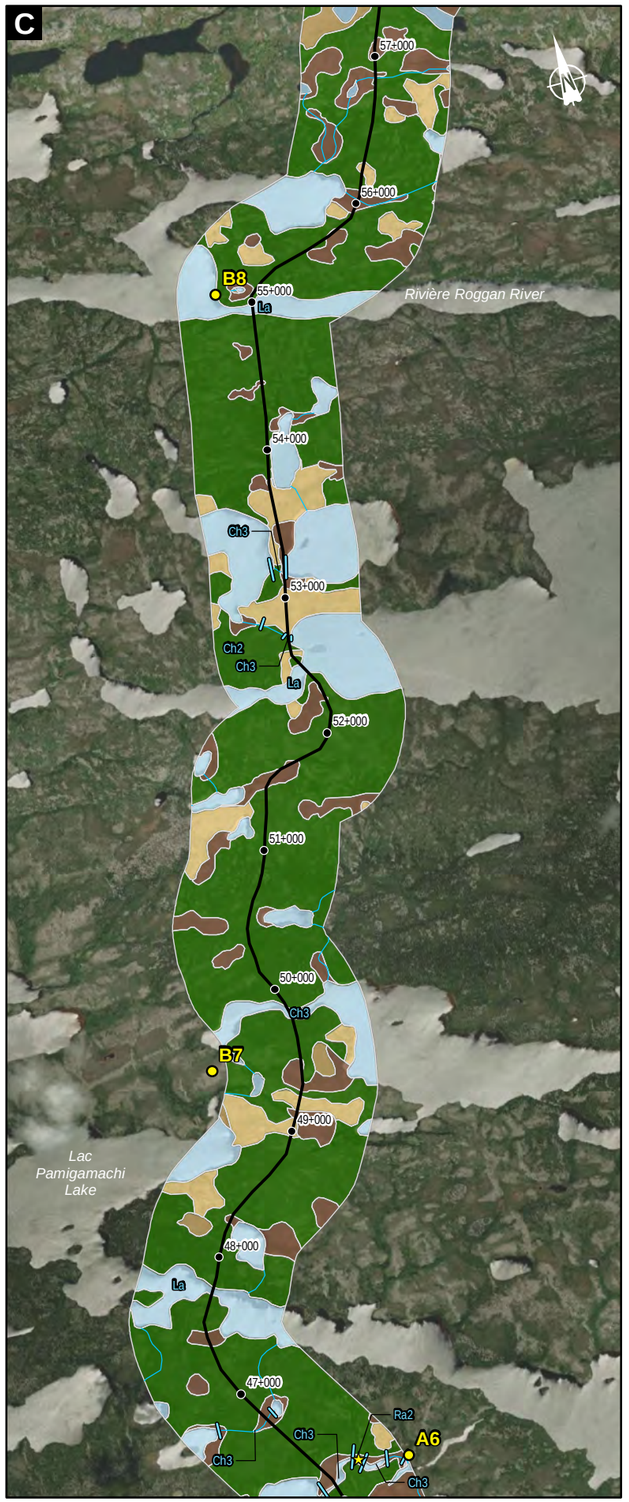

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

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- Marécage arbustif / Shrub swamp
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Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
- Plan d'eau / Waterbody

Habitat aquatique / Aquatic habitat

- Limite de segment homogène d'habitat / Boundary of aquatic habitat segment
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Rapide 2 / Rapids 2	Ra2	G	C/G/R
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Seuil 2 / Sill 2	Se2	G/C	B/V
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Chenal 2 / Channel 2	Ch2	C/V	S/G
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Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 9 / Map 9
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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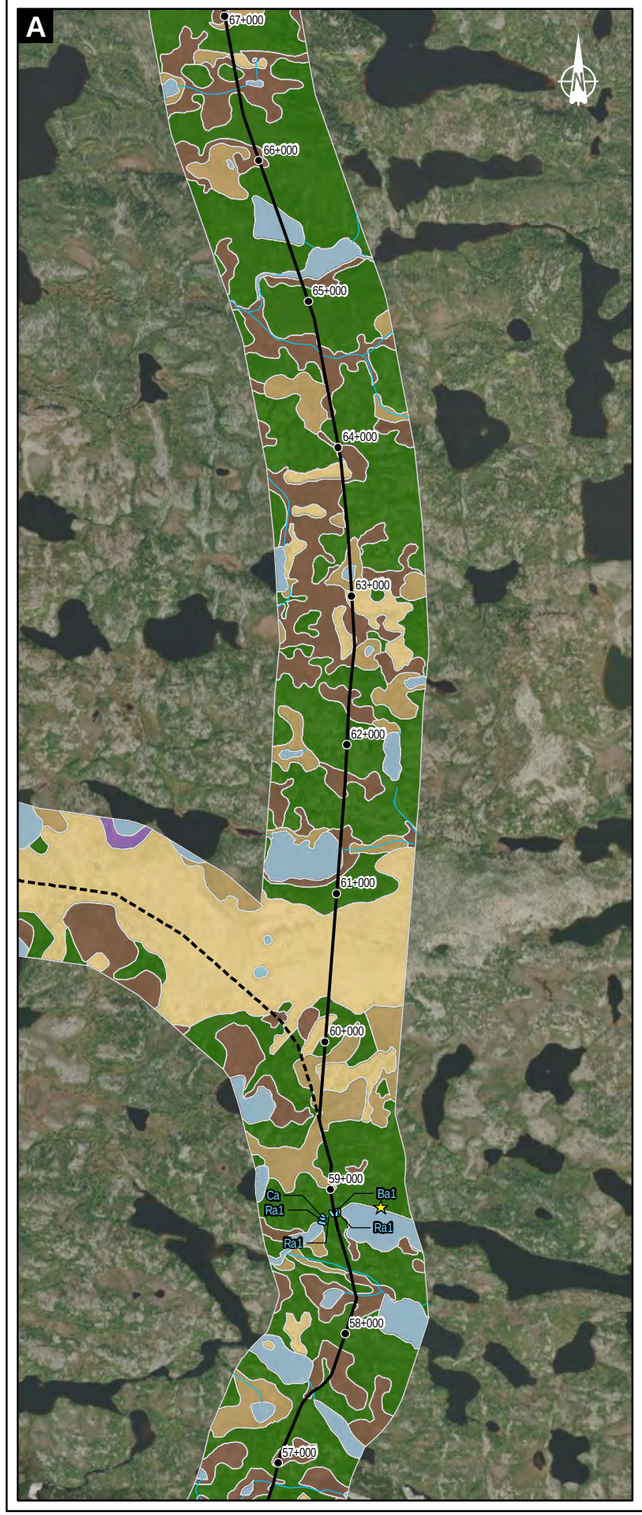

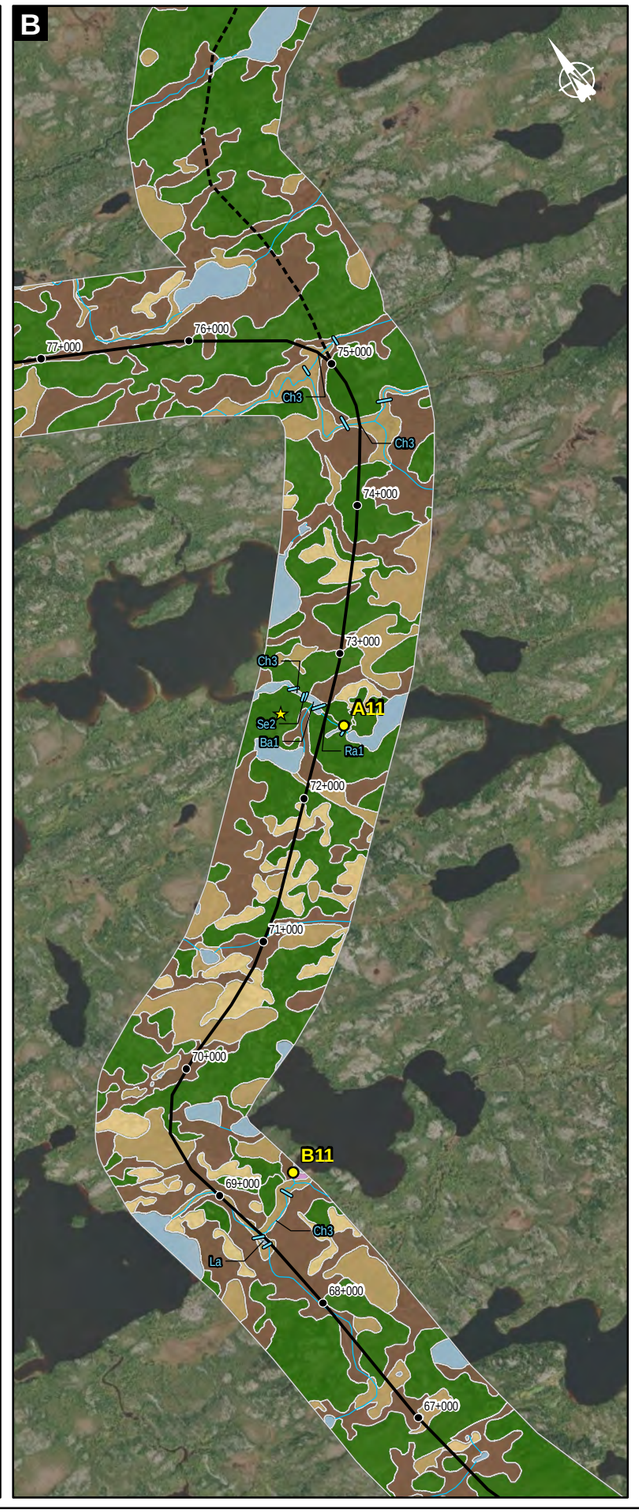

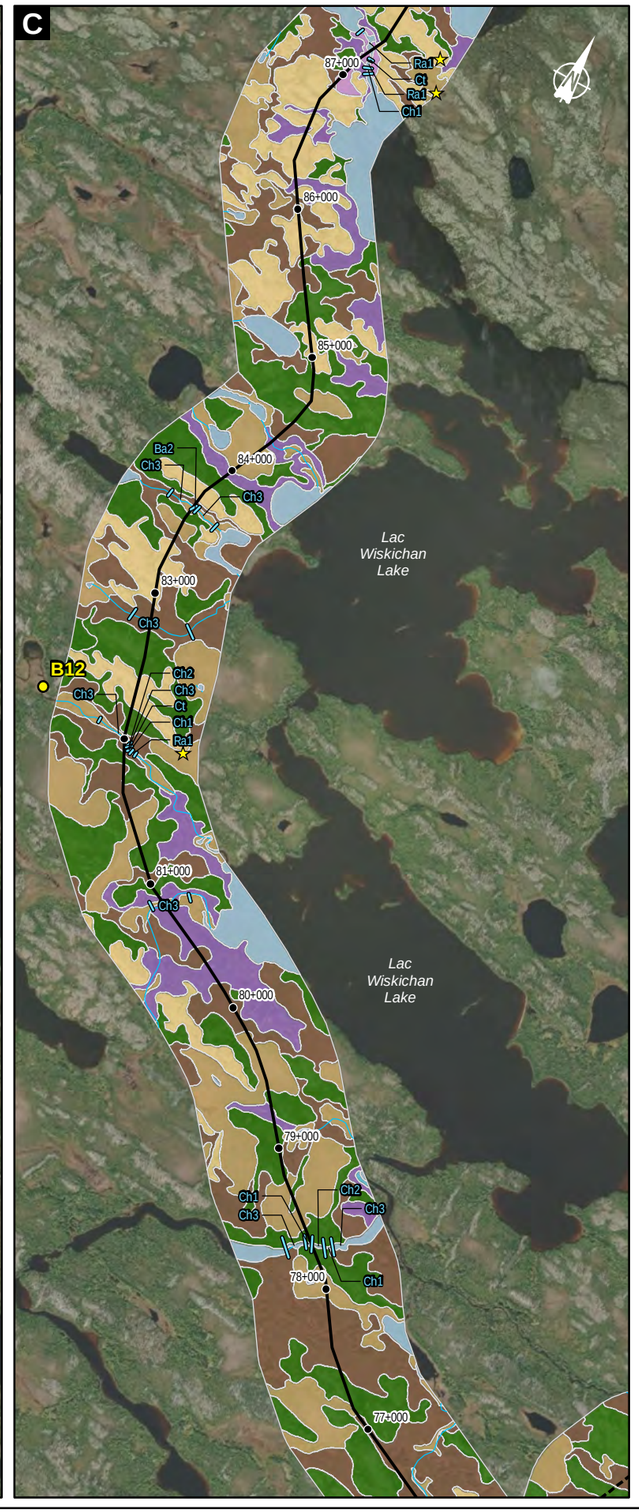

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
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Cascade	Ca	R/B^x	B
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Seuil 1 / Sill 1	Se1	G/B	C
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Chenal 1 / Channel 1	Ch1	G/B	C
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Chenal 3 / Channel 3	Ch3	V/S	C
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Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
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Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 10 / Map 10
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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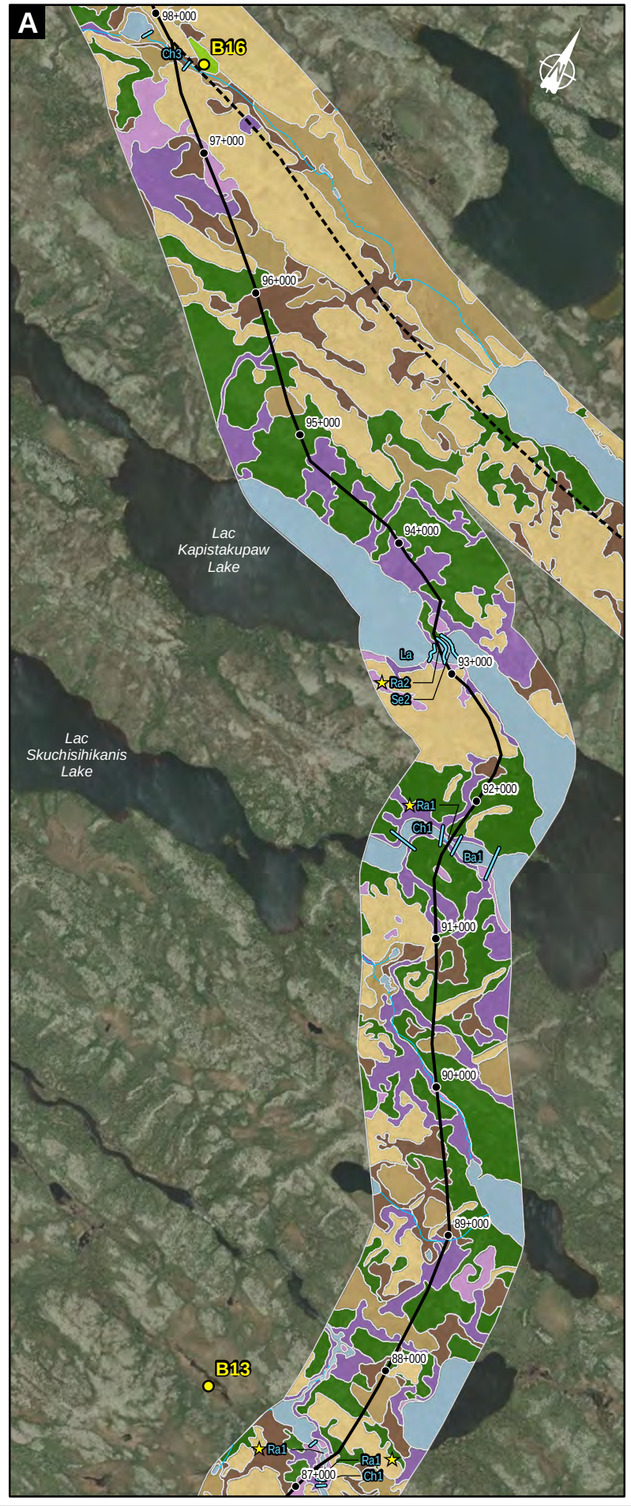

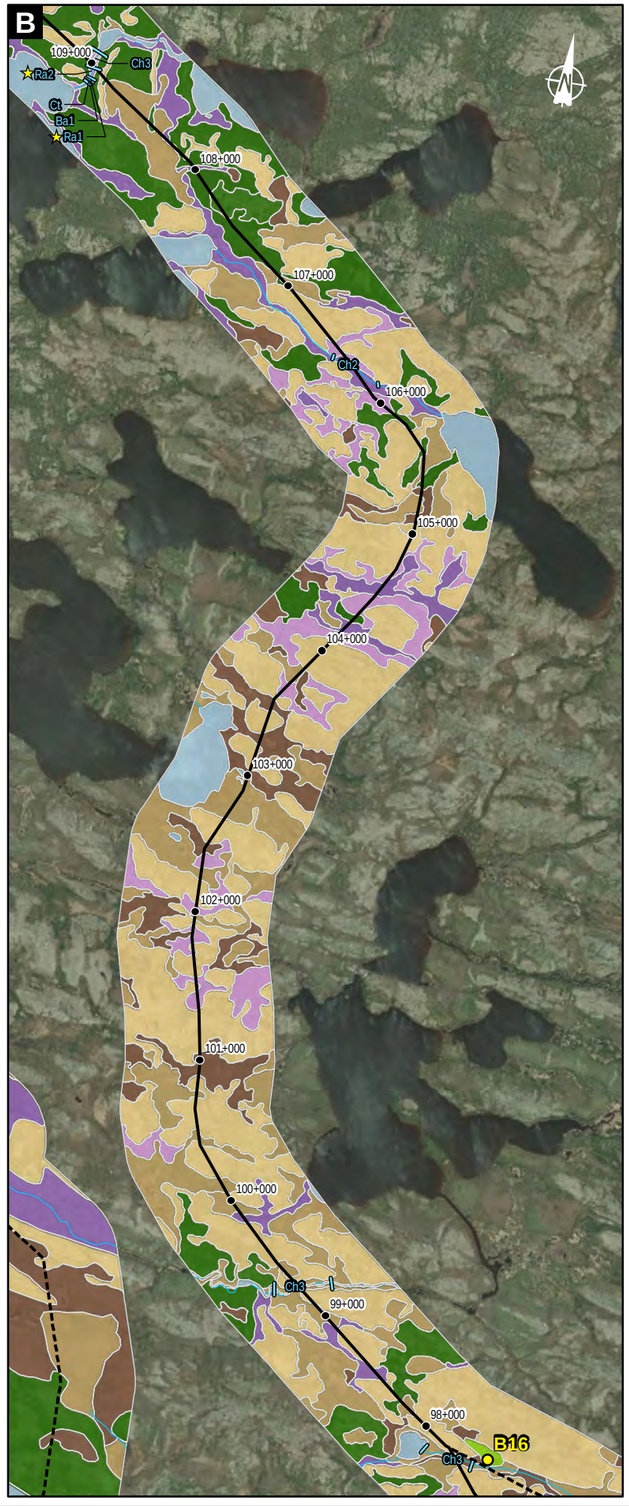

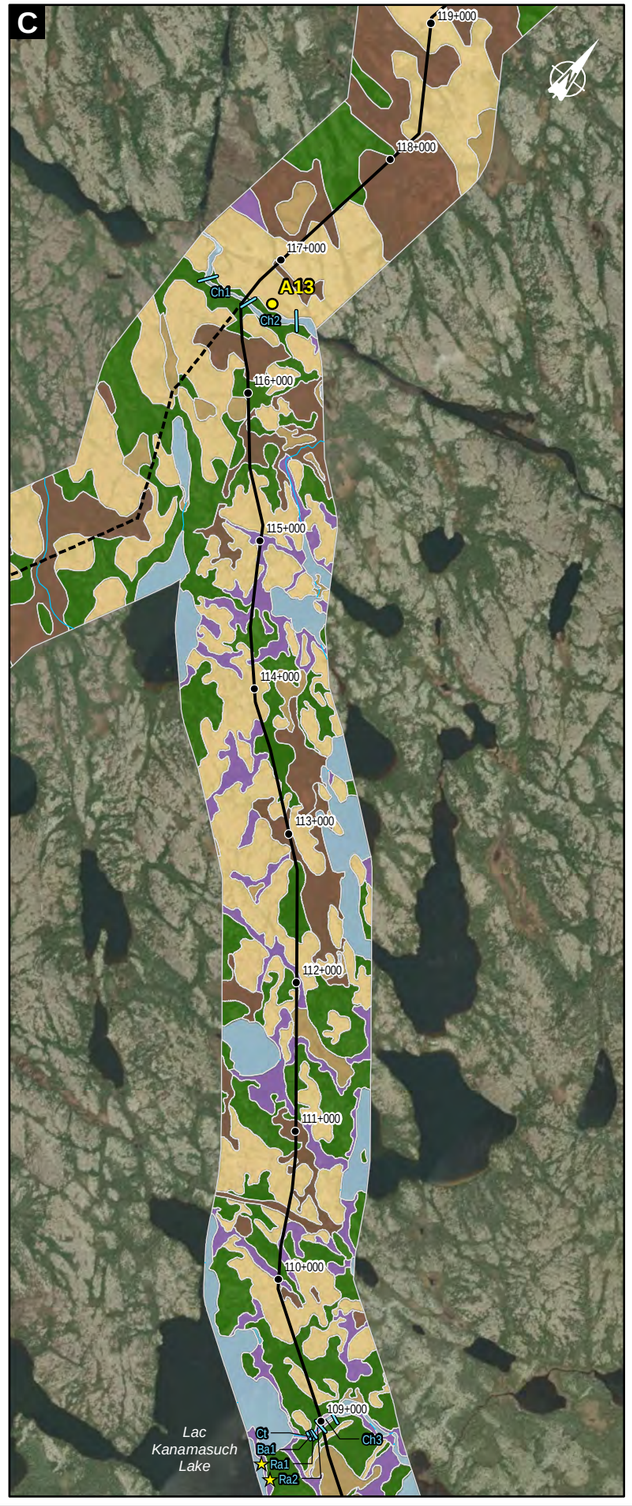

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
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- Feuillus/Mélangé / Deciduous/Mixed
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Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
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Habitat aquatique / Aquatic habitat

Limite de segment homogène d'habitat / Boundary of aquatic habitat segment

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Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
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Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
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Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^x	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
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Réseau routier / Road network

- Route projetée / Proposed road
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LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 11 / Map 11
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice
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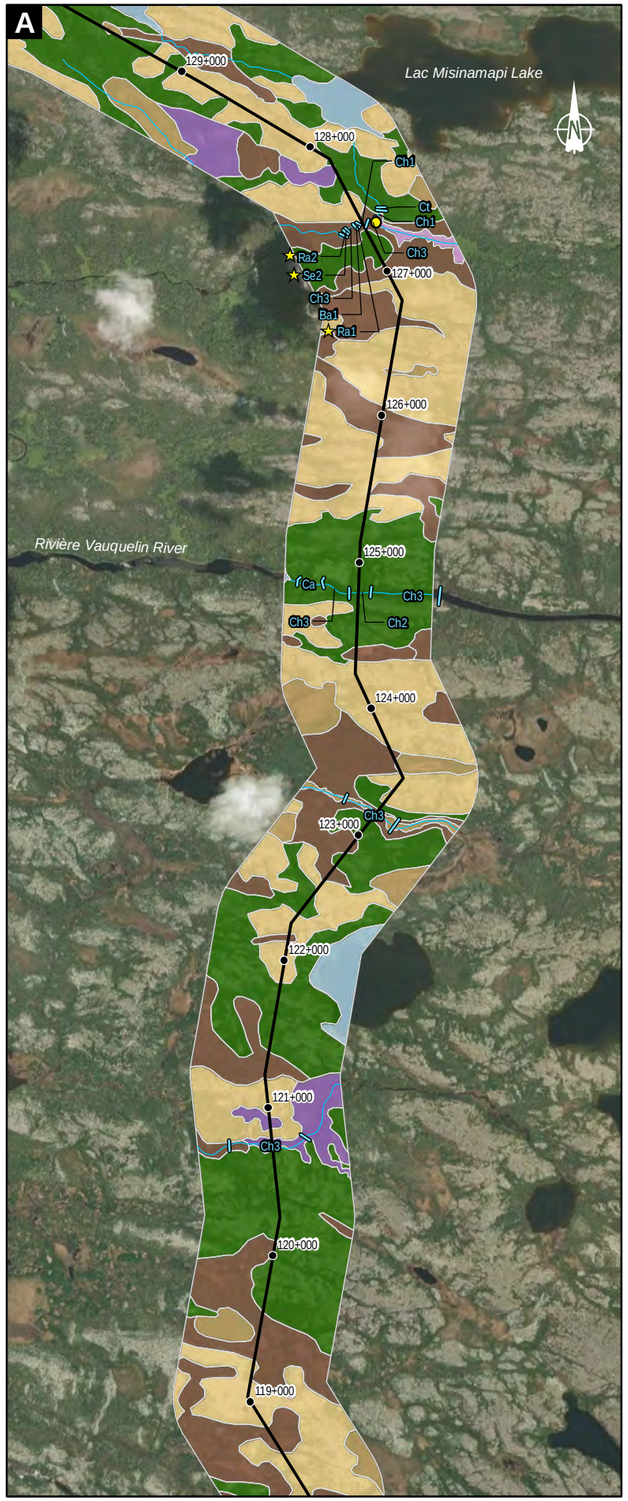

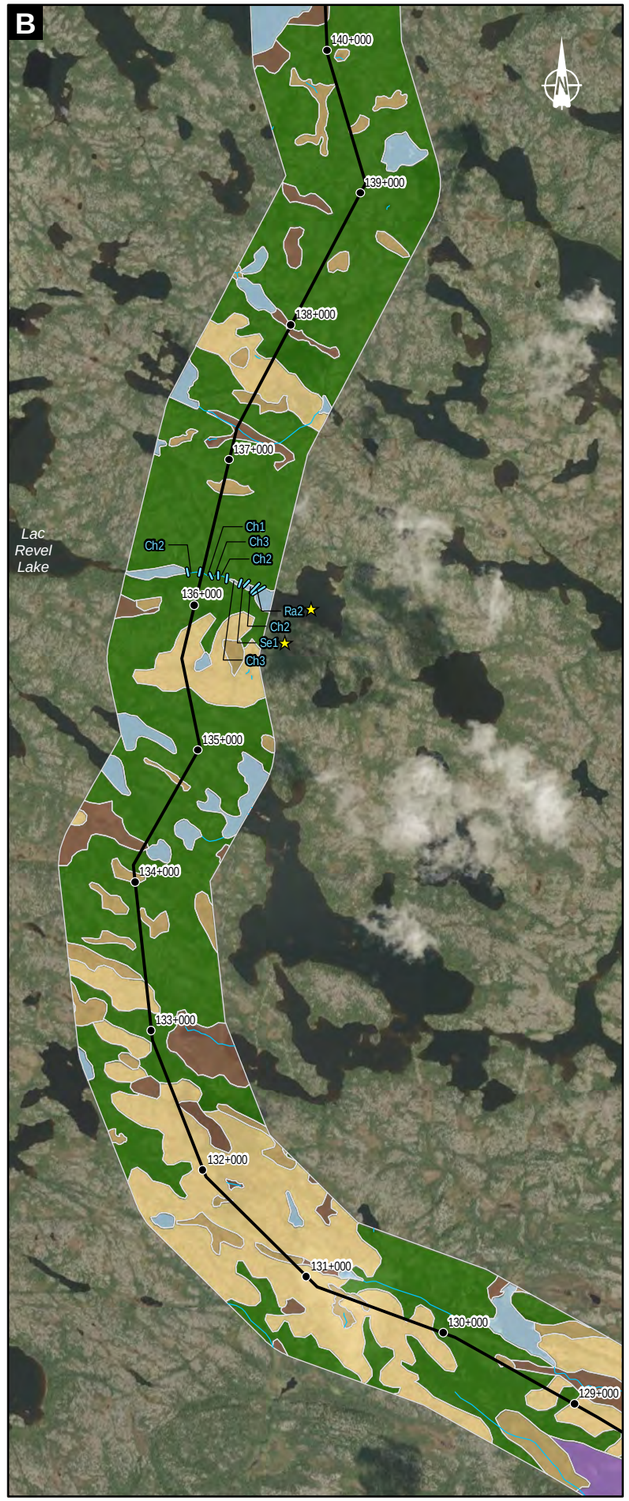

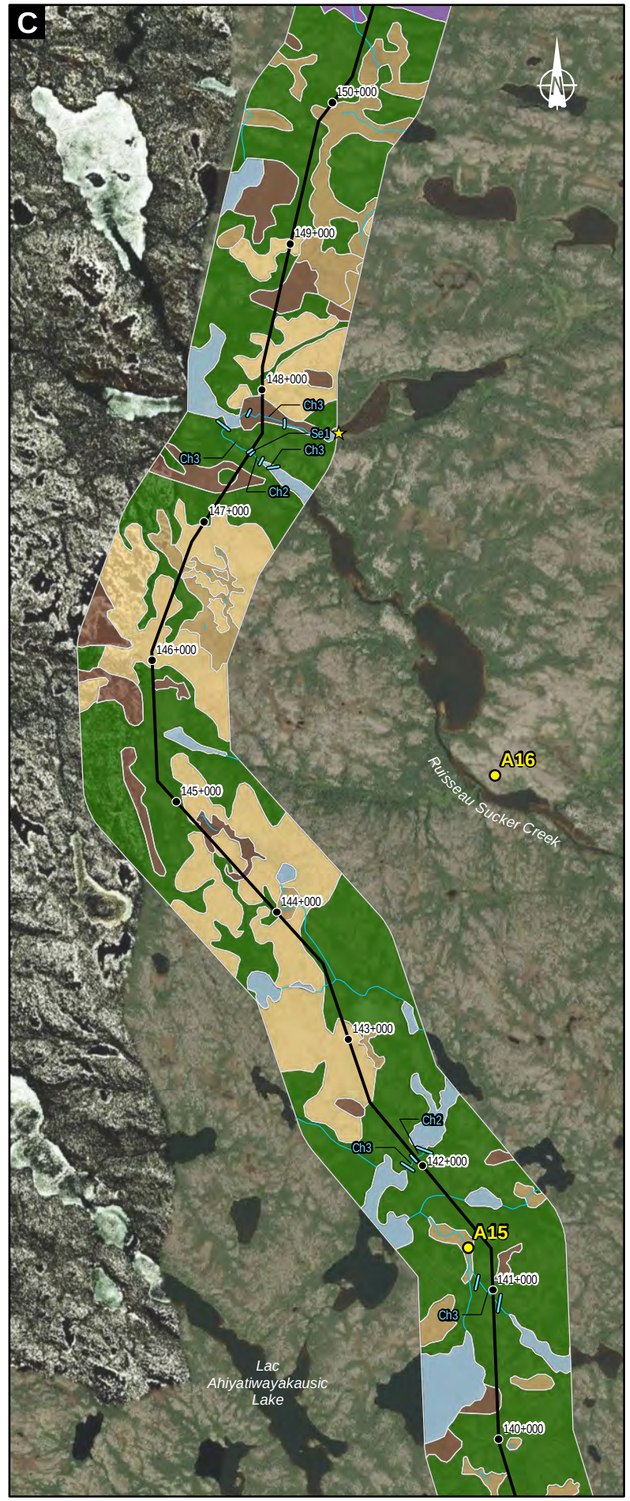

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

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Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
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Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
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Réseau routier / Road network

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LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 12 / Map 12
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
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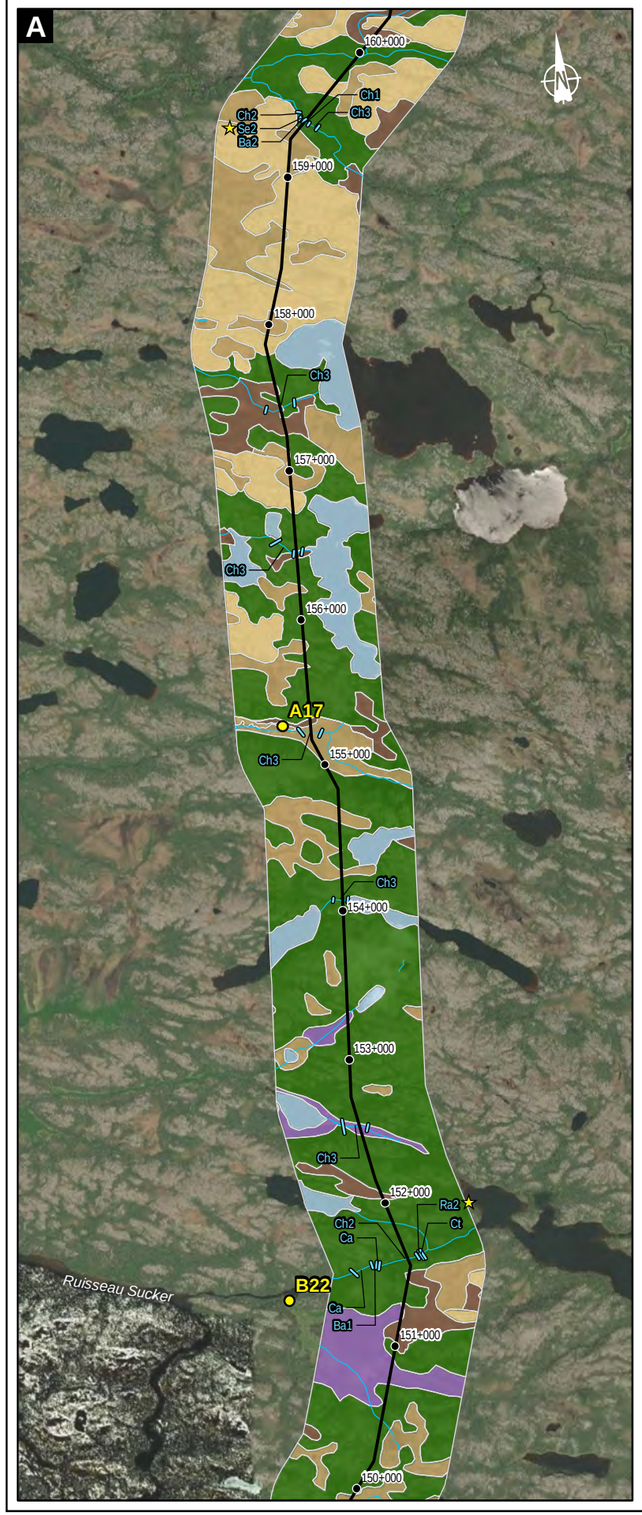

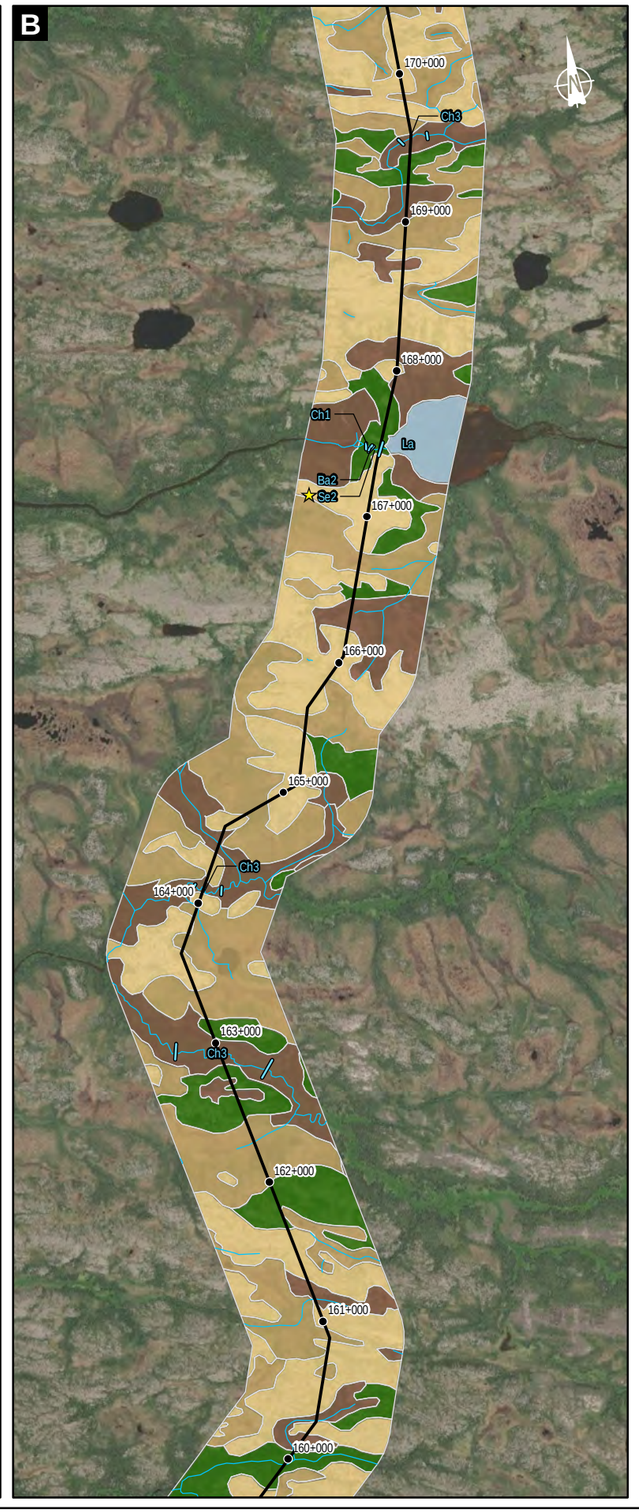

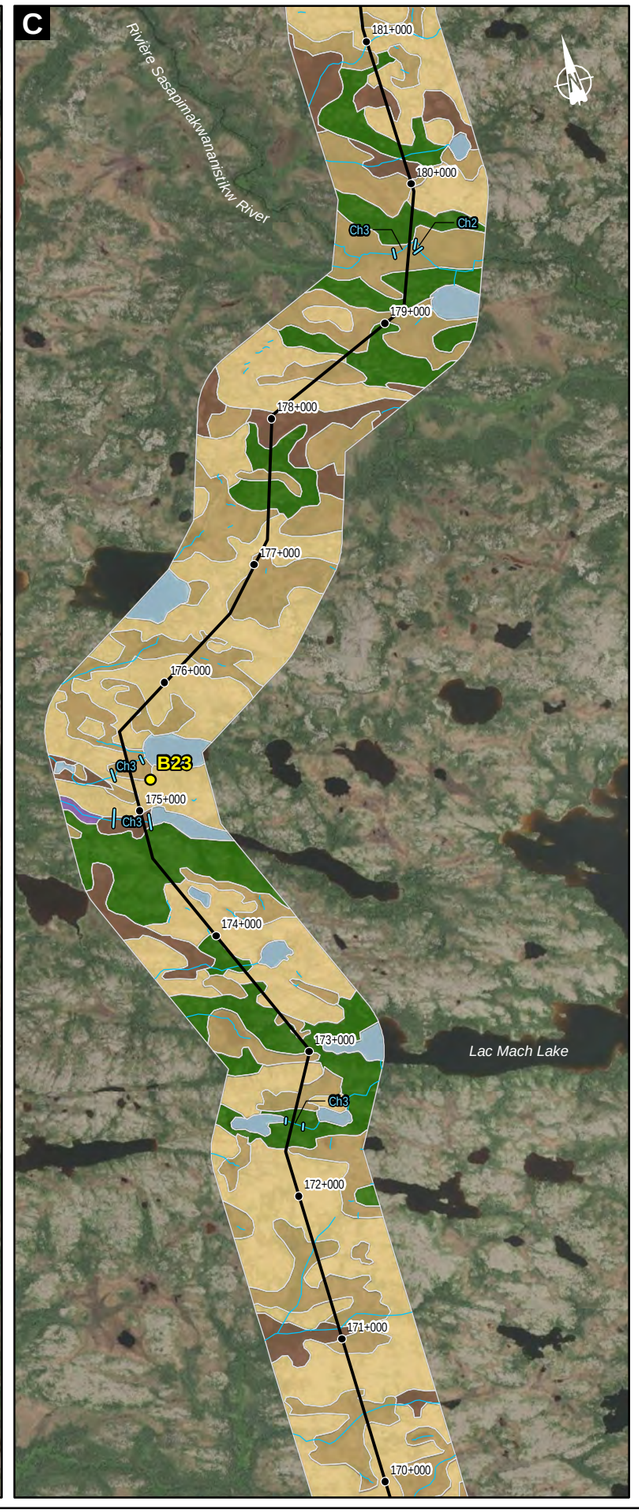

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
- Marais / Marsh
- Marécage arborescent / Tree swamp
- Marécage arbustif / Shrub swamp
- Tourbière boisée / Treed peatland
- Tourbière ouverte / Open peatland

Végétation terrestre / Terrestrial vegetation

- Feuillus/Mélangé / Deciduous/Mixed
- Résineux / Conifer
- Herbacée-Mousse-Lichen / Herbaceous-Moss-Lichen

Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
- Plan d'eau / Waterbody

Habitat aquatique / Aquatic habitat

- Limite de segment homogène d'habitat / Boundary of aquatic habitat segment
- Les seuils (Se) et le pied des rapides (Ra) sont les faciès les plus propices à la fraie des poissons / The sills (Se) and the foot of rapids (Ra) are the most suitable habitats for fish spawning

Description des habitats types / Typical habitat description

Habitat type	Faciès d'écoulement / Flow facies	Substrat dominant / Dominant substrate	Substrat sous-dominant / Subdominant substrate
Chute / Fall	Ct	R	B^x
Cascade	Ca	R/B^x	B
Rapide 1 / Rapids 1	Ra1	B/B^x	G/R
Rapide 2 / Rapids 2	Ra2	G	C/G/R
Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
Lac / Lake	La	V/S	B/G/C

Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^x	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
B	Bloc / Block	250 à/to 1000 mm	S	Sable / Sand	0,125 à/to 4 mm
G	Galet / Cobble	64 à/to 250 mm	L	Limon / Silt	< 0,125 mm

Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 13 / Map 13
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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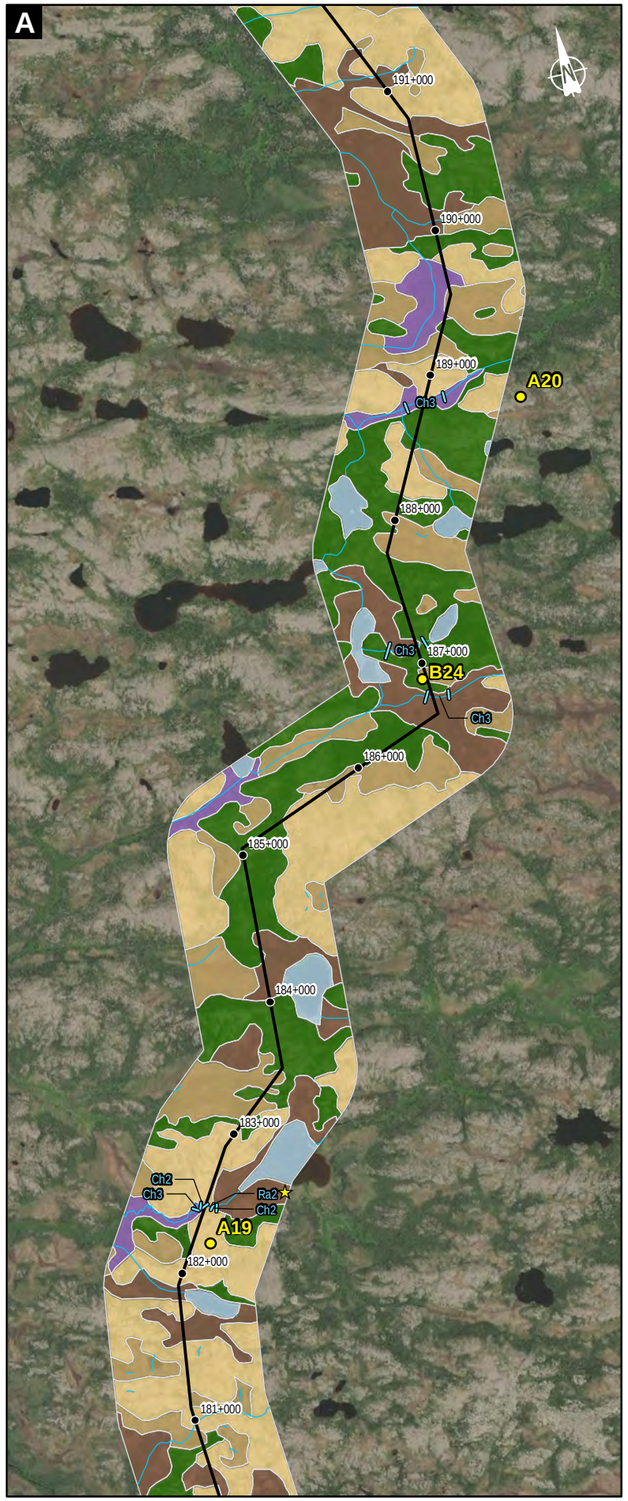

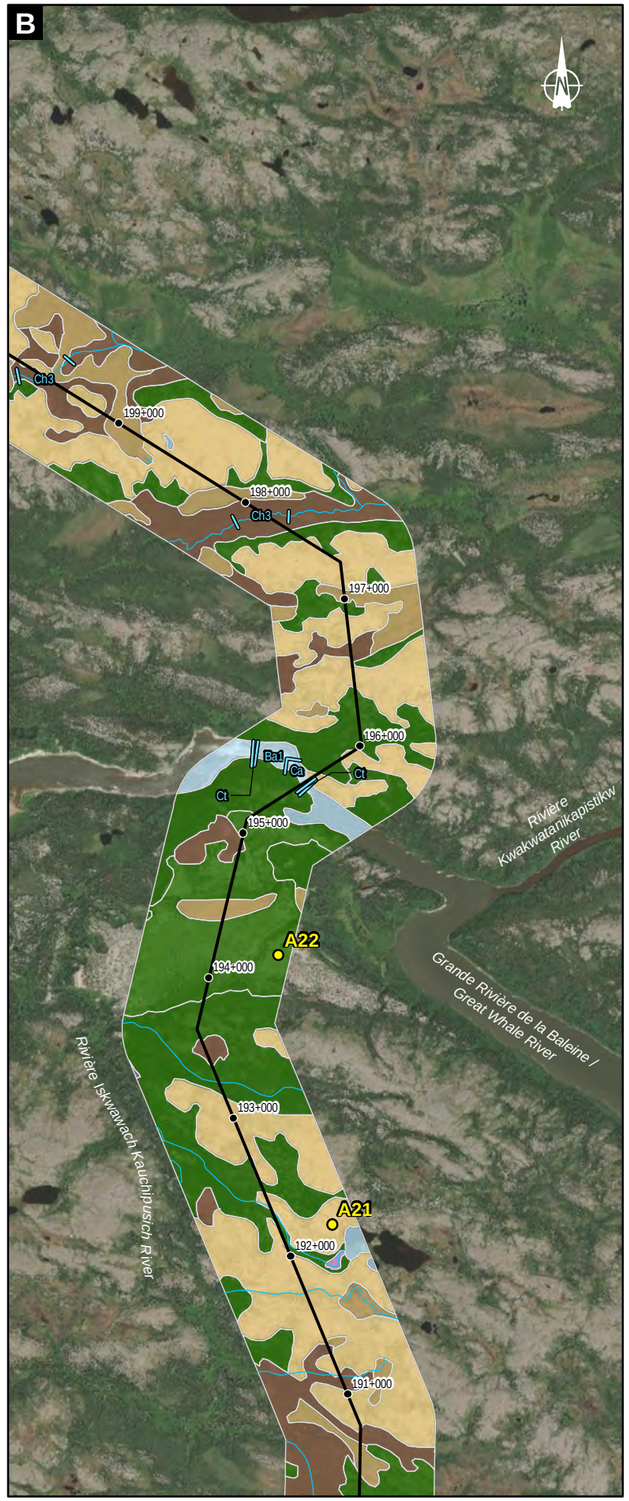

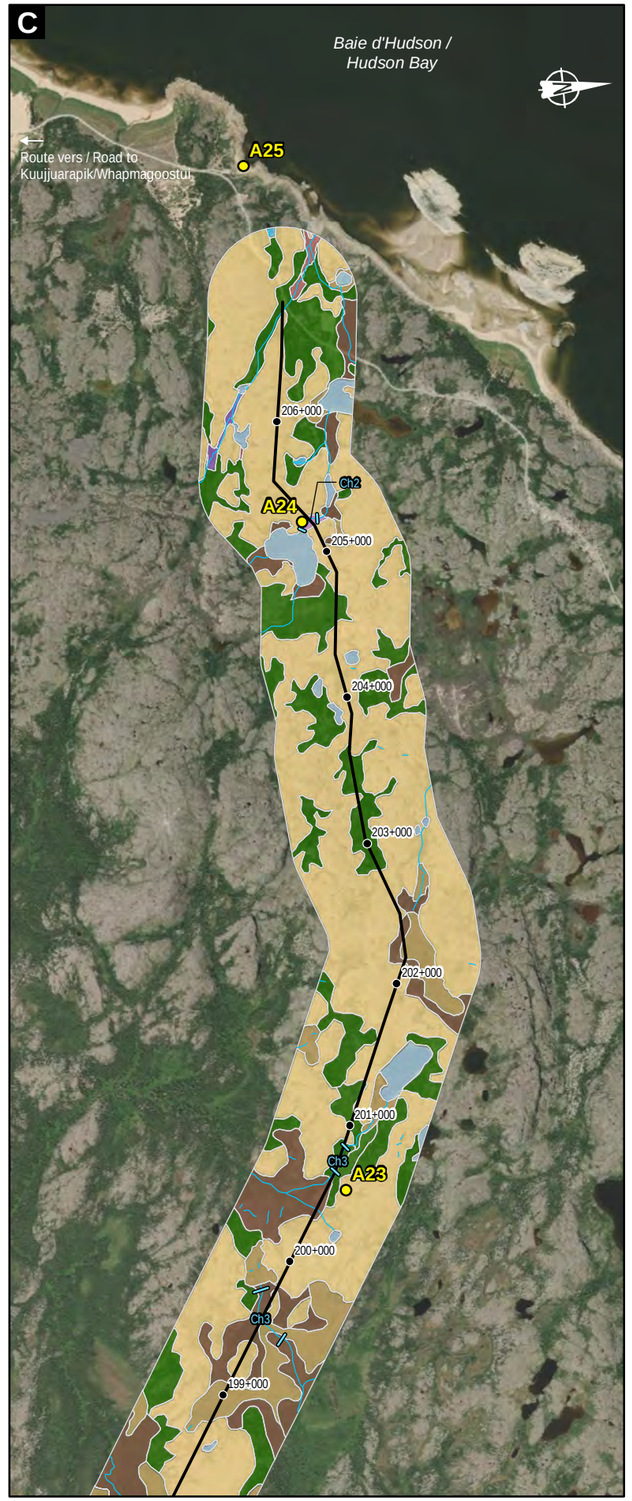

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
- Marais / Marsh
- Marécage arborescent / Tree swamp
- Marécage arbustif / Shrub swamp
- Tourbière boisée / Treed peatland
- Tourbière ouverte / Open peatland

Végétation terrestre / Terrestrial vegetation

- Feuillus/Mélangé / Deciduous/Mixed
- Résineux / Conifer
- Herbacée-Mousse-Lichen / Herbaceous-Moss-Lichen

Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
- Plan d'eau / Waterbody

Habitat aquatique / Aquatic habitat

- Limite de segment homogène d'habitat / Boundary of aquatic habitat segment
- Les seuils (Se) et le pied des rapides (Ra) sont les faciès les plus propices à la fraie des poissons / The sills (Se) and the foot of rapids (Ra) are the most suitable habitats for fish spawning

Description des habitats types / Typical habitat description

Habitat type	Faciès d'écoulement / Flow facies	Substrat dominant / Dominant substrate	Substrat sous-dominant / Subdominant substrate
Chute / Fall	Ct	R	B^X
Cascade	Ca	R/B^X	B
Rapide 1 / Rapids 1	Ra1	B/B^X	G/R
Rapide 2 / Rapids 2	Ra2	G	C/G/R
Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
Lac / Lake	La	V/S	B/G/C

Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^X	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
B	Bloc / Block	250 à/to 1000 mm	S	Sable / Sand	0,125 à/to 4 mm
G	Galet / Cobble	64 à/to 250 mm	L	Limon / Silt	< 0,125 mm

Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 14 / Map 14
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice
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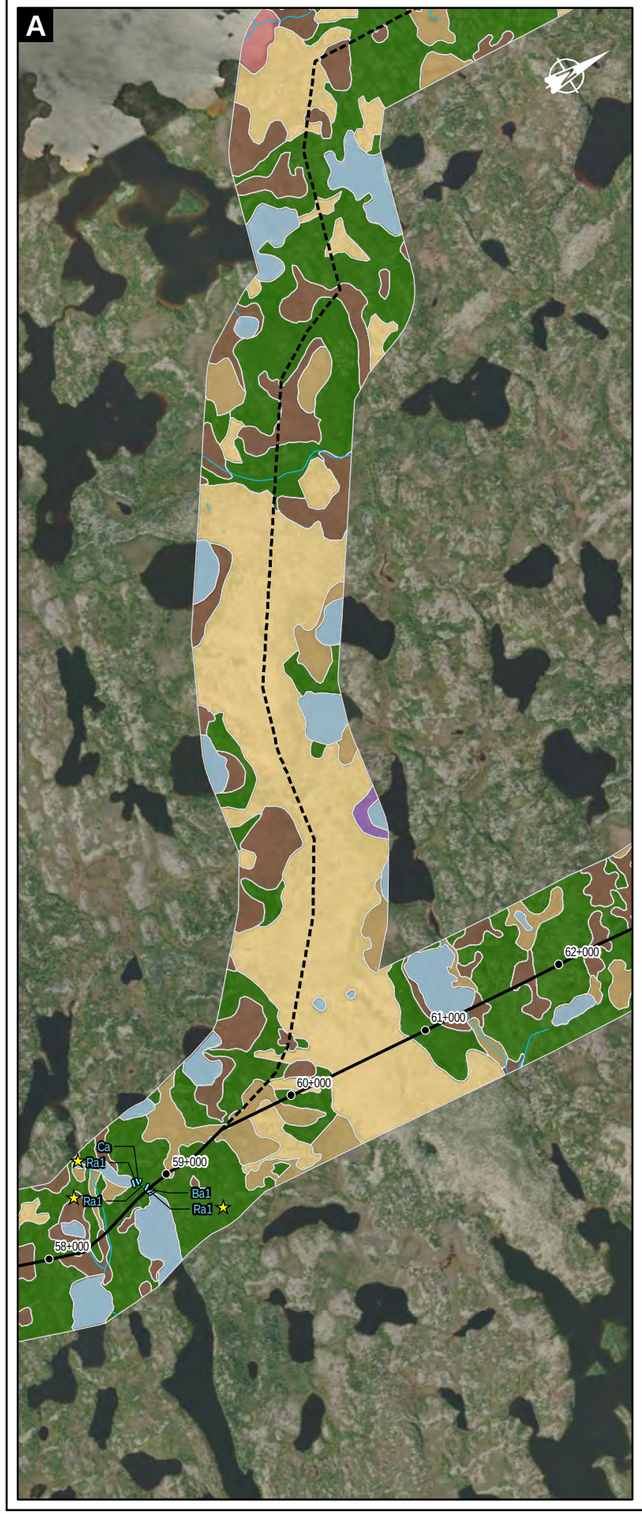

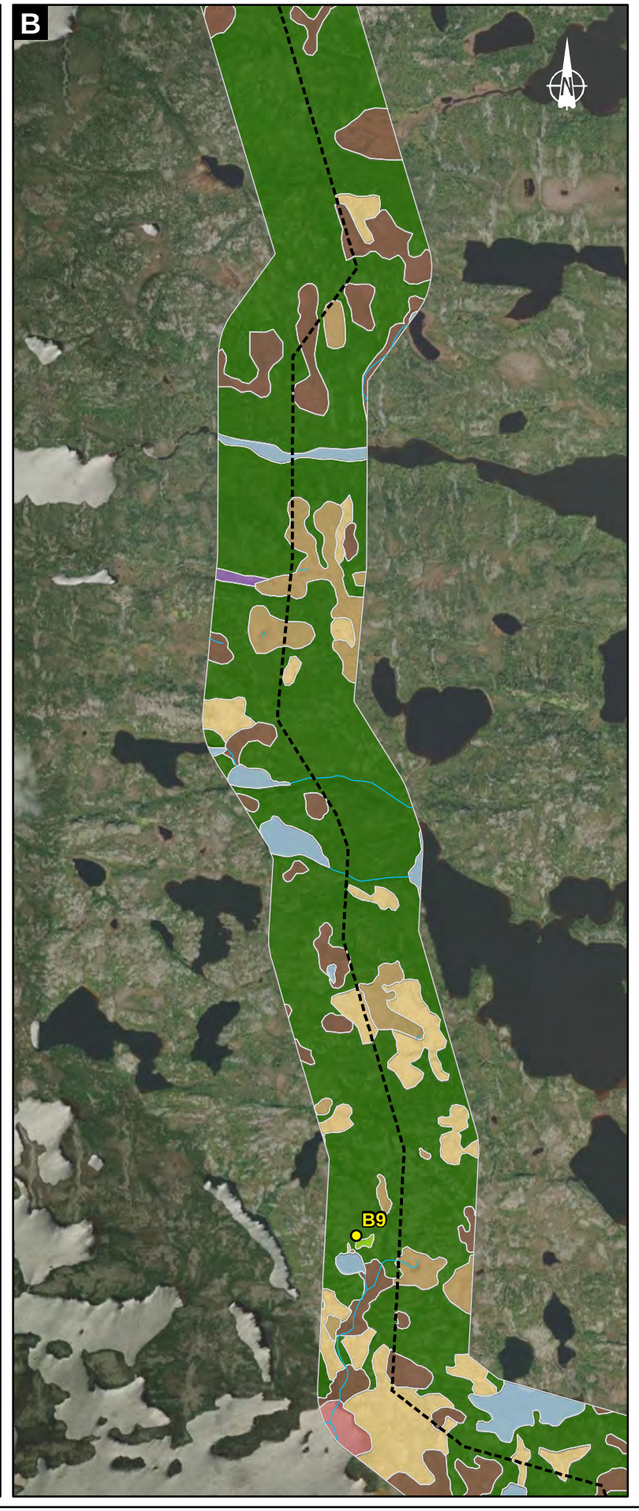

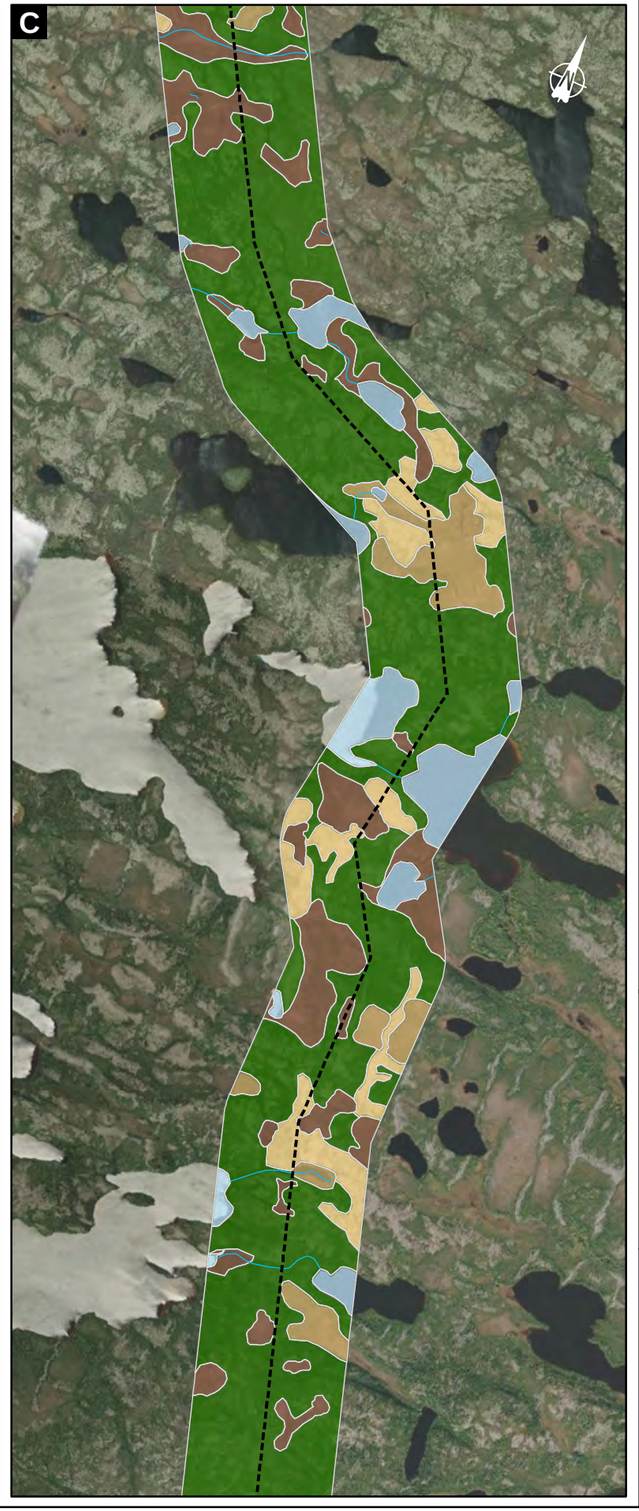

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
- Marais / Marsh
- Marécage arborescent / Tree swamp
- Marécage arbustif / Shrub swamp
- Tourbière boisée / Treed peatland
- Tourbière ouverte / Open peatland

Végétation terrestre / Terrestrial vegetation

- Feuillus/Mélangé / Deciduous/Mixed
- Résineux / Conifer
- Herbacée-Mousse-Lichen / Herbaceous-Moss-Lichen

Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
- Plan d'eau / Waterbody

Habitat aquatique / Aquatic habitat

- Limite de segment homogène d'habitat / Boundary of aquatic habitat segment
- Les seuils (Se) et le pied des rapides (Ra) sont les faciès les plus propices à la fraie des poissons / The sills (Se) and the foot of rapids (Ra) are the most suitable habitats for fish spawning

Description des habitats types / Typical habitat description

Habitat type	Faciès d'écoulement / Flow facies	Substrat dominant / Dominant substrate	Substrat sous-dominant / Subdominant substrate
Chute / Fall	Ct	R	B^x
Cascade	Ca	R/B^x	B
Rapide 1 / Rapids 1	Ra1	B/B^x	G/R
Rapide 2 / Rapids 2	Ra2	G	C/G/R
Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
Lac / Lake	La	V/S	B/G/C

Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^x	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
B	Bloc / Block	250 à/to 1000 mm	S	Sable / Sand	0,125 à/to 4 mm
G	Galet / Cobble	64 à/to 250 mm	L	Limon / Silt	< 0,125 mm

Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 15 / Map 15
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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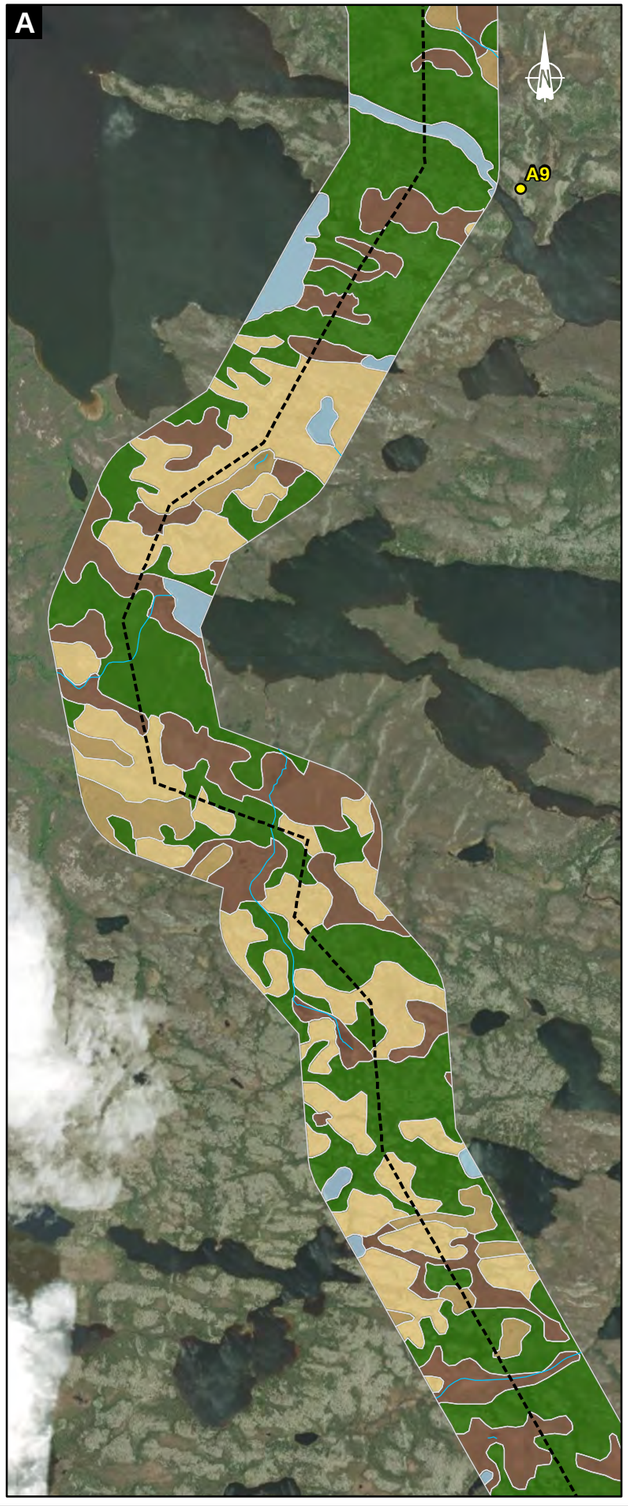

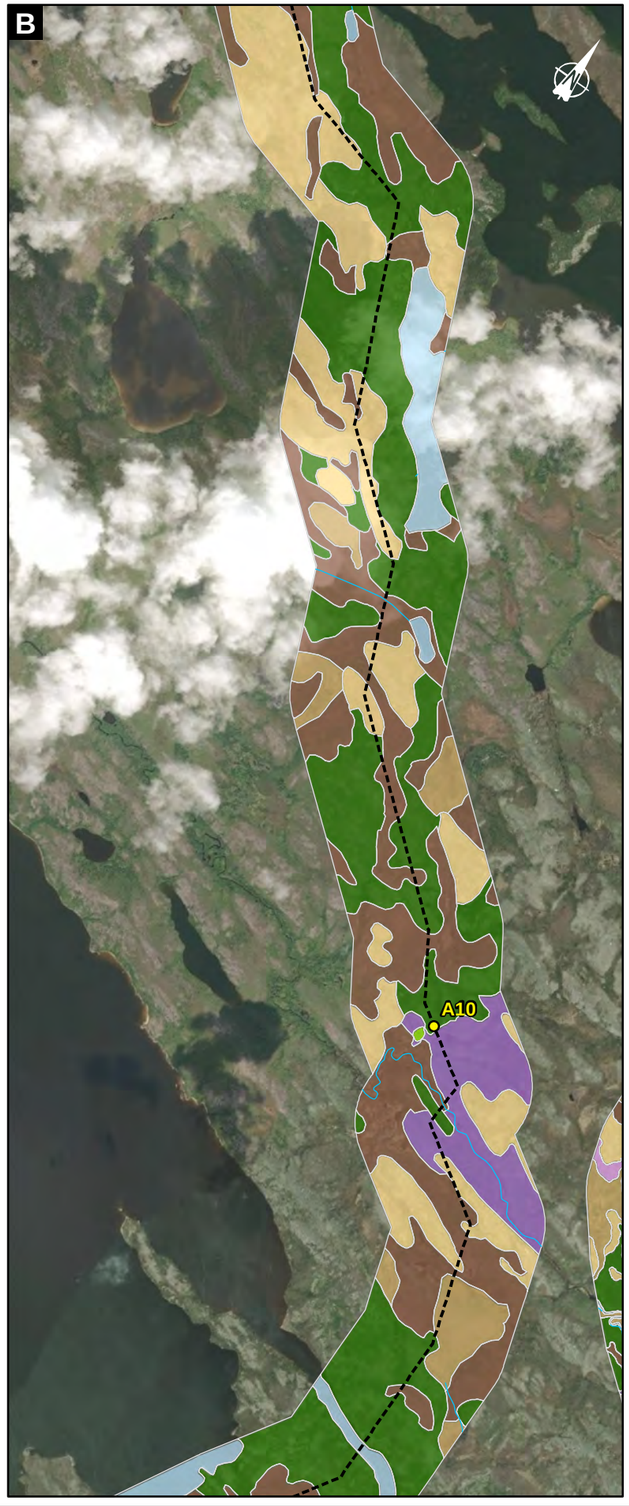

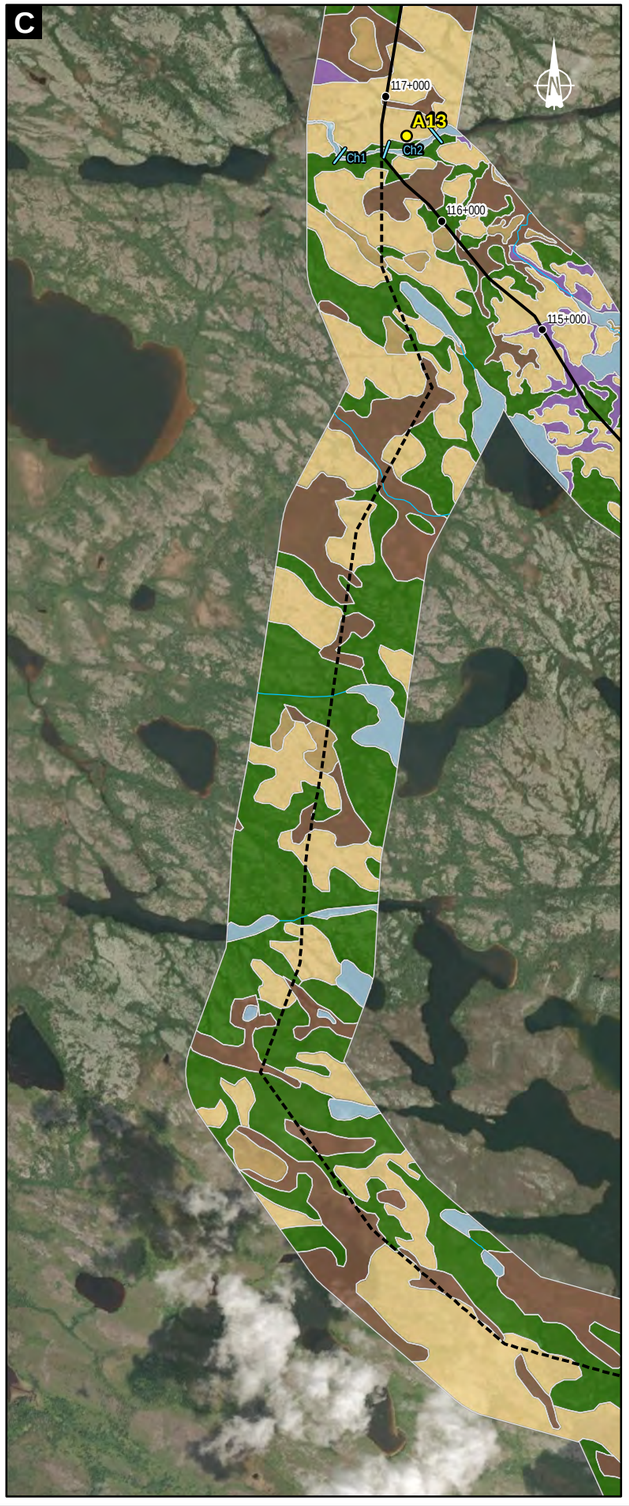

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
- Marais / Marsh
- Marécage arborescent / Tree swamp
- Marécage arbustif / Shrub swamp
- Tourbière boisée / Treed peatland
- Tourbière ouverte / Open peatland

Végétation terrestre / Terrestrial vegetation

- Feuillus/Mélangé / Deciduous/Mixed
- Résineux / Conifer
- Herbacée-Mousse-Lichen / Herbaceous-Moss-Lichen

Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
- Plan d'eau / Waterbody

Habitat aquatique / Aquatic habitat

- Limite de segment homogène d'habitat / Boundary of aquatic habitat segment
- Les seuils (Se) et le pied des rapides (Ra) sont les faciès les plus propices à la fraie des poissons / The sills (Se) and the foot of rapids (Ra) are the most suitable habitats for fish spawning

Description des habitats types / Typical habitat description

Habitat type	Faciès d'écoulement / Flow facies	Substrat dominant / Dominant substrate	Substrat sous-dominant / Subdominant substrate
Chute / Fall	Ct	R	B^x
Cascade	Ca	R/B^x	B
Rapide 1 / Rapids 1	Ra1	B/B^x	G/R
Rapide 2 / Rapids 2	Ra2	G	C/G/R
Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
Lac / Lake	La	V/S	B/G/C

Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^x	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
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Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 16 / Map 16
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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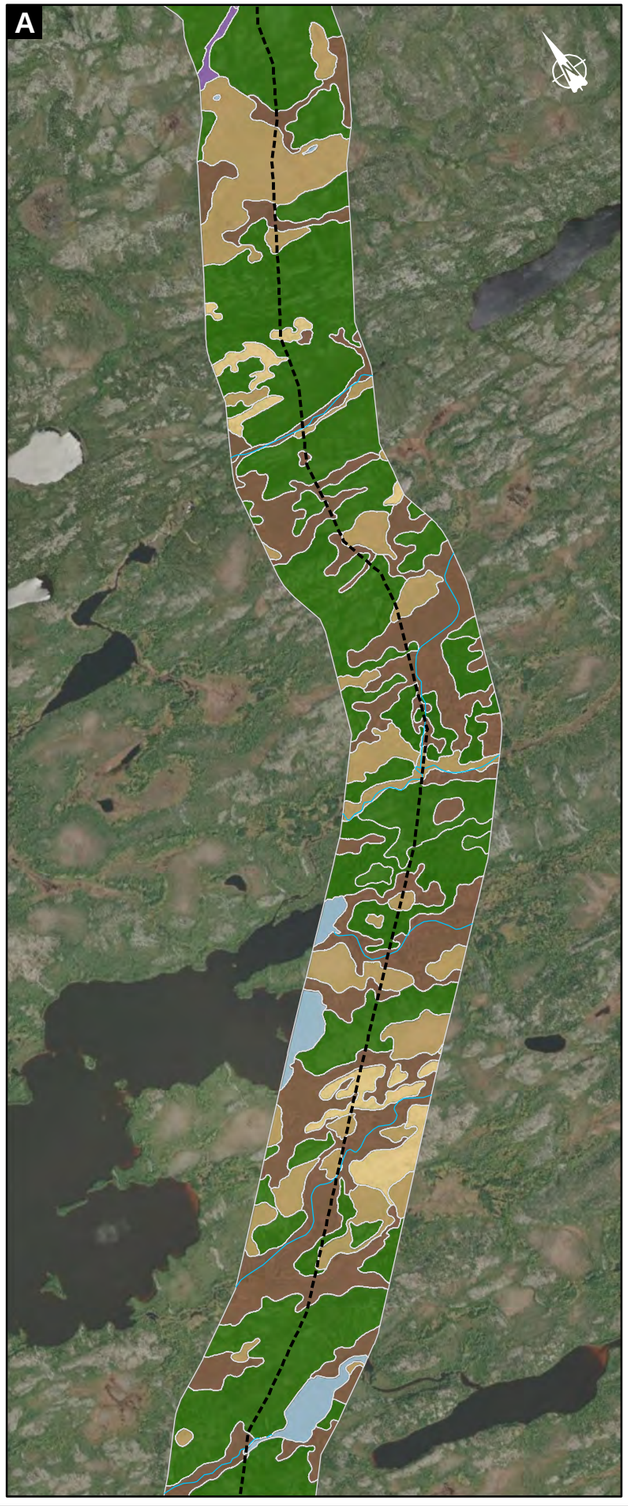

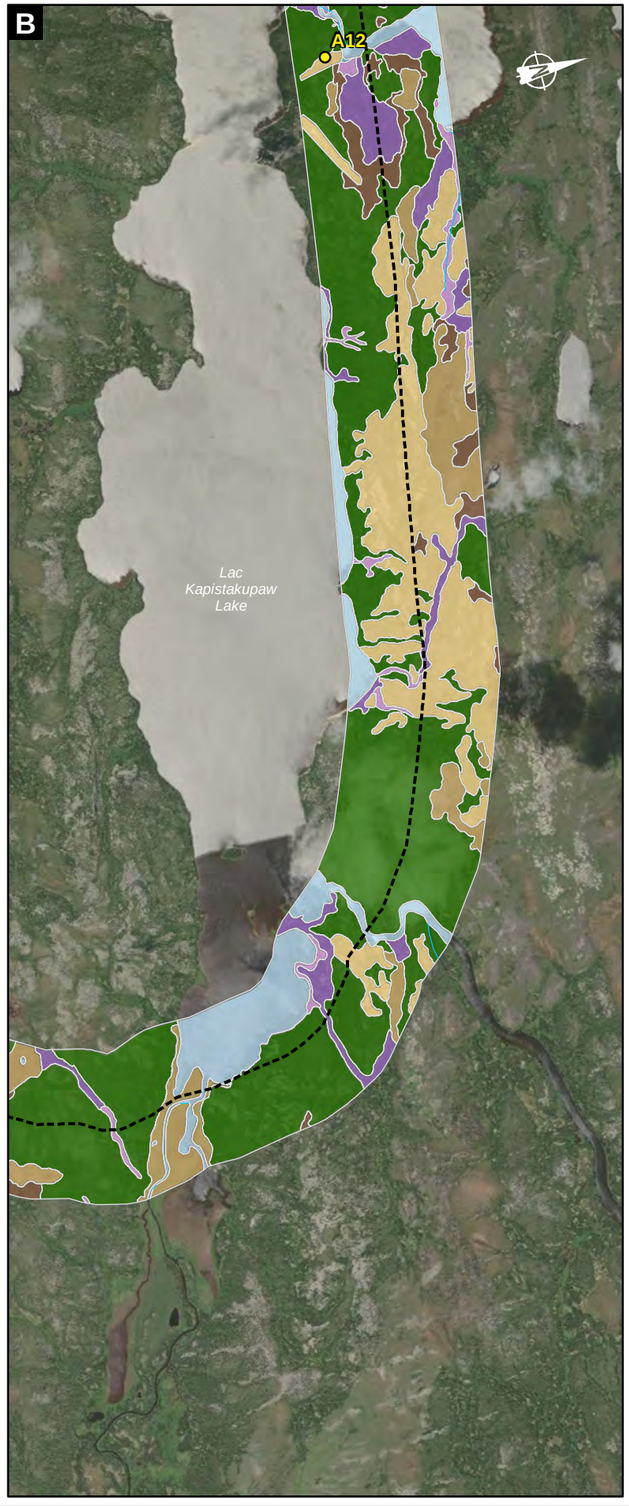

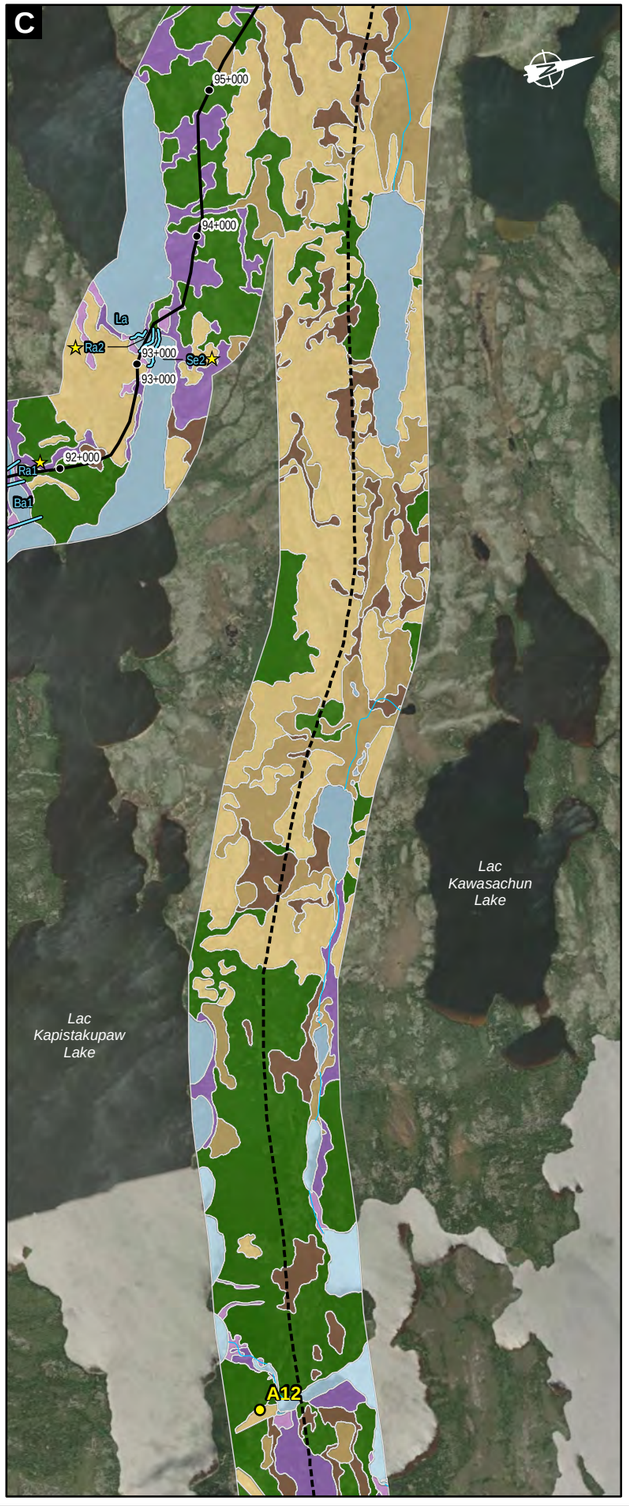

Site d'inventaire (site d'atterissage de l'hélicoptère / Survey site (helicopter landing site)

Photo-interprétation / Photo-interpretation

Milieux humides / Wetlands

- Eau peu profonde / Shallow water
- Marais / Marsh
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Milieux non végétalisés / Non-vegetated areas

- Anthropique / Anthopogenic
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Description des habitats types / Typical habitat description

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Cascade	Ca	R/B^x	B
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Rapide 2 / Rapids 2	Ra2	G	C/G/R
Seuil 1 / Sill 1	Se1	G/B	C
Seuil 2 / Sill 2	Se2	G/C	B/V
Chenal 1 / Channel 1	Ch1	G/B	C
Chenal 2 / Channel 2	Ch2	C/V	S/G
Chenal 3 / Channel 3	Ch3	V/S	C
Bassin / Basin	Ba1	V/S	B/G/C
Bassin / Basin	Ba2	V/S	
Lac / Lake	La	V/S	B/G/C

Classe granulométrique / Particle-size class

R	Roc / Rock	Roche-mère / Bedrock	C	Caillou / Pebble	32 à/to 64 mm
B^x	Bloc métrique / Metric block	> 1000 mm	V	Gravier / Gravel	4 à/to 32 mm
B	Bloc / Block	250 à/to 1000 mm	S	Sable / Sand	0,125 à/to 4 mm
G	Galet / Cobble	64 à/to 250 mm	L	Limon / Silt	< 0,125 mm

Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmagoostui/Kuujuuarapik / Feasibility study – Road between Radisson and Whapmagoostui/Kuujuuarapik

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 17 / Map 17
Photo-interprétation / Photo-interpretation

Sources :
AQréseau+, réseau routier, MERN, 2021
Canvec, 1:50 000, ressources naturelles Canada
Photo-interpretation, WSP 2022
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 400 800 m
UTM, zone 18, NAD83

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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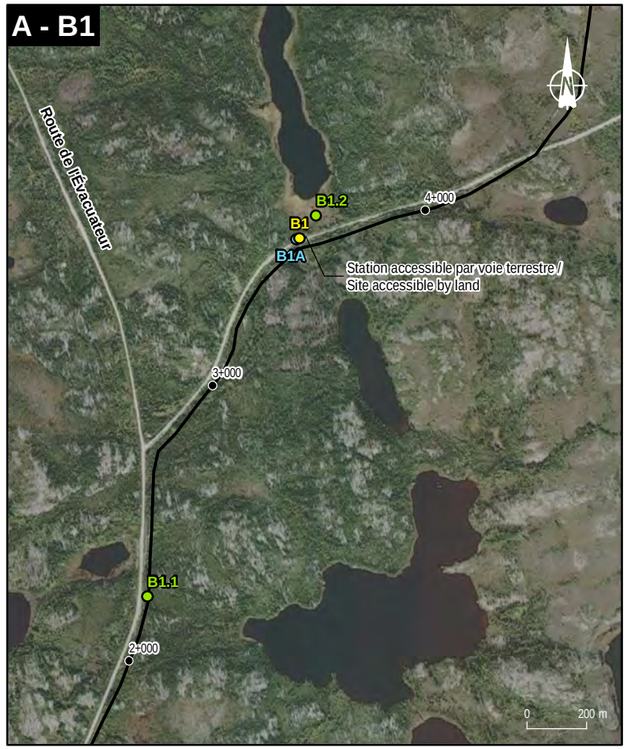
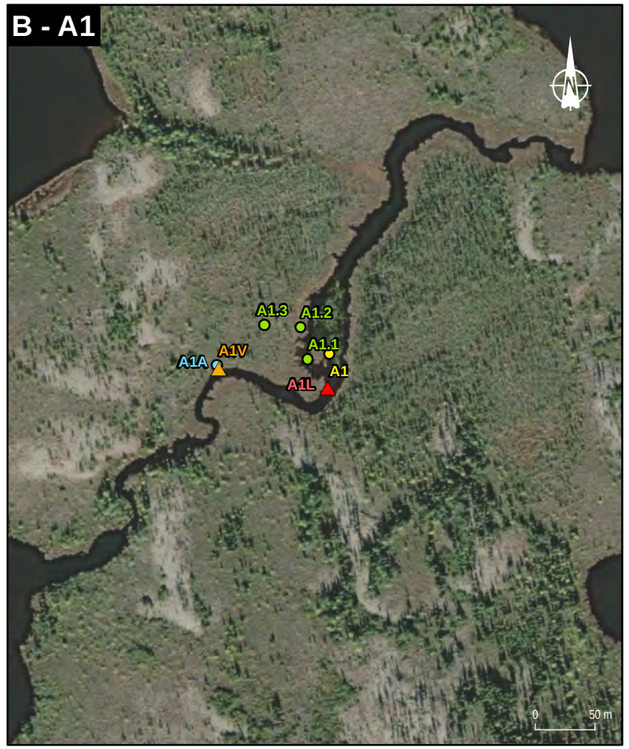
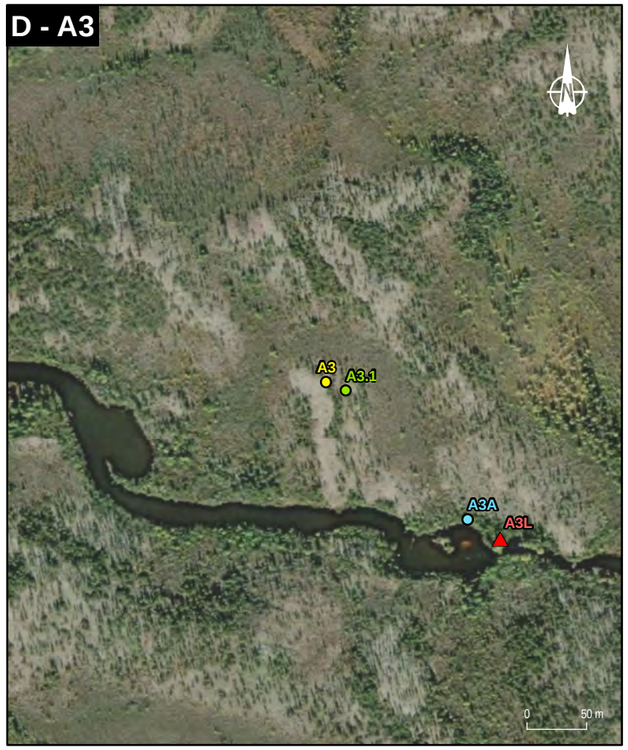
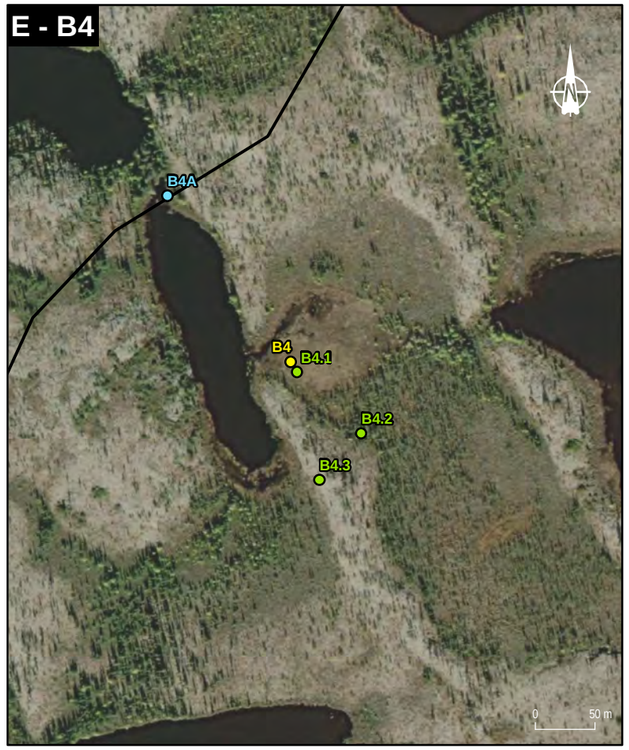
APPENDIX

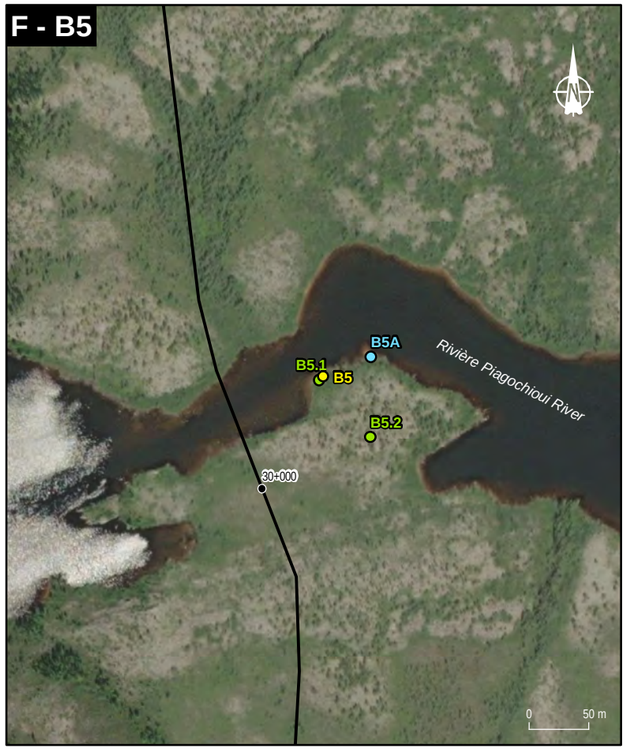
A-9 *MAP 18 TO 23: SURVEY SITES OF 2022*











Site d'atterissage de l'hélicoptère / Helicopter landing site

Station d'inventaire de la végétation
Vegetation survey site

Stations d'inventaire du milieu aquatique / Aquatic habitat survey site

- Pêche à la ligne / Angling
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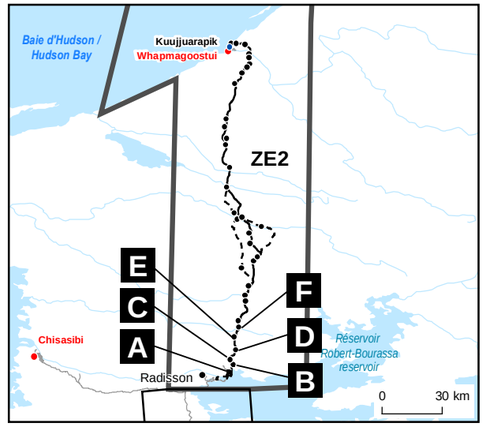
- Obstacle infranchissable (chute) / Impassable obstacle (fall)

Réseau routier / Road network

- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative



LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmahoostui / Feasibility study – Road between Radisson and Whapmahoostui

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 18 / Map 18
Sites d'inventaires / Survey Sites

Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/1 000 000, MERN, Québec, 2021
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

Décembre 2022 /
December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice
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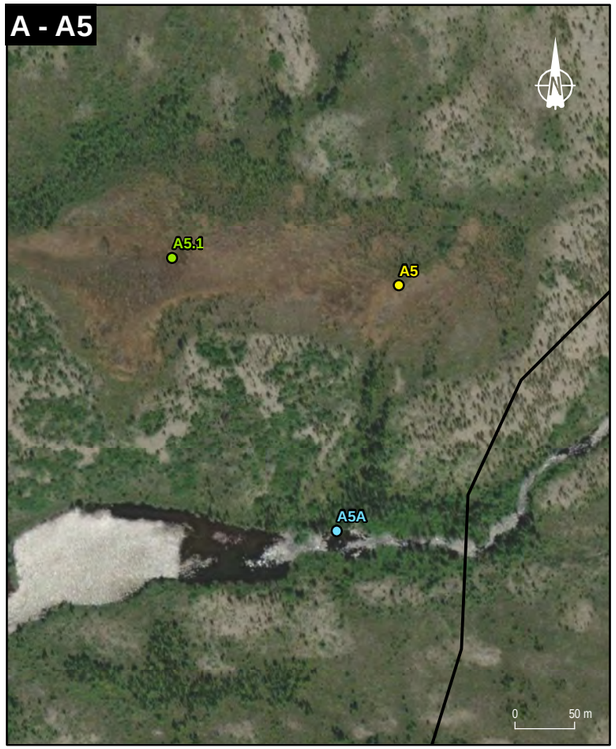

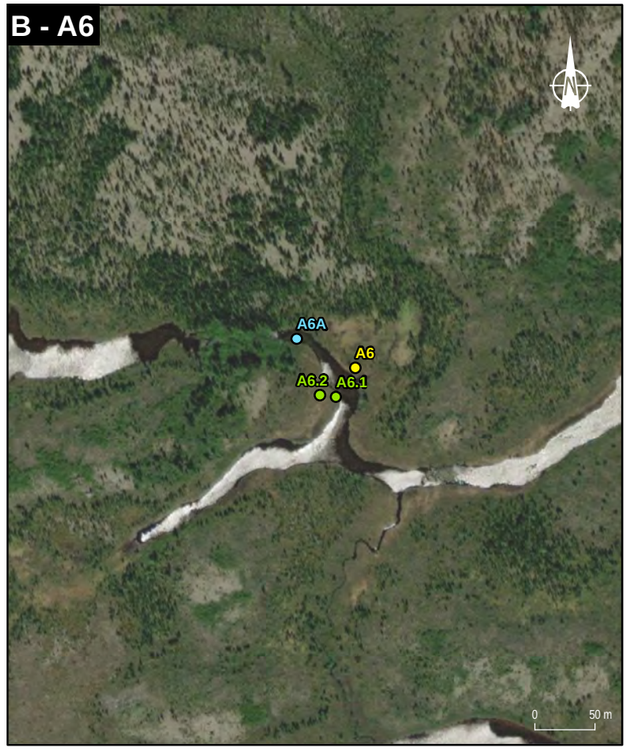

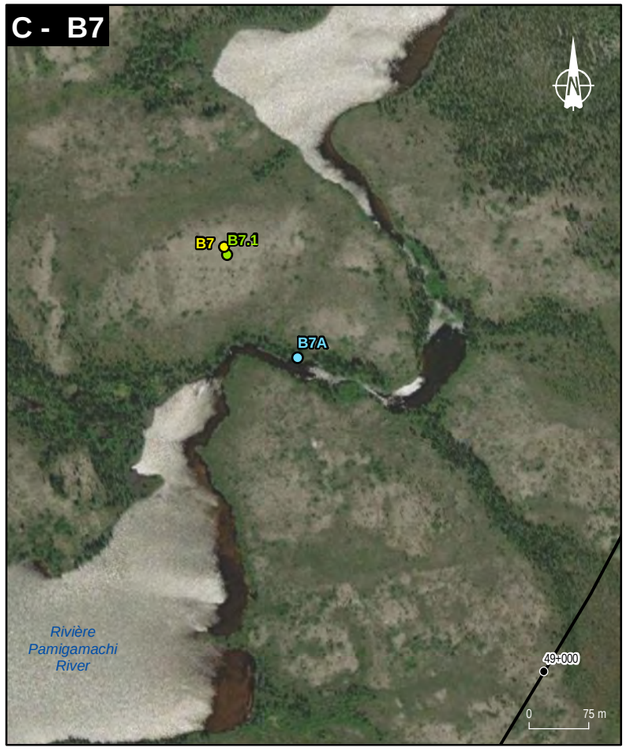

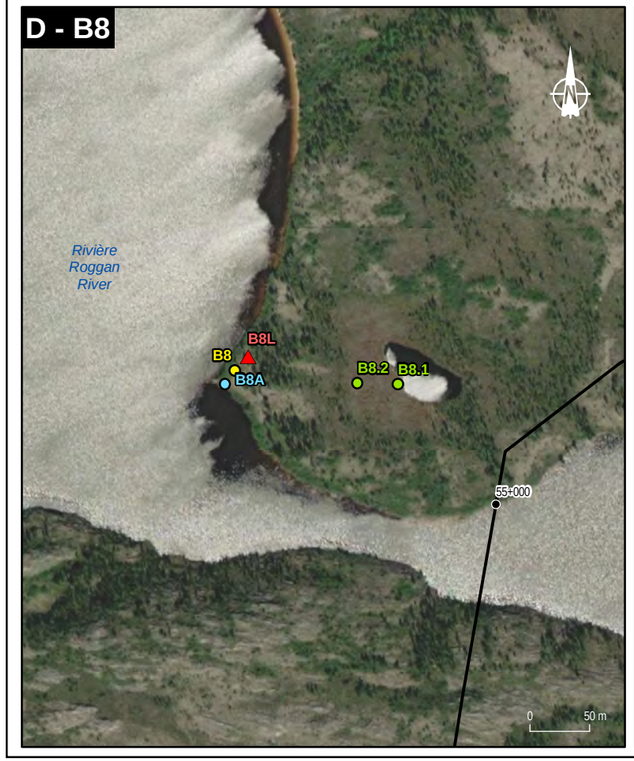

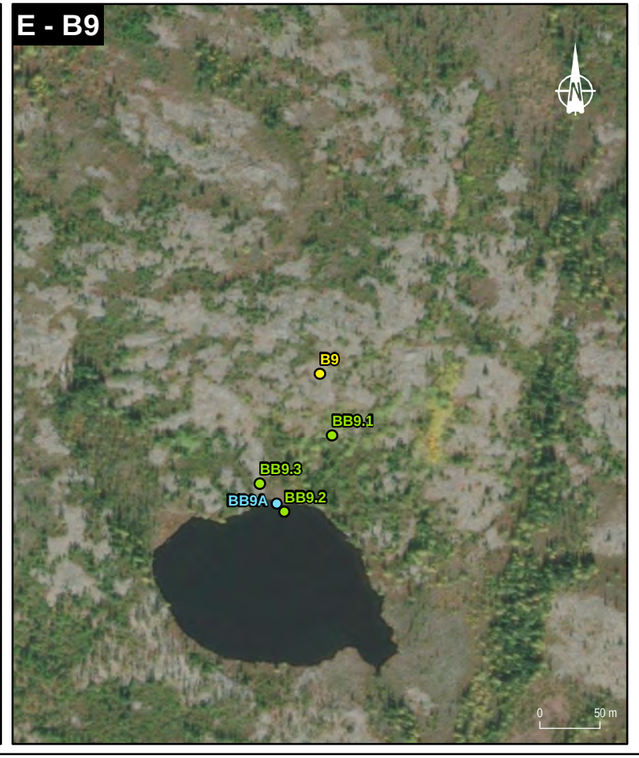

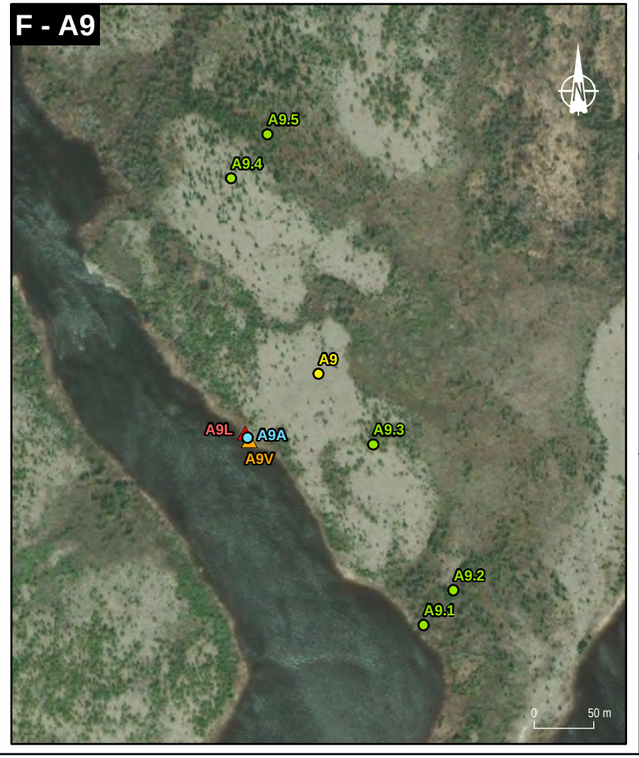

Site d'atterissage de l'hélicoptère / Helicopter landing site

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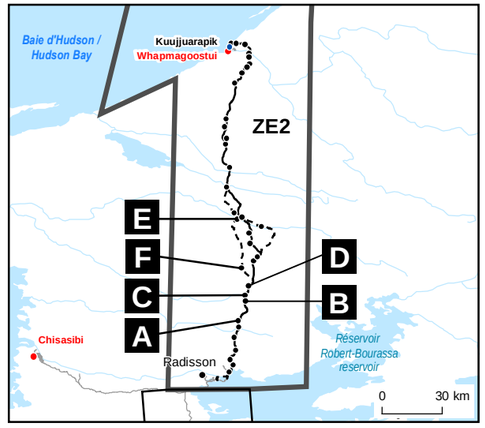
- Route projetée / Proposed road
- Variante de route projetée / Proposed road alternative



LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmahoostui / Feasibility study – Road between Radisson and Whapmahoostui

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 19 / Map 19
Sites d'inventaires / Survey Sites

Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/1 000 000, MERN, Québec, 2021
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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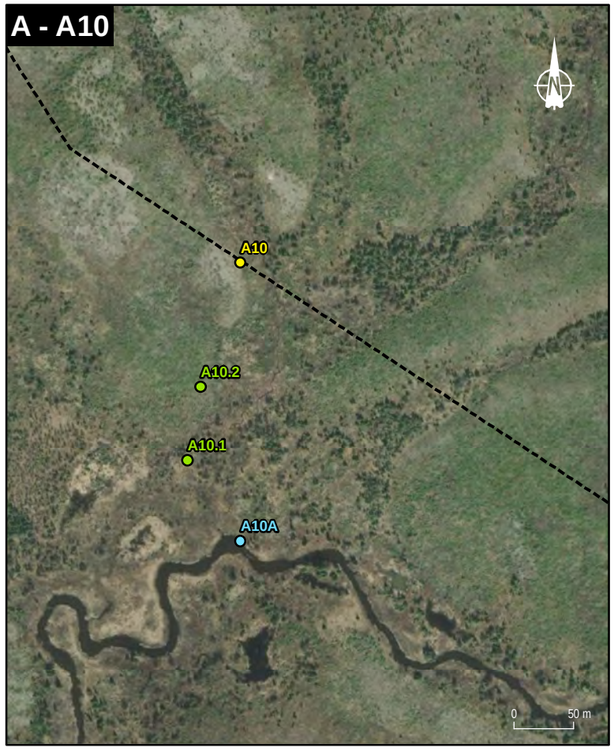

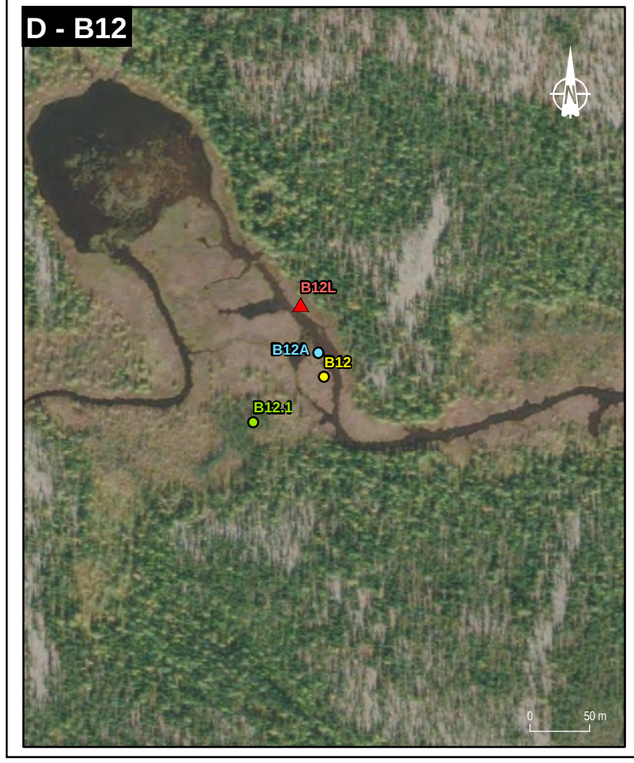

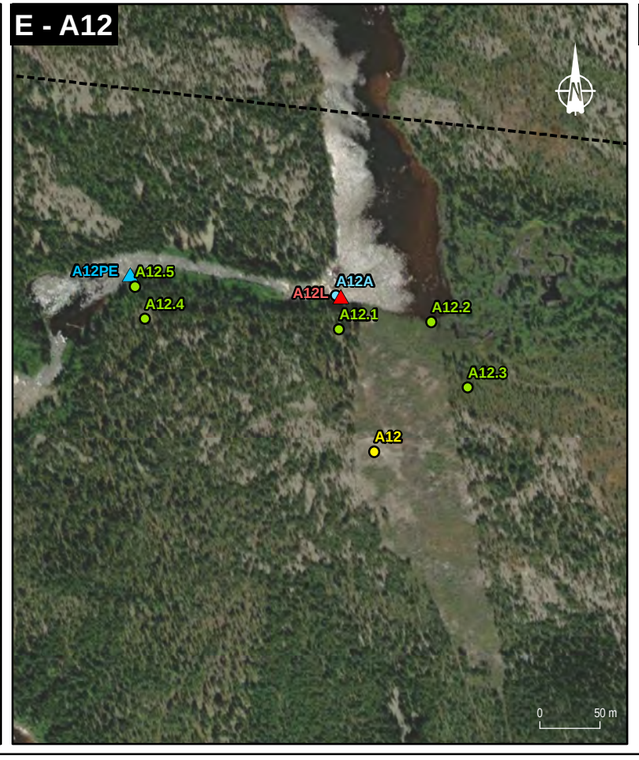

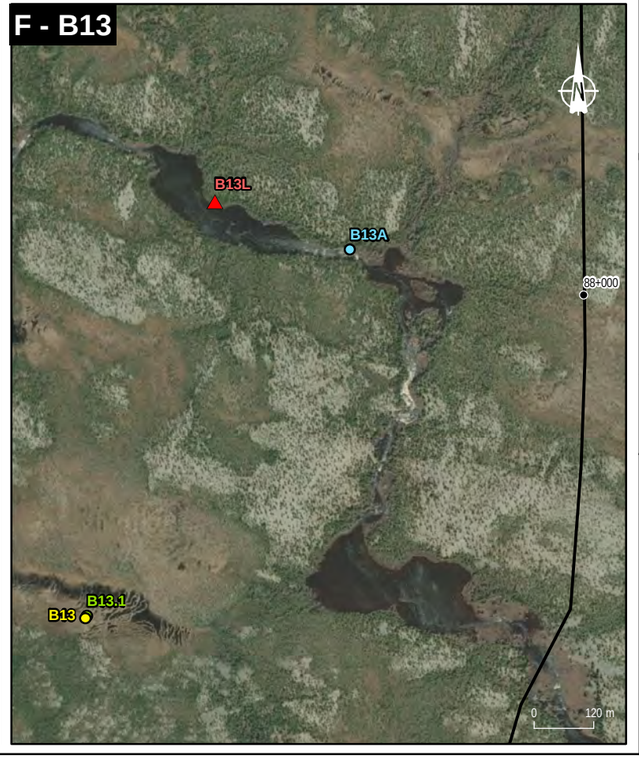

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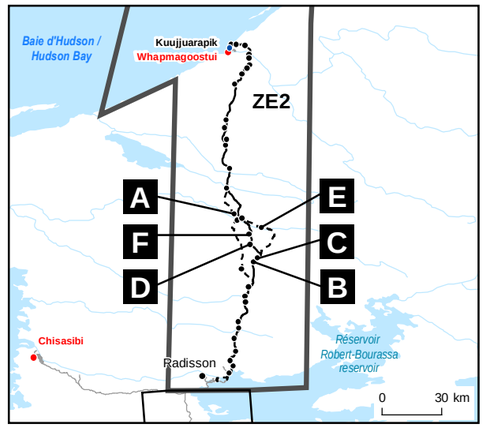

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmahoostui / Feasibility study – Road between Radisson and Whapmahoostui

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 20 / Map 20
Sites d'inventaires / Survey Sites

Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/1 000 000, MERN, Québec, 2021
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Approbation / Approved by: B. Aubé-Maurice
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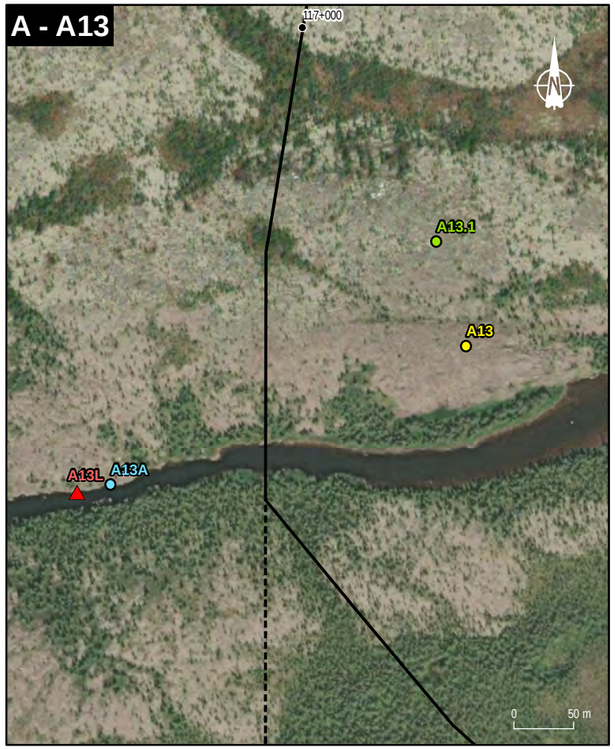

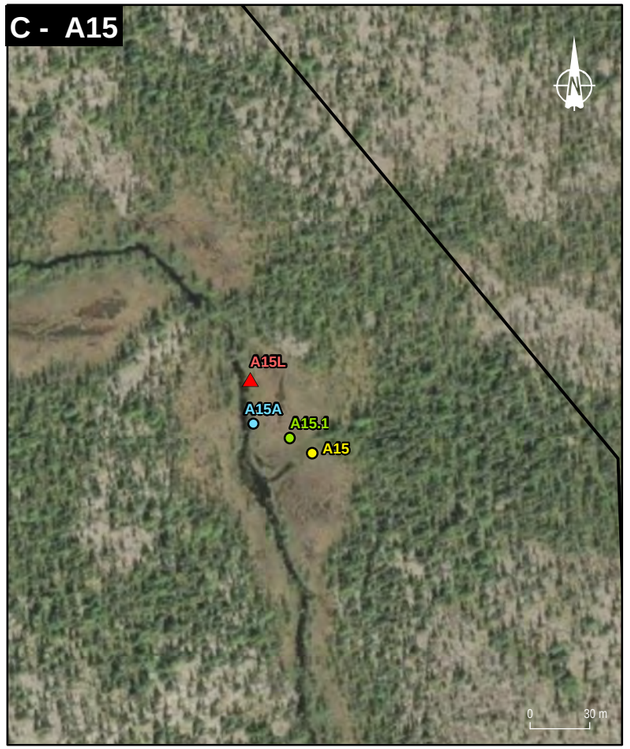

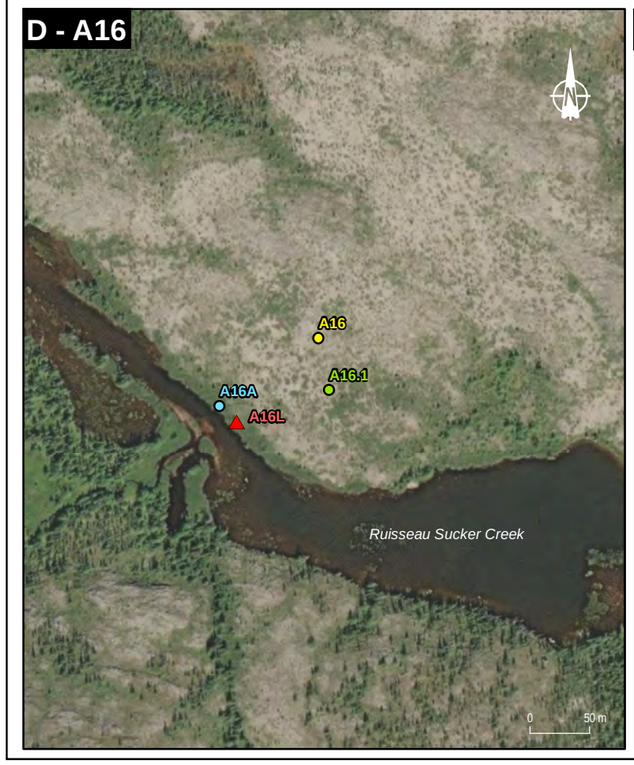

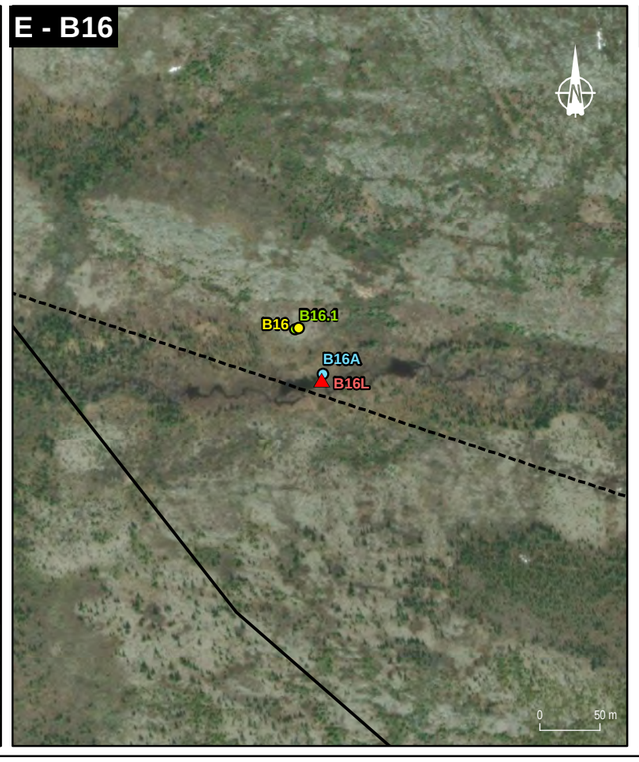

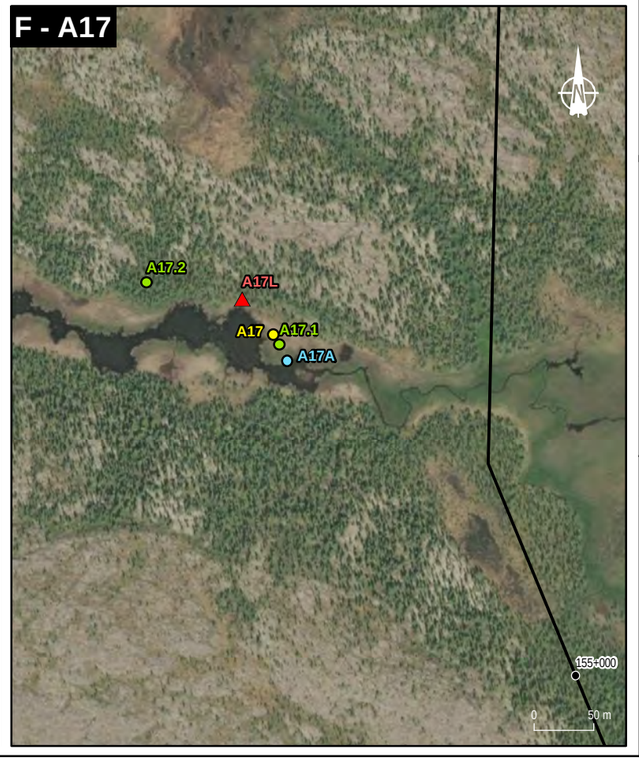

Site d'atterissage de l'hélicoptère / Helicopter landing site

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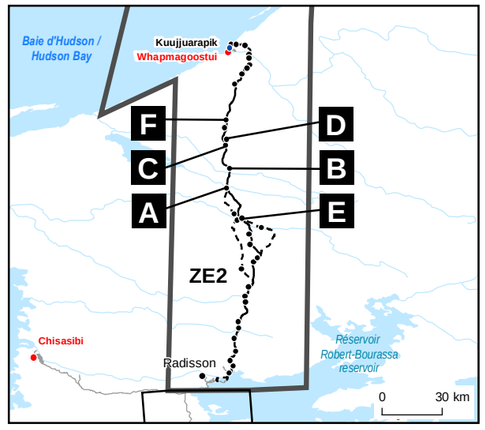
Réseau routier / Road network

Route projetée / Proposed road

Variante de route projetée / Proposed road alternative



LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmahoostui / Feasibility study – Road between Radisson and Whapmahoostui

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 21 / Map 21
Sites d'inventaires / Survey Sites

Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/1 000 000, MERN, Québec, 2021
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

Décembre 2022 / December 2022

Préparation / Prepared by: B. Aubé-Maurice
Dessin / Drawned by: J.-M. Tremblay | F. St-Hilaire-Dorion
Approbation / Approved by: B. Aubé-Maurice

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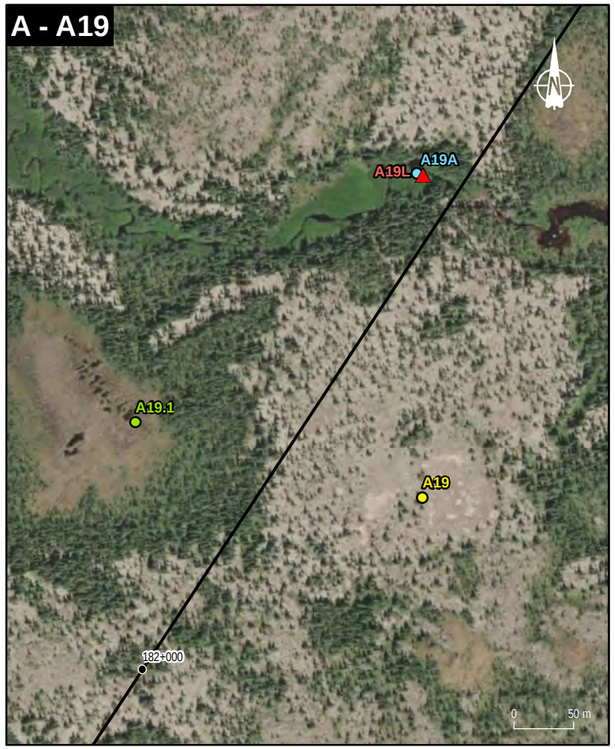

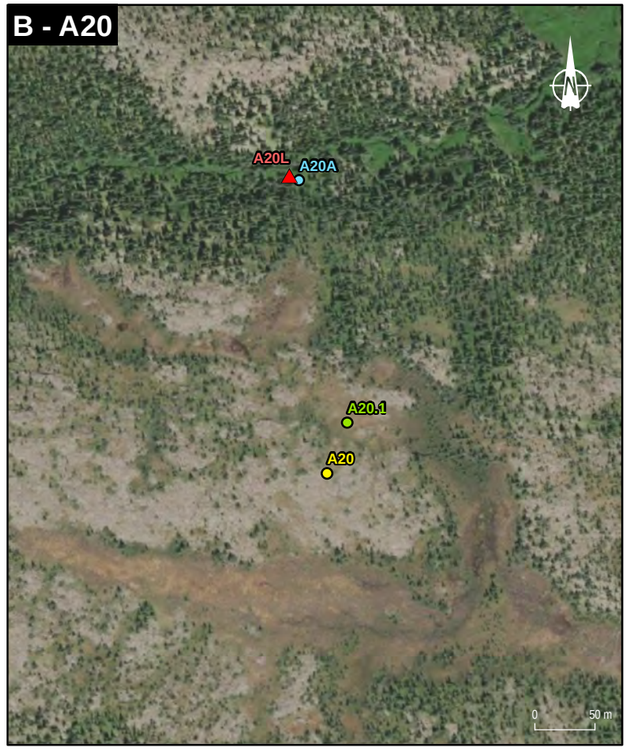

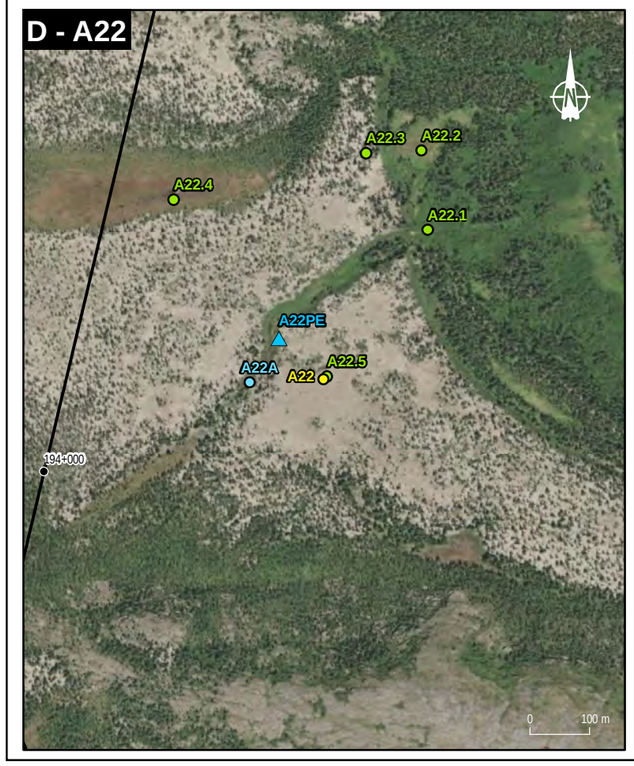

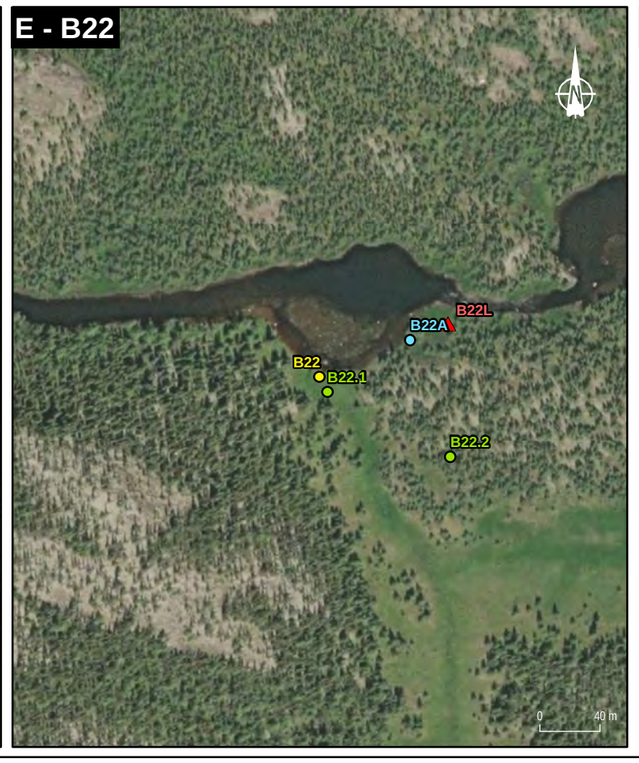

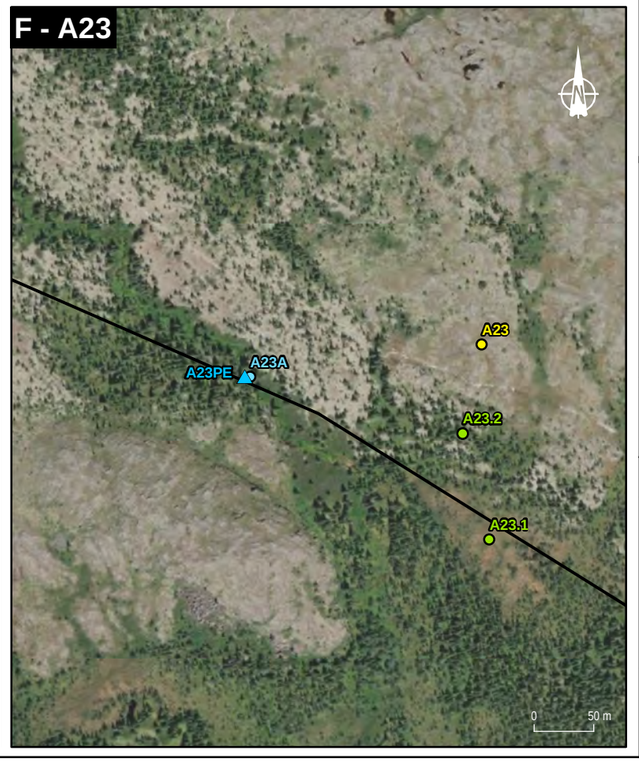

Site d'atterissage de l'hélicoptère / Helicopter landing site

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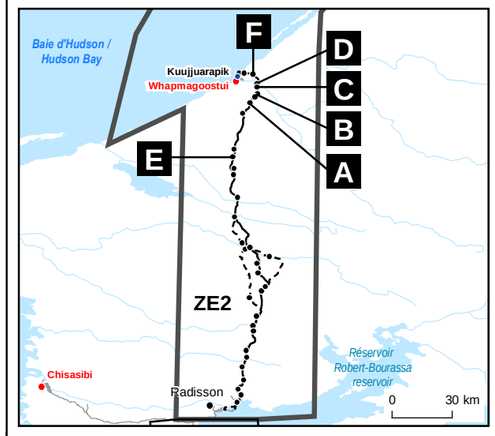

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmahoostui / Feasibility study – Road between Radisson and Whapmahoostui

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 22 / Map 22
Sites d'inventaires / Survey Sites

Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/1 000 000, MERN, Québec, 2021
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Approbation / Approved by: B. Aubé-Maurice

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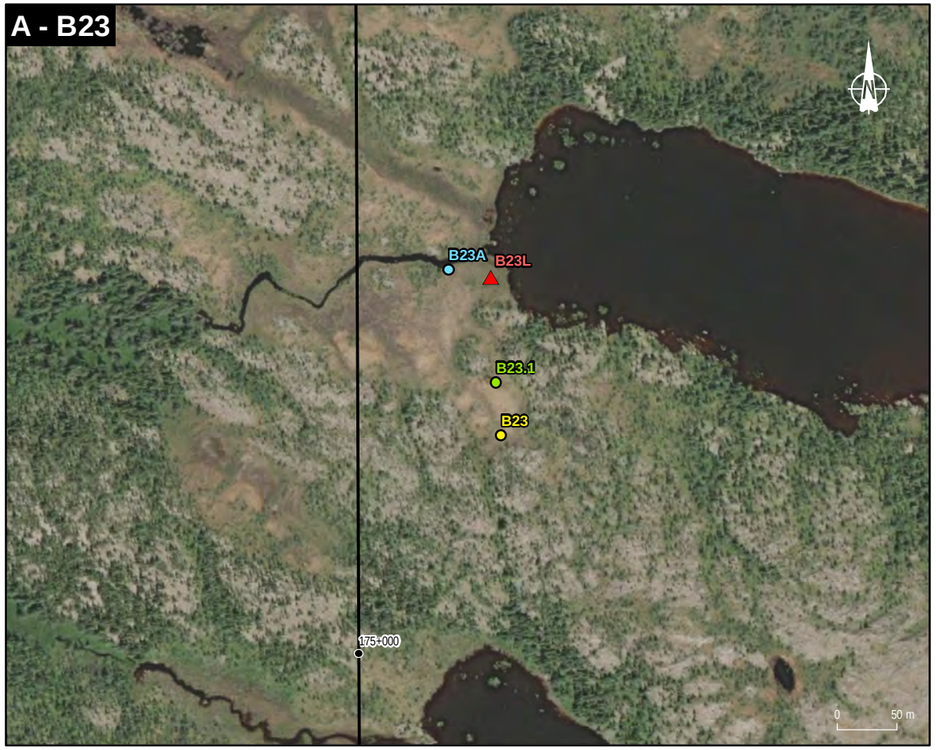

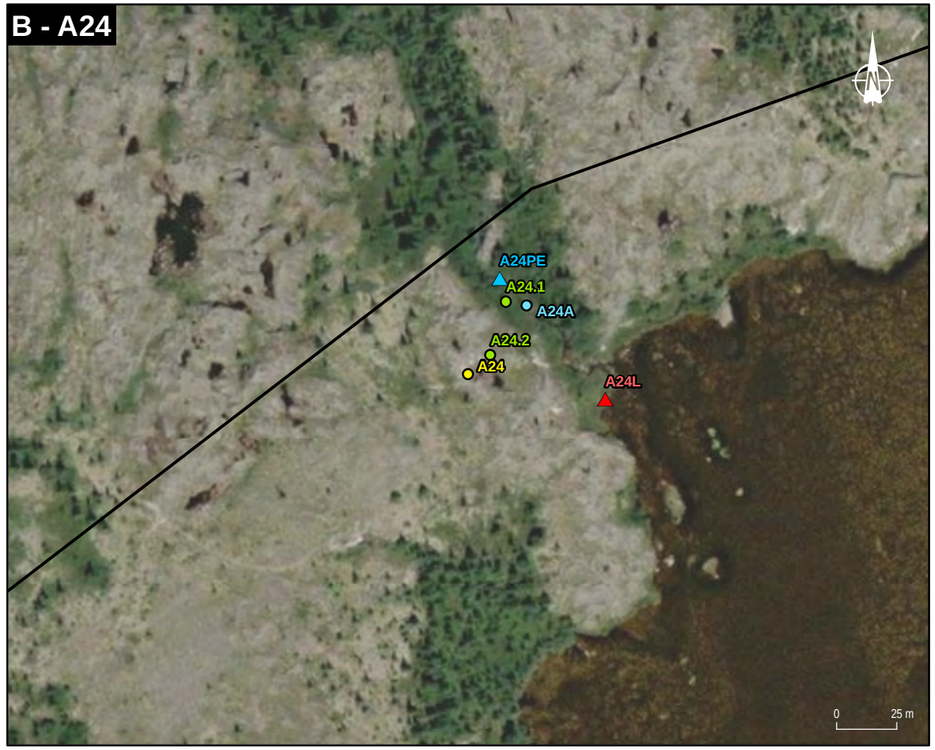

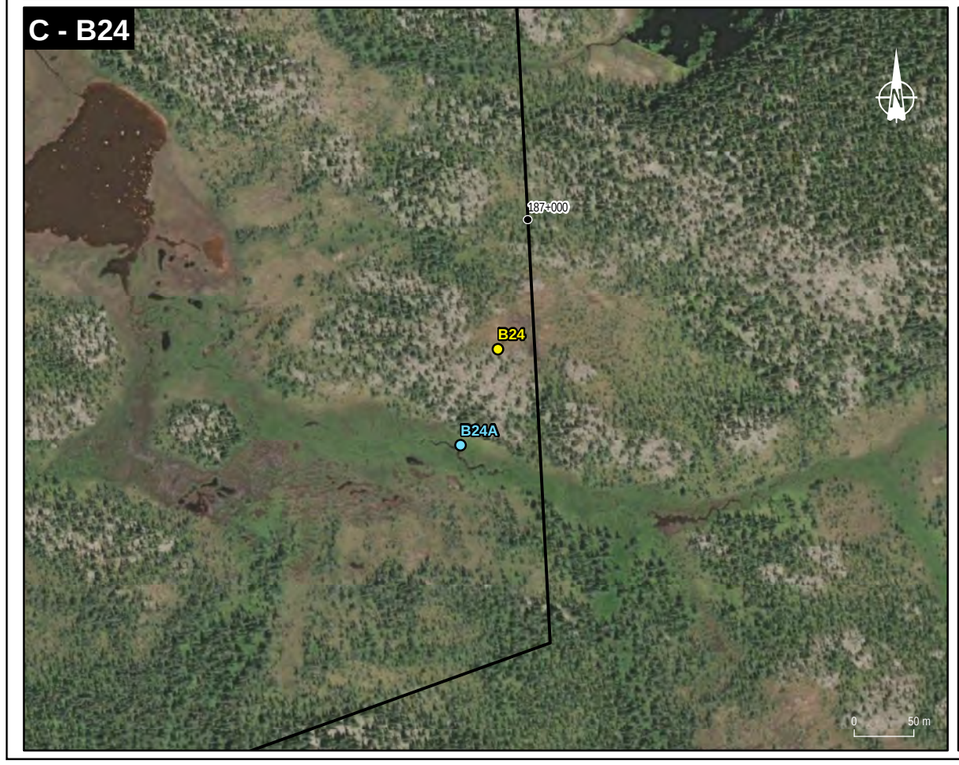

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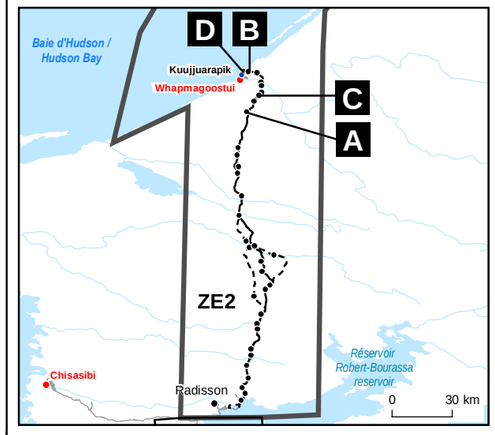

LA GRANDE ALLIANCE

Étude de faisabilité – Route entre Radisson et Whapmahoostui /
Feasibility study – Road between Radisson and Whapmahoostui

Note technique 6 / Technical Note 6
Milieu naturel terrestre / Terrestrial natural environment

Inventaires de l'été 2022 / Surveys of summer 2022

Carte 23 / Map 23
Sites d'inventaires / Survey Sites

Sources :
AQréseau+, réseau routier, MERN, 2021
BDGA, 1/1 000 000, MERN, Québec, 2021
Imagerie Esri, Maxar, Earthstar Geographics, and the GIS User Community

Décembre 2022 /
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Approbation / Approved by: B. Aubé-Maurice
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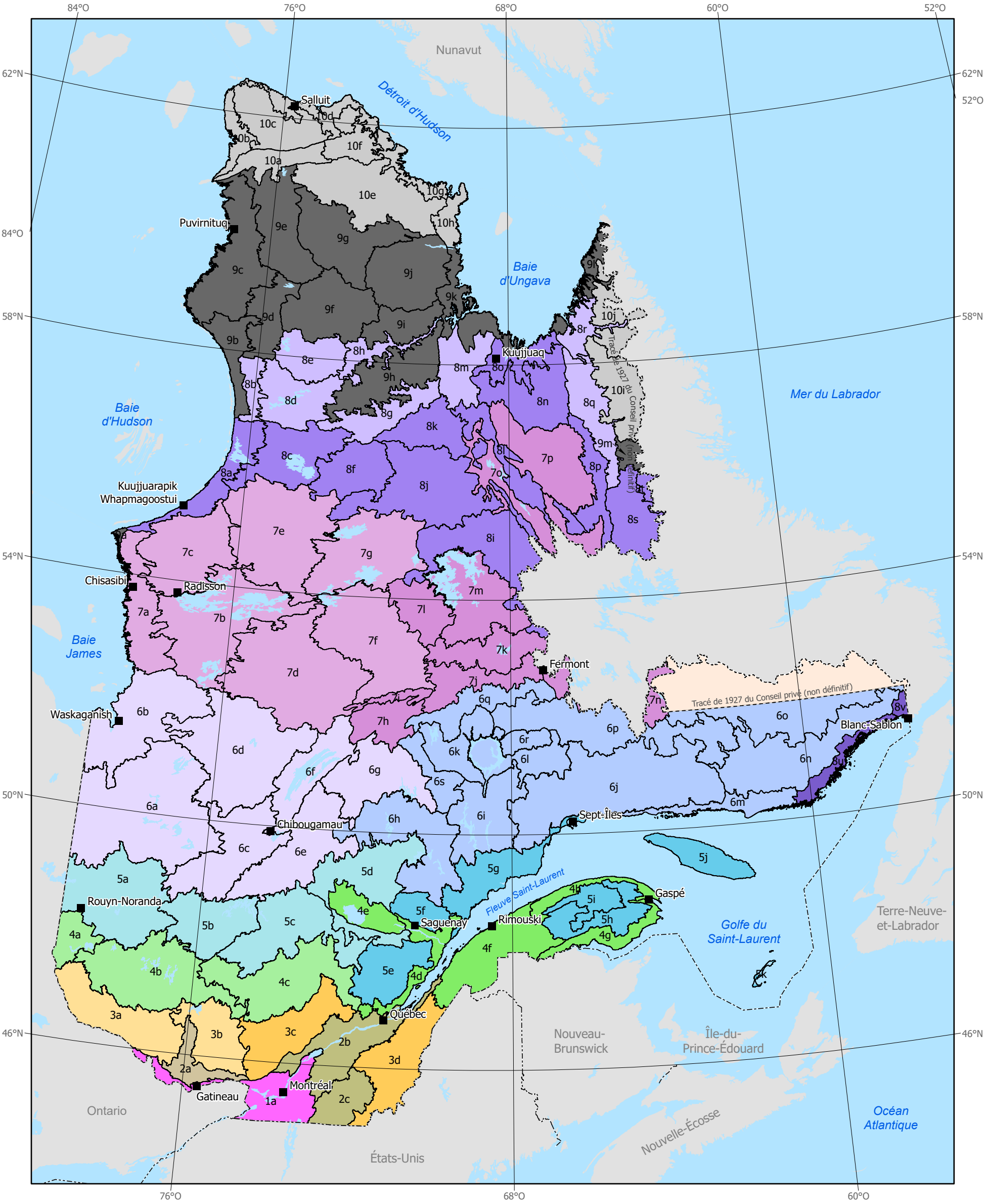
APPENDIX

B VEGETATION ZONES, BIOCLIMATIC AND ECOLOGICAL REGIONS

Zones de végétation, domaines bioclimatiques et régions écologiques



Légende

ZONE ARCTIQUE

Sous-zone de la toundra du Bas-Arctique

- Toundra à arbustes prostrés
- Toundra à arbustes dressés

ZONE BORÉALE

Sous-zone de la toundra forestière

- Toundra forestière *

Sous-zone de la forêt boréale ouverte

- Pessière à lichens **

Sous-zone de la forêt boréale fermée

- Pessière à mousses **
- Sapinière à bouleau à papier **

ZONE TEMPÉRÉE NORDIQUE

Sous-zone de la forêt mixte

- Sapinière à bouleau jaune **

Sous-zone de la forêt décidue

- Érablière à bouleau jaune **
- Érablière à tilleul **
- Érablière à caryer cordiforme

- Frontière internationale
- Frontière interprovinciale
- Frontière Québec–Terre-Neuve-et-Labrador (cette frontière n'est pas définitive)

5i Région écologique

Non cartographié

* Les couleurs distinguent respectivement les sous-domaines bioclimatiques Nord, Sud et Côte-Nord.

** Les couleurs distinguent respectivement les sous-domaines bioclimatiques Ouest et Est.

Projection cartographique

Conique de Lambert avec deux parallèles d'échelle conservée (46°et 60°)

0 100 200 km

Source

Données	Organisme	Année
Frontières et classification écologique	Ministère des Forêts, de la Faune et des Parcs	2021

Réalisation et diffusion

Ministère des Forêts, de la Faune et des Parcs
Direction des inventaires forestiers

Note : Le présent document n'a aucune portée légale.

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Forêts, Faune et Parcs
Québec

APPENDIX

C LIST OF LISTED BIRD SPECIES IN THE STUDY AREA OR LIKELY TO FREQUENT IT

Appendix C: List of Bird Species Known or likely to Occur in the Study Area

FAMILY	ENGLISH NAME	LATIN NAME	NESTING CODE[1]			LL AREAS	PROVINCIAL* /FEDERAL** STATUS [5]
			ZONE 1	ZONE 2	ZONE 3		
Alcidae	Dovekie	*Alle alle*	-	X2	-	X2	-
	Thick-billed murre	*Uria lomvia*	-	X2	-	X2	-
	Black guillemot	*Cepphus grylle*	-	CONF	-	CONF	-
Anatidae	**Harlequin duck**	***Histrionicus histrionicus***	**-**	**CONF**	**CONF**	**CONF**	**V / SC**
	Canada goose	*Branta canadensis*	CONF	CONF	CONF	CONF	-
	Brant	*Branta bernicla*	CONF	X2	**-**	CONF	-
	American black duck	*Anas rubripes*	CONF	CONF	CONF	CONF	-
	Wood duck	*Aix sponsa*	CONF	**-**	POSS[3]	CONF	-
	Gadwall	*Mareca strepera*	**-**	X2	**-**	X2	-
	Mallard	*Anas platyrhynchos*	CONF	CONF	POSS	CONF	-
	American wigeon	*Mareca americana*	CONF	POSS	**-**	CONF	-
	Northern pintail	*Anas acuta*	CONF	CONF	CONF	CONF	-
	Northern shoveler	*Spatula clypeata*	CONF	X2,4	-	CONF	-
	Tundra swan	*Cygnus columbianus*	**-**	POSS	-	POSS	-
	Ruddy duck	*Oxyura jamaicensis*	**-**	X2	-	X2	-
	Ring-necked duck	*Aythya collaris*	CONF	CONF	PROB	CONF	-
	Greater scaup	*Aythya marila*	CONF	CONF	POSS[3]	CONF	-
	Common goldeneye	*Bucephala clangula*	POSS	CONF	POSS	CONF	-
	Barrow's goldeneye	***Bucephala islandica***	**-**	**POSS**	**-**	**POSS**	**V / SC**
	Common merganser	*Common Merganser*	CONF	CONF	CONF	CONF	-
	Long-tailed duck	*Clangula hyemalis*	CONF	CONF	-	CONF	-
	Hooded merganser	*Lophodytes cucullatus*	CONF	CONF	PROB	CONF	-
	Red-breasted merganser	*Mergus serrator*	CONF	CONF	PROB	CONF	-
	White-winged scoter	*Melanitta deglandi*	CONF	CONF	-	CONF	-
	Yellow-billed scoter	*Melanitta americana*	PROB	CONF	PROB	CONF	-
	Surf scoter	*Melanitta perspicillata*	CONF	CONF	PROB	CONF	-
	Common eider	*Somateria mollissima*	-	CONF	-	CONF	-
	King eider	*Somateria spectabilis*	-	X2	-	X2	-
	Snow goose	*Anser caerulescens*	-	X2,4	-	X2	-
	White-fronted goose	*Anser albifrons*	-	X2	-	X2	-
	Lesser scaup	*Aythya affinis*	CONF	CONF	-	CONF	-
	Bufflehead	*Bucephala albeola*	CONF	CONF	PROB[3]	CONF	-
	Blue-winged teal	*Spatula discors*	CONF	X2	**-**	CONF	-
	Green-winged teal	*Anas crecca*	CONF	CONF	CONF	CONF	-
Phasianidae	Ruffed grouse	*Bonasa umbellus*	CONF	-	-	CONF	-
	Willow ptarmigan	*Lagopus*	X	CONF	X3	CONF	-
	Rock ptarmigan	*Lagopus muta*	-	PROB	X3	PROB	-
	Sharp-tailed grouse	*Tympanuchus phasianellus*	CONF	PROB	-	CONF	-
	Spruce grouse	*Falcipennis canadensis*	CONF	CONF	CONF	CONF	-
Columbids	Rock pigeon	*Columba livia*	-	X	-	X	-
	Mourning dove	*Zenaida macroura*	POSS	X	-	POSS	-
Caprimulgidae	**Common nighthawk**	***Chordeiles minor***	**CONF**	**POSS**	**POSS**	**CONF**	**LDTV / M**

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FAMILY	ENGLISH NAME	LATIN NAME	NESTING CODE[1]			LL AREAS	PROVINCIAL* /FEDERAL** STATUS [5]
			ZONE 1	ZONE 2	ZONE 3		
Rallidae	Sora	*Porzana carolina*	-	PROB	-	PROB	-
Gruids	Sandhill crane	*Grus canadensis*	PROB	POSS	POSS[3]	PROB	-
Charadriidae	Black-bellied plover	*Pluvialis squatarola*	-	X2	-	X2	-
	Black-bellied plover	*Pluvialis dominica*	-	X2	-	X2	-
	Killdeer	*Charadrius vociferus*	PROB	CONF	-	CONF	-
	Semipalmated plover	*Charadrius semipalmatus*	-	CONF	CONF	CONF	-
Scolopacidae	Hudsonian godwit	*Limosa haemastica*	-	X2	-	X2	-
	White-rumped sandpiper	*Calidris fuscicollis*	-	X2	-	X2	-
	Ashy-breasted sandpiper	*Calidris melanotos*	-	X2	-	X2	-
	Baird's sandpiper	*Calidris bairdii*	-	X2	-	X2	-
	Red knot	***Calidris canutus***	**-**	**X2**	**-**	X2	**LDTV / E**
	Least sandpiper	*Calidris minutilla*	-	CONF	CONF	CONF	-
	Sanderling sandpiper	*Calidris alba*	-	X2	-	X2	-
	Dunlin	*Calidris alpina*	-	X2	-	X2	-
	Red snipe	*Limnodromus griseus*	-	CONF	X3	CONF	-
	Wilson's snipe	*Gallinago delicata*	POSS	CONF	CONF	CONF	-
	Spotted sandpiper	*Actitis macularius*	CONF	CONF	CONF	CONF	-
	Willet	*Tringa semipalmata*	X	X	-	X	-
	Solitary sandpiper	*Tringa solitaria*	CONF	PROB	CONF	CONF	-
	Whimbrel	*Numenius phaeopus*	-	X2	-	X2	-
	Greater yellowlegs	*Tringa melanoleuca*	CONF	CONF	CONF	CONF	-
	Lesser yellowlegs	*Tringa flavipes*	X	CONF	PROB	CONF	-
	Red-necked phalarope	***Phalaropus lobatus***	**-**	**CONF**	**-**	**CONF**	**No status / SC**
	Red phalarope	*Phalaropus fulicarius*	-	X2	-	X2	-
	Ruddy turnstone	*Arenaria interpres*	-	X2	-	X2	-
Larids	Ring-billed gull	*Larus delawarensis*	X	POSS	-	POSS	-
	Herring gull	*Larus argentatus*	CONF	CONF	CONF	CONF	-
	Glaucous gull	*Larus hyperboreus*	-	PROB	X	PROB	-
	Great black-backed gull	*Larus marinus*	-	CONF	-	CONF	-
	Bonaparte's gull	*Chroicocephalus philadelphia*	PROB	-	CONF	CONF	-
	Arctic tern	*Sterna paradisaea*	CONF	CONF	CONF	CONF	-
	Common tern	*Sterna hirundo*	CONF	POSS	CONF	CONF	-
Gaviidae	Red-throated loon	*Gavia stellata*	CONF	CONF	POSS[3]	CONF	-
	Common loon	*Gavia immer*	CONF	CONF	POSS	CONF	-
Phalacrocoracidae	Double-crested cormorant	*Phalacrocorax auritus*	POSS	X2	-	POSS	-
Ardeids	American bittern	*Botaurus lentiginosus*	-	POSS	-	POSS	-
	Great blue heron	*Ardea herodias*	CONF	X4	POSS[3]	CONF	-
Pandionidae	Osprey	*Pandion haliaetus*	CONF	CONF	CONF	CONF	-

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FAMILY	ENGLISH NAME	LATIN NAME	NESTING CODE[1]			LL AREAS	PROVINCIAL* /FEDERAL** STATUS [5]
			ZONE 1	ZONE 2	ZONE 3		
Accipitrids	**Golden eagle**	***Aquila chrysaetos***	-	**CONF**	**POSS[3]**	**CONF**	**V / Not at risk**
	Northern goshawk	*Accipiter gentilis*	CONF	CONF	-	CONF	-
	Northern harrier	*Circus hudsonius*	PROB	PROB	CONF	CONF	-
	Red-tailed hawk	*Buteo jamaicensis*	CONF	CONF	CONF	CONF	-
	Rough-legged hawk	*Buteo lagopus*	CONF	POSS	-	CONF	-
	Sharp-shinned hawk	*Accipiter striatus*	CONF	X	-	CONF	-
	Bald eagle	***Haliaeetus leucocephalus***	**POSS**	**CONF**	**CONF**	**CONF**	**V / Not at risk**
Strigidae	Northern hawk owl	*Surnia ulula*	-	CONF	-	CONF	-
	Great gray owl	*Strix nebulosa*	POSS	X	POSS[3]	POSS	-
	Great horned owl	*Bubo virginianus*	POSS	CONF	-	CONF	-
	Snowy owl	*Bubo scandiacus*	-	X2	-	X2	-
	Long-eared owl	*Asio otus*	-	X	-	X	-
	Short-eared owl	***Asio flammeus***	**POSS**	**PROB**	**POSS**	**CONF**	**LDTV / SC**
	Boreal owl	*Aegolius funereus*	-	PROB	-	PROB	-
Alcedinidae	American kingfisher	*Megaceryle alcyon*	POSS	PROB	CONF	CONF	-
Picidae	Black-backed woodpecker	*Picoides arcticus*	CONF	-	POSS	CONF	-
	American three-toed woodpecker	*Picoides dorsalis*	CONF	CONF	CONF	CONF	-
	Hairy woodpecker	*Dryobates villosus*	POSS	POSS	-	POSS	-
	Northern flicker	*Colaptes auratus*	CONF	PROB	PROB	CONF	-
	Yellow-bellied sapsucker	*Sphyrapicus varius*	PROB		-	PROB	-
	Downy woodpecker	*Dryobates pubescens*	X	X	-	X	-
Falconidae	American kestrel	*Falco sparverius*	PROB	POSS	-	PROB	-
	Merlin	*Falco columbarius*	PROB	CONF	POSS	CONF	-
	Gyrfalcon	*Falco rusticolus*	-	CONF	-	CONF	-
	Peregrine falcon subspecies *anatum*	***Falco peregrinus anatum***	**-**	**CONF**	**-**	**CONF**	**V / SC**
	Peregrine falcon subspecies *tundrius*	***Falco peregrinus tundrius***	**-**	**CONF**	**-**	**CONF**	**LDTV / SC**
Tyrannidae	**Olive-sided flycatcher**	***Contopus cooperi***	**PROB**	**-**	**CONF**	**CONF**	**LDTV / T**
	Yellow-bellied flycatcher	*Empidonax flaviventris*	PROB	POSS	PROB	PROB	-
	Alder flycatcher	*Empidonax alnorum*	PROB	PROB	CONF	CONF	-
	Eastern phoebe	*Sayornis phoebe*	-	X2	POSS[3]	POSS	-
	Least flycatcher	*Empidonax minimus*	PROB	POSS	CONF	CONF	-
Vireonidae	Blue-headed vireo	*Vireo solitarius*	POSS	X2	POSS[3]	POSS	-
	Red-eyed vireo	*Vireo olivaceus*	PROB	-	POSS[3]	PROB	-
Laniidae	Northern shrike	*Lanius borealis*	POSS	-	-	POSS	-
	Great grey shrike	*Lanius excubitor*	-	PROB	-	PROB	-
Corvids	American crow	*Corvus brachyrhynchos*	POSS	PROB	POSS[3]	PROB	-
	Common raven	*Corvus corax*	CONF	CONF	CONF	CONF	-
	Canada jay	*Perisoreus canadensis*	CONF	CONF	CONF	CONF	-
Paridae	Brown-capped chickadee	*Poecile hudsonicus*	CONF	PROB	PROB	CONF	-
	Black-capped chickadee	*Poecile atricapillus*	-	X	-	X	-

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FAMILY	ENGLISH NAME	LATIN NAME	NESTING CODE[1]			LL AREAS	PROVINCIAL* /FEDERAL** STATUS [5]
			ZONE 1	ZONE 2	ZONE 3		
Alaudidae	Horned lark	*Eremophila alpestris*	-	CONF	-	CONF	-
Hirundinidae	Tree swallow	*Tachycineta bicolor*	CONF	CONF	CONF	CONF	-
	Bank swallow	***Riparia riparia***	**POSS**	**POSS**	**CONF**	**CONF**	**No status / T**
	Barn swallow	***Hirundo rustica***	**POSS**	-	-	**POSS**	**No status / T**
Regulidae	Golden-crowned kinglet	*Regulus satrapa*	CONF	POSS	CONF	CONF	-
	Ruby-crowned kinglet	*Regulus calendula*	CONF	PROB	CONF	CONF	-
Sittidae	Red-breasted nuthatch	*Sitta canadensis*	CONF	-	POSS[3]	CONF	-
Certhiidae	Brown creeper	*Certhia americana*	POSS	-	PROB	PROB	-
Troglodytids	Winter wren	*Troglodytes hiemalis*	PROB	PROB	POSS	PROB	-
Sturnidae	European starling	*Sturnus vulgaris*	POSS	CONF	-	CONF	-
Mimidae	Northern mockingbird	*Mimus polyglottos*	X	-	-	X	-
Turdidae	Swainson's thrush	*Catharus ustulatus*	CONF	PROB	CONF	CONF	-
	Grey-cheeked thrush	*Catharus minimus*	-	CONF	PROB	CONF	-
	Veery	*Catharus fuscescens*	X	-	-	X	-
	Hermit thrush	*Catharus guttatus*	CONF	PROB	CONF	CONF	-
	American robin	*Turdus migratorius*	CONF	CONF	CONF	CONF	-
	Eastern bluebird	*Sialia sialis*	CONF	-	POSS[3]	CONF	-
Bombycillidae	Bohemian waxwing	*Bombycilla garrulus*	POSS	PROB	CONF	CONF	-
	Cedar waxwing	*Bombycilla cedrorum*	PROB	POSS	PROB	PROB	-
Motacillidae	American pipit	*Anthus rubescens*	-	CONF	-	CONF	-
Fringillidae	White-winged crossbill	*Loxia leucoptera*	CONF	PROB	PROB	CONF	-
	Red crossbill	*Loxia curvirostra*	POSS	X2	PROB	PROB	-
	Pine grosbeak	*Pinicola enucleator*	X	PROB	POSS	PROB	-
	Purple finch	*Haemorhous purpureus*	POSS	POSS	POSS[3]	POSS	-
	Hoary redpoll	*Acanthis hornemanni*	-	POSS	-	POSS	-
	Common redpoll	*Acanthis flammea*	POSS	CONF	PROB	CONF	-
	Pine siskin	*Spinus pinus*	POSS	POSS	POSS	POSS	-
Calcariidae	Snow bunting	*Plectrophenax nivalis*	X	X2	-	X2	-
	Lapland longspur	*Calcarius lapponicus*	-	POSS	-	POSS	-
Passerellidae	White-crowned bunting	*Zonotrichia leucophrys*	PROB	CONF	CONF	CONF	-
	White-throated sparrow	*Zonotrichia albicollis*	CONF	PROB	CONF	CONF	-
	Song sparrow	*Melospiza melodia*	POSS	X4	POSS[3]	POSS	-
	Fox sparrow	*Passerella iliaca*	CONF	PROB	CONF	CONF	-
	LeConte's sparrow	*Ammospiza leconteii*	X	-	-	X	-
	Lincoln's sparrow	*Melospiza lincolnii*	CONF	PROB	CONF	CONF	-
	Swamp sparrow	*Melospiza georgiana*	CONF	PROB	PROB	CONF	-
	Savannah sparrow	*Passerculus sandwichensis*	PROB	CONF	CONF	CONF	-
	Chipping sparrow	*Spizella passerina*	POSS	POSS	-	POSS	-
	American tree sparrow	*Spizelloides arborea*	X	CONF	-	CONF	-
	Nelson's sparrow	***Ammospiza nelsoni***	**X**	**-**	-	**X**	**LDTV / Not at risk**
	Dark-eyed junco	*Junco hyemalis*	CONF	CONF	CONF	CONF	-

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FAMILY	ENGLISH NAME	LATIN NAME	NESTING CODE[1]			LL AREAS	PROVINCIAL* /FEDERAL** STATUS [5]
			ZONE 1	ZONE 2	ZONE 3		
Icteridia	Common grackle	*Quiscalus quiscula*		POSS	-	POSS	-
	Rusty blackbird	***Euphagus carolinus***	**CONF**	**CONF**	**CONF**	**CONF**	**LDTV / SC**
	Brown-headed cowbird	*Molothrus ater*	-	X2	-	X2	-
Warblers	Wilson's warbler	*Cardellina pusilla*	CONF	CONF	CONF	CONF	-
	Palm warbler	*Setophaga palmarum*	CONF	PROB	PROB	CONF	-
	Yellow-rumped warbler	*Setophaga coronata*	CONF	CONF	CONF	CONF	-
	Chestnut-sided warbler	*Setophaga pensylvanica*	POSS	-	-	POSS	-
	Black-throated warbler	*Setophaga virens*	-	-	POSS[3]	POSS	-
	Blackburnian warbler	*Setophaga fusca*	-	POSS	-	POSS	-
	Nashville warbler	*Leiothlypis ruficapilla*	PROB	POSS	POSS	PROB	-
	Bay-breasted warbler	*Setophaga castanea*	PROB	-	-	PROB	-
	Magnolia warbler	*Setophaga magnolia*	CONF	PROB	PROB	CONF	-
	Black-throated blue warbler	*Setophaga caerulescens*	-	-	PROB[3]	PROB	-
	Northern waterthrush	*Parkesia noveboracensis*	CONF	CONF	CONF	CONF	-
	American redstart	*Setophaga ruticilla*	PROB	-	POSS[3]	PROB	-
	Yellow warbler	*Setophaga petechia*	CONF	CONF	CONF	CONF	-
	Common yellowthroat	*Geothlypis trichas*	PROB	POSS	POSS[3]	PROB	-
	Black and white warbler	*Mniotilta varia*	CONF	-	POSS	CONF	-
	Tennessee warbler	*Leiothlypis peregrina*	PROB	PROB	PROB	PROB	-
	Blackpoll warbler	*Setophaga striata*	PROB	CONF	CONF	CONF	-
	Mourning warbler	*Geothlypis philadelphia*	POSS	-	-	POSS	-
	Orange-crowned warbler	*Leiothlypis celata*	CONF	PROB	PROB	CONF	-

Notes: Species names in bold indicate a special status species.
*Ministère des Forêts, de la Faune et des Parcs (MFFP), 2022. Threatened or vulnerable wildlife species. Consulted online in February 2022.
**Government of Canada, 2022. Public Registry of Species at Risk. Accessed online in February 2022.
1: Nesting code: CONF: confirmed, POSS: possible, PROB: probable, CONF: confirmed, X: a code has not been assigned in the source database
2: Species identified as migrant or visitor
3: Species observed by MTQ (2010)
4: Species observed by PESCA Environment (2020)
5: E: Endangered; LDTV: Likely to be designated as threatened or vulnerable; SC: Special Concern; T: Threatened; V: Vulnerable

APPENDIX

D LIST OF STATUS BIRD SPECIES LIKELY TO FREQUENT THE STUDY AREA

APPENDIX

D-1 LIST OF BIRD SPECIES OF PRECARIOUS STATUS LIKELY TO FREQUENT THE AREA STUDY 1

Appendix D-1: List of Bird Species of Precarious Status Likely to Occur in the Study Area 1

SPECIES GROUP	SPECIES	SCIENTIFIC NAME	STATUS[1]		PREFERRED NESTING HABITAT		MIGRATION HABITAT		WINTER HABITAT	
			PROVINCIAL[2]	FEDERAL[3]	HABITAT	SOURCE OFTHE REFERENCE	HABITAT	SOURCE OFTHE REFERENCE	HABITAT	SOURCE OFTHE REFERENCE
Waterfowl and water birds	Harlequin duck	*Histrionicus*	V	SC	In the vicinity of fast-flowing watercourses	-	Batture, marsh, grassland	-	-	-
	Barrow's goldeneye	*Bucephala islandica*	V	SC	-	-	Batture, marsh, grassland	-	-	-
	Yellow rail	*Coturnicops noveboracensis*	T	SC	-	-	Batture, marsh, grassland	-	-	-
Birds of prey	Golden eagle	*Aquila chrysaetos*	V	-	-	-	Batture, marsh, grassland	-	-	-
	Peregrine falcon *anatum*	*Falco peregrinus anatum*	V	SC	-		Batture, marsh, grassland, forest and openarea	-	-	-
	Peregrine falcon *tundrius*	*Falco peregrinus tundrius*	LDTV	SC	-		Batture, marsh, grassland, forest and openarea	-	-	-
	Short-eared owl	*Asio flammeus*	LDTV	SC	Open habitat, such as agricultural fields and bogs	-	Open areas for feeding	-	-	-
	Bald eagle	*Haliaeetus leucocephalus*	V	-	Mature forest near a large water body	AONQ (2021)	Batture, marsh, grassland, forest and openarea	-	-	-
Shorebirds	Red knot	*Calidris canutus*	LDTV	E	-	-	Batture, marsh, grassland	-	-	-
	Buff-breasted sandpiper	*Tryngites subruficollis*	-	SC	-	-	Batture, marsh, grassland	-	-	-
	Red-necked phalarope	*Phalaropus lobatus*	-	SC	Subarctic and low arctic wetlands near freshwater ponds,lakes or streams	-	Batture, marsh, grassland	-	-	-
Land and forest birds	Nelson's sparrow	*Ammospiza nelsoni*	LDTV	-	Thin strip of salt or brackish marsh along the coast or islands, and more rarely freshwater marsh	Mousseau (2004)	Batture, marsh, grassland	-	-	-
	Common nighthawk	*Chordeiles minor*	LDTV	T	Open habitat with no vegetation (dune, burnt area, beach, deforested area, rocky outcrop, bare ground)	AONQ (2021)	Batture, marsh, grassland, forest and openarea	-	-	-
	Bank swallow	*Riparia riparia*	-	T	Vertical slopes with substrates consisting of a mixture ofsand and silt	AONQ (2021)	Batture, marsh, grassland, forest and openarea	-	-	-
	Barn swallow	*Hirundo rustica*	-	T	Open environment, watercourse, vertical or horizontal substrate (often enclosed)	AONQ (2021)	Batture, marsh, grassland, forest and openarea	-	-	-
	Olive-sided flycatcher	*Contopus cooperi*	LDTV	T	Open areas with large trees or snags (perches), swamps, burns	AONQ (2021)	Batture, marsh, grassland, forest and open area	-	-	-
	Canada warbler	*Cardellina canadensis*	LDTV	T	Alder grove, a forest environment with a well-developed deciduous shrub layer	-	Batture, marsh, grassland, forest and openarea	-	-	-
	Rusty blackbird	*Euphagus carolinus*	LDTV	SC	Open wetlands such as bogs, swamps, marshes and ponds	AONQ (2021)	Batture, marsh, grassland, forest and openarea	-	-	-

Notes:
1. E: Endangered; LDTV: Likely to be designated as threatened or vulnerable; SC: Special Concern; T: Threatened; V: Vulnerable
2. MFFP, 2022. Threatened or vulnerable wildlife species
3. Government of Canada, 2022. Public Registry of Species at Risk

APPENDIX

D-2 *LIST OF BIRD SPECIES OF PRECARIOUS STATUS LIKELY TO FREQUENT THE AREA STUDY 2*

AppendixD-2: List of Bird Species of Precarious Status Likely to Frequent the Study Area 2

SPECIES GROUP	SPECIES	SCIENTIFIC NAME	STATUS[1]		PREFERRED NESTING HABITAT		MIGRATION HABITAT		WINTER HABITAT	
			PROVINCIAL[2]	FEDERAL[3]	ABITAT	SOURCE OFTHE REFERENCE	HABITAT	SOURCE OFTHE REFERENCE	HABITAT	SOURCE OFTHE REFERENCE
Waterfowl and water birds	Harlequin duck	*Histrionicus histrionicus*	V	SC	In the vicinity of fast-flowing watercourses	CDPNQ (2021), Hydro-Québec (1993), ZICO (2022b)	Batture, marsh, grassland	-	-	-
	Barrow's goldeneye	*Bucephala islandica*	V	SC	Generally around lakes of less than 10 ha in size and locatedat an altitude of more than 500 m	Hydro-Québec (1993)	Batture, marsh, grassland	-	-	-
	Yellow rail	*Coturnicops noveboracensis*	T	SC	-	-	Batture, marsh, grassland	-	-	-
Birds of prey	Golden eagle	*Aquila chrysaetos*	V	-	Cliff, forest and open habitat	CDPNQ (2021), Hydro-Québec (1993), ZICO (2022b)	Batture, marsh, grassland	-	-	-
	Peregrine falcon *anatum*	*Falco peregrinus anatum*	V	SC	Cliffs (nesting), open space for hunting and man-madesites such as bridges and quarries	Hydro-Québec (2013)	Batture, marsh, grassland, forest and open area	-	-	-
	Peregrinene falcon *tundrius*	*Falco peregrinus tundrius*	LDTV	SC	Cliff (nesting), open space for hunting	Hydro-Québec (2013)	Batture, marsh, grassland, forest and open area	-	-	-
	Short-eared owl	*Asio flammeus*	LDTV	SC	Open habitat, such as agricultural fields and bogs	Hydro-Québec (1993)	Open areas for feeding	-	-	-
	Bald eagle	*Haliaeetus leucocephalus*	V	-	Mature forest near a large body of water and	AONQ (2021), CDPNQ (2021)	Batture, marsh, grassland, forest and open area	-	-	-
Shorebirds	Red knot	*Calidris canutus*	LDTV	E	-	-	Batture, marsh, grassland	-	-	-
	Buff-breasted sandpiper	*Tryngites subruficollis*	-	SC	-	-	Batture, marsh, grassland	-	-	-
	Red-necked phalarope	*Phalaropus lobatus*	-	SC	Subarctic and low arctic wetlands near freshwater ponds, lakes or streams	Hydro-Québec (1993)	Batture, marsh, grassland	-	-	-
Land and forest birds	Common nighthawk	*Chordeiles minor*	LDTV	T	Open habitat with no vegetation (dune, burnt area, beach, deforested area, rocky outcrop, bare ground)	AONQ (2021)	Batture, marsh, grassland, forest and open area	-	-	-
	Bank swallow	*Riparia riparia*	-	T	Vertical slopes with substrates consisting of a mixture of sand and silt	Hydro-Québec (1993)	Batture, marsh, grassland, forest and open area	-	-	-
	Olive-sided flycatcher	*Contopus cooperi*	LDTV	T	Open areas with large trees or snags (perches), swamps, burns	-	Batture, marsh, grassland, forest and open area	-	-	-
	Rusty blackbird	*Euphagus carolinus*	LDTV	SC	Open wetlands such as bogs, swamps, marshes and ponds	Hydro-Québec (1993)	Batture, marsh, grassland, forest and open area	-	-	-

Notes:
1. E: Endangered; LDTV: Likely to be designated as threatened or vulnerable; SC: Special Concern; T: Threatened; V: Vulnerable
2. MFFP, 2022. Threatened or vulnerable wildlife species
3. Government of Canada, 2022. Public Registry of Species at Risk

APPENDIX

D-3 *LIST OF BIRD SPECIES OF PRECARIOUS STATUS LIKELY TO FREQUENT THE AREA STUDY 3*

AppendixD-3: List of Bird Species of Precarious Status Likely to Occur in the Study Area 3

SPECIES GROUP	SPECIES	SCIENTIFIC NAME	STATUS[1]		PREFERRED NESTING HABITAT		MIGRATION HABITAT		WINTER HABITAT	
			PROVINCIAL[2]	FEDERAL[3]	HABITAT	SOURCE OF THE REFERENC E	HABITAT	SOURCE OF THE REFERENCE	HABITAT	SOURCE OF THE REFERENCE
Waterfowl and water birds	Harlequin duck	*Histrionicus histrionicus*	V	SC	In the vicinity of fast-flowing watercourses	Roche SNC Lavalin Consortium (2010), CDPNQ (2021)	Batture, marsh, grassland	-	-	-
	Barrow's goldeneye	*Bucephala islandica*	V	SC	-	-	Batture, marsh, grassland	-	-	-
	Yellow rail	*Coturnicops noveboracensis*	T	SC	-	-	Batture, marsh, grassland	-	-	-
Birds of prey	Golden eagle	*Aquila chrysaetos*	V	-	Cliff, forest and open habitat	Roche SNC Consortium Lavalin (2010)	Batture, marsh, grassland	-	-	-
	Peregrine falcon *anatum*	*Falco peregrinus anatum*	V	SC	-	-	Batture, marsh, grassland, forest and open area	-	-	-
	Peregrine falcon *tundrius*	*Falco peregrinus tundrius*	LDTV	SC	-	-	Batture, marsh, grassland, forest and open area	-	-	-
	Short-eared owl	*Asio flammeus*	LDTV	SC	Open habitat, such as agricultural fields and Bogs	AONQ (2021)	Open areas for feeding	-	-	-
	Bald eagle	*Haliaeetus leucocephalus*	V	-	Mature forest near a large water body	AONQ (2021), CDPNQ (2021), Roche Consortium SNC Lavalin (2010)	Batture, marsh, grassland, forest and open area	-	-	-
Shorebirds	Red knot	*Calidris canutus*	LDTV	E	-	-	Batture, marsh, grassland	-	-	-
	Buff-breasted sandpiper	*Tryngites subruficollis*	-	SC	-	-	Batture, marsh, grassland	-	-	-
	Red-necked phalarope	*Phalaropus lobatus*	-	SC	Subarctic and low arctic wetlands, near freshwater ponds, lakes or streams	-	Batture, marsh, grassland	-	-	-
Land and forest birds	Common nighthawk	*Chordeiles minor*	LDTV	T	Open habitat with no vegetation (dune, burnt area, beach, deforested area, rocky outcrop, bare ground)	AONQ (2021)	Batture, marsh, grassland, forest and open area	-	-	-
	Bank swallow	*Riparia riparia*	-	T	Vertical slopes with substrates consisting of a mixture of sand and silt	AONQ (2021), Consortium Roche SNC Lavalin (2010)	Batture, marsh, grassland, forest and open area	-	-	-
	Olive-sided flycatcher	*Contopus cooperi*	LDTV	T	Open areas with large trees or snags (perches), swamps, burns	AONQ (2021), Consortium Roche SNC Lavalin (2010)	Batture, marsh, grassland, forest and open area	-	-	-
	Rusty blackbird	*Euphagus carolinus*	LDTV	SC	Open wetlands such as bogs, swamps, marshes and ponds	AONQ (2021), CDPNQ (2021), Roche Consortium SNC Lavalin (2010)	Batture, marsh, grassland, forest and open area	-	-	-

Notes:
1. E: Endangered; LDTV: Likely to be designated as threatened or vulnerable; SC: Special Concern; T: Threatened; V: Vulnerable
2. MFFP, 2022. Threatened or vulnerable wildlife species
3. Government of Canada, 2022. Public Registry of Species at Risk

APPENDIX

E DETAILED RESULTS OF THE VEGETATION AND WETLAND INVENTORY

APPENDIX E-1 Survey of vegetation and wetlands - Southern area of 2E2

Sampling station (n = 19)	B-01.1	B-01.2	A-01.3	A-01.2	A-01.1	A-02.1	A-02.2	A-03.1	B-04.3	B-04.2	B-04.1	B-05.2	B-05.1	A-05.1	A-06.2	A-06.1	B-07.1	B-08.2	B-08.1
Location	South	South	South	South	South	South	South	South	South	South	South	South	South	South	South	South	South	South	South
Date	2022-08-03	2022-08-03	2022-08-07	2022-08-06	2022-08-06	2022-08-11	2022-08-11	2022-08-06	2022-08-11	2022-08-11	2022-08-11	2022-08-11	2022-08-11	2022-08-05	2022-08-12	2022-08-12	2022-08-11	2022-08-07	2022-08-07
Lat °N	53°48'58"N	53°49'40"N	53°51'43"N	53°51'43"N	53°51'43"N	53°53'05"N	53°53'06"N	53°55'48"N	53°59'16"N	53°59'17"N	53°59'18"N	54°02'03"N	54°02'04"N	54°03'55"N	54°09'24"N	54°09'25"N	54°10'56"N	54°13'39"N	54°13'40"N
Long °W	77°36'15"W	77°35'46"W	77°24'23"W	77°24'21"W	77°24'21"W	77°26'01"W	77°26'01"W	77°22'53"W	77°25'18"W	77°25'18"W	77°25'18"W	77°23'50"W	77°23'52"W	77°24'38"W	77°22'25"W	77°22'24"W	77°23'00"W	77°21'42"W	77°21'41"W
Vegetation type (remark)	Treed bog	Riverine fen (with creek)	Treed bog (burnt)	Shrub swamp	Shallow/Open water (depth: 15cm-1m+)	Shallow/Open water (depth: 50cm-1m+)	Riverine fen (fire ± 35yrs)	Jack Pine stand	Jack Pine stand (young)	Treed bog	Riverine fen	Jack Pine stand (young)	Shrub swamp	Grass fen	Shrub swamp	Shallow/Open water (depth: 50cm-1m+)	Regeneration (fire ≥ 25yrs)	Treed bog (fire ≤ 35yrs)	Riverine bog
Type de végétation	Bog boisé	Fen riverain	Bog boisé	Marécage arbustif	Eau peu profonde	Eau peu profonde	Fen riverain	Pinède à pin gris	Pinède à pin gris	Bog boisé	Fen riverain	Pinède à pin gris	Marécage arbustif	Fen herbacé	Marécage arbustif	Eau peu profonde	Régénération	Bog boisé	Bog riverain
Substrate (depth)	Peat(>50cm)	Peat(>100cm)	Peat(>100cm)	Peat(100cm)/Alluvium	Sand+alluvium-boulders	Alluvium	Peat(25cm)/Alluvium/Clay	Drift+sand+clay	Drift	Peat(>100cm)	Peat(>100cm)	Drift (scattered)/Bedrock	Peat/Alluvium/Boulders	Peat(>100cm)	Peat(80cm)/Alluvium	Alluvium	Drift	Peat(>100cm)	Peat(>100cm)
Drainage	Very poor	Very poor	Poor	Very poor	None	None	Very poor	Good	Good	Very poor	Very poor	Rapid	Very poor	Very poor	Very poor	None	Good	Very poor	Very poor
Soil features	—	—	—																
Groundwater level (cm)	60	15	20	0	Flooded	Flooded	0	n/d	n/d	50	0	n/d	0	0	0	Flooded	n/d	0	0
Wetland?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes
	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
Total Tree layer	16	1	15	—	—	—	—	38	18	16	—	15	1	—	—	—	1	1	—
Total Shrub layer	95	71	117	129	2	—	102	115	75	88	60	109	144	42	62	—	41	104	33
Total Herb/Forb layer	16	63	33	70	120	58	19	54	21	39	56	23	59	161	40	66	24	19	28
Total Lichen/Moss layer	106	30	81	38	—	—	4	88	88	88	88	78	15	88	89	—	88	101	63
Total Bare ground/Litter	3	88	15	88	15	—	88	15	30	3	15	53	88	—	3	—	18	—	3
Open water	—	—	—	38	88	88	15	—	—	1	—	—	15	15	—	88	—	3	63

Species observed (n = 93)	Vegetation layer	Species code (latin)	Nom commun	Common name	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
	Tree layer (T: > 4m)																				
	T	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch																	
(1)	T	Larix laricina	Mélèze laricin	Tamarack	1	1							3	1							
	T	Picea glauca	Épinette blanche	White spruce																	
(1)	T	Picea mariana	Épinette noire	Black spruce	15		15							15			1			1	1
(1)	T	Pinus banksiana	Pin gris	Jack pine								38	15			15					
	T	Populus tremuloides	Peuplier faux-tremble	Trembling aspen																	
	Shrub layer (S: < 4m)																				
1	S	Alnus alnobetula subsp. crispa	Aulne crispé	American green alder								3			3	1					
1	S	Alnus incana subsp. rugosa	Aulne rugueux	Speckled alder		15	3									15		1			
1	S	Amelanchier bartramiana	Amélanchier de Bartram	Bartram's serviceberry											1						
1	S	Andromeda polifolia var. polifolia	Andromède à feuilles de Polium	Northern bog rosemary													15				
	S	Arctous alpina	Busserole alpine	Alpine bearberry																	
	S	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch																	
1	S	Betula glandulosa	Bouleau glanduleux	Glandular birch								3	15			15	15				
	S	Betula pumila var. glandulifera	Bouleau glandulifère	Northern bog birch																	
1	S	Chamaedaphne calyculata	Cassandre caliculé	Leatherleaf	15	38	63	38	1		38		15	15	38		38	15	38	1	63	15
	S	Cornus stolonifera	Cornouiller hart-rouge	Red-osier dogwood																	
1	S	Dasiphora fruticosa	Potentille fruticosa	Shrubby cinquefoil													1				
1	S	Empetrum nigrum subsp. nigrum	Camarine noire	Black crowberry			15								1		1			15	
1	S	Epigaea repens	Épigée rampante	Trailing arbutus								3	1								
	S	Gaultheria hispidula	Petit thé	Creeping snowberry																	
1	S	Juniperus communis var. depressa	Genévrier commun déprimé	Depressed juniper												1					
1	S	Kalmia angustifolia var. angustifolia	Kalmia à feuilles étroites	Sheep laurel								1	15								
1	S	Kalmia polifolia	Kalmia à feuilles d'andromède	Pale bog laurel	3		1	3						1	3					3	
	S	Kalmia procumbens	Azalée des Alpes	Alpine azalea																	
1	S	Larix laricina	Mélèze laricin	Tamarack		3						1	1		1						
1	S	Linnaea borealis subsp. longiflora	Linnée à longues fleurs	Long-tube twinflower								1	3								
1	S	Lonicera villosa	Chèvrefeuille velu	Mountain fly-honeysuckle													1				
1	S	Myrica gale	Myrique baumier	Sweet gale				88	1		63				15		38		15		15
	S	Picea glauca	Épinette blanche	White spruce																	
1	S	Picea mariana	Épinette noire	Black spruce	38		15					3	3	3		1	15	1	1	3	3
1	S	Pinus banksiana	Pin gris	Jack pine								1	3			1					
	S	Populus tremuloides	Peuplier faux-tremble	Trembling aspen																	
1	S	Prunus pensylvanica	Cerisier de Pennsylvanie	Pin cherry												3					
1	S	Rhododendron groenlandicum	Thé du Labrador	Common Labrador tea	38		15					15		63		15	1	1		15	15
	S	Rhododendron tomentosum	Petit thé du Labrador	Northern Labrador tea																	
	S	Ribes glandulosum	Gadellier glanduleux	Skunk currant																	
	S	Ribes hirtellum	Groseillier hérissé	Swamp gooseberry																	
	S	Ribes lacustre	Gadellier lacustre	Bristly black currant																	
	S	Ribes triste	Gadellier amer	Swamp red currant																	
1	S	Rubus idaeus subsp. strigosus	Framboisier sauvage	North American red raspberry													1				
	S	Salix arctophila	Saule arctophile	Northern willow																	
	S	Salix argyrocarpa	Saule à fruits argentés	Labrador willow																	
	S	Salix balli	Saule de Ball	Ball's willow																	
1	S	Salix bebbiana	Saule de Bebb	Bebbi's willow								3								1	
	S	Salix glauca var. cordifolia	Saule à beaux fruits	Beautiful willow																	
1	S	Salix humilis var. humilis	Saule humble	Tall prairie willow								15				15				3	
1	S	Salix pedicellaris	Saule pédicellé	Bog willow		15					1						1		1		
	S	Salix petiolaris	Saule satiné	Satiny willow																	
1	S	Salix planifolia	Saule à feuilles planes	Tea-leaved willow													1				
1	S	Salix pyrifolia	Saule à feuilles de poirier	Balsam willow													15				
	S	Salix uva-ursi	Saule raisin d'ours	Bearberry willow																	
	S	Salix vestita	Saule pubescent	Hairy willow																	
	S	Shepherdia canadensis	Shépherdie du Canada	Soapberry																	
	S	Sorbus americana	Sorbier d'Amérique	American mountain-ash																	
1	S	Vaccinium angustifolium	Bleuet à feuilles étroites	Early lowbush blueberry			1					63	15			38				15	1
1	S	Vaccinium cespitosum	Airelle gazonnante	Dwarf bilberry									1								
	S	Vaccinium myrtilloides	Bleuet fausse-myrtille	Velvet-leaved blueberry																	
1	S	Vaccinium oxycoccos	Canneberge commune	Small cranberry	1		3							3	3			3	3	1	3
1	S	Vaccinium uliginosum	Airelle des marécages	Bog bilberry								3	3	3		15	1			3	
1	S	Vaccinium vitis-idaea	Airelle rouge	Mountain cranberry			1													3	
	S	Viburnum edule	Viorne comestible	Squashberry																	
	Herb and forb layer (H)																				
	H	Achillea borealis var. borealis	Achillée boréale	Boreal yarrow																	
	H	Agrostis mertensii	Agrostide de Mertens	Northern bentgrass																	
	H	Agrostis scabra	Agrostide scabre	Rough bentgrass																	
	H	Anthoxanthum monticola subsp. monticola	Hélérochloé des montagnes	Alpine sweetgrass																	
	H	Arctanthemum arcticum subsp. arcticum	Chrysanthème arctique	Arctic daisy																	
	H	Arctopoa eminens	Pâturin superbe	Eminent bluegrass																	
	H	Armeria maritima subsp. sibirica	Arméria de Sibérie	Sea thrift																	
1	H	Avenella flexuosa	Deschampsie flexueuse	Wavy hairgrass								1				1				1	
	H	Bistorta vivipara	Renouée vivipare	Alpine bistort																	
	H	Bromus ciliatus	Brome ciliè	Fringed brome																	
1	H	Calamagrostis canadensis s.l.	Bluejoint reedgrass	Bluejoint reedgrass								1									
	H	Calamagrostis deschampsioides	Calamagrostide fausse-deschampsie	Circumpolar reedgrass													3				
	H	Calla palustris	Calla des marais	Wild calla																	
	H	Callitriche palustris	Callitriche des marais	Spring water-starwort																	
	H	Caltha palustris	Populage des marais	Yellow marsh marigold																	
	H	Campanula gieseckeana	Campanule de Giesecke	Giesecke's bellflower																	
	H	Carex aquatilis s.l.	Carex aquatique	Water sedge																	
	H	Carex arctogena	Carex arctogène	Tufted black sedge																	
	H	Carex bigelowii subsp. bigelowii	Carex de Bigelow	Bigelow's sedge																	
	H	Carex brunnescens s.l.	Carex brunâtre	Brownish sedge																	
1	H	Carex canescens s.l.	Carex blanchâtre	Hoary sedge																	
	H	Carex capillaris subsp. capillaris	Carex capillaire	Hair-like sedge																	
1	H	Carex deflexa var. deflexa	Carex déprimé	Bent northern sedge												1					
	H	Carex disperma	Carex disperme	Two-seeded sedge																	
1	H	Carex echinata subsp. echinata	Carex étoilé	Star sedge				1									38				
1	H	Carex exilis	Carex maigre	Meagre sedge														15			
	H	Carex glareosa subsp. glareosa	Carex des graviers	Gravel sedge																	
	H	Carex leptalea	Carex à tiges grêles	Bristle-stalked sedge																	
1	H	Carex lasiocarpa subsp. americana	Carex à fruits tomenteux d'Amérique	American woolly-fruited sedge				38	3	3											
1	H	Carex limosa	Carex des bourbiers	Mud sedge				3					1					3			3
1	H	Carex magellanica subsp. irrigua	Carex chétif	Boreal bog sedge		3															
1	H	Carex michauxiana	Carex de Michaux	Michaux's sedge				3													
	H	Carex norvegica	Carex de Norvège	Norway sedge																	
1	H	Carex oligosperma	Carex oligosperme	Few-seeded sedge							3		38					15	38		
	H	Carex paleacea	Carex paléacé	Chaffy sedge																	
1	H	Carex pauciflora	Carex pauciflore	Few-flowered sedge			1											1			3
	H	Carex rariflora	Carex rariflore	Loose-flowered alpine sedge																	
1	H	Carex rostrata	Carex rostré	Swollen beaked sedge						3											
	H	Carex saxatilis	Carex saxatile	Russet sedge																	
	H	Carex scirpoidea subsp. scirpoidea	Carex faux-scirpe	Single-spike sedge																	
	H	Carex stylosa	Carex à long style	Long-styled sedge																	
	H	Carex tenuiflora	Carex tenuiflore	Sparse-flowered sedge																	
	H	Carex tonsa s.l.	Carex à fruits glabres	Deep green sedge																	
1	H	Carex trisperma	Carex trisperme	Three-seeded sedge			1														
	H	Carex vaginata	Carex engainé	Sheated sedge																	
	H	Castilleja raupii	Castillèje de Raup	Raup's paintbrush																	
1	H	Chamaenerion angustifolium subsp. angustifolium	Épilobe à feuilles étroites	Fireweed								3				1			1		
	H	Cinna latifolia	Cinna à larges feuilles	Drooping woodreed																	
1	H	Comarum palustre	Comaret des marais	Marsh cinquefoil		15		1			1					1					
	H	Coptidium lapponicum	Renoncule de Laponie	Lapland buttercup																	
	H	Coptis trifolia	Savoyane	Goldthread																	
	H	Corallorhiza trifida	Corallorhize trifide	Early coralroot																	
1	H	Cornus canadensis	Quatre-temps	Bunchberry								15	15			3	1			15	
	H	Danthonia spicata	Danthonie à épi	Poverty oatgrass																	
1	H	Dendrolycopodium dendroideum	Lycopode dendroïde	Round-branched tree-clubmoss												1					
	H	Deschampsia cespitosa subsp. cespitosa	Deschampsie cespiteuse	Tufted hairgrass																	
1	H	Diphasiastrum complanatum	Lycopode aplati	Northern ground-cedar												1			1		
1	H	Diphasiastrum sitchense	Lycopode de Sitka	Sitka ground-cedar								3	3			3			3		
	H	Draba glabella	Drave glabre	Smooth draba																	
	H	Drosera anglica	Drosère d'Angleterre	English sundew																	
1	H	Drosera rotundifolia	Drosère à feuilles rondes	Round-leaved sundew			1	3							1			15	1		3
1	H	Eleocharis acicularis	Éléocharide aciculaire	Needle spikerush					15	15											
	H	Elymus trachycaulus subsp. trachycaulus	Élyme à chaumes rudes	Slender wildrye																	
	H	Epilobium ciliatum subsp. glandulosum	Épilobe glanduleux	Glandular willowherb																	
	H	Epilobium palustre	Épilobe des marais	Marsh willowherb																	
	H	Equisetum arvense	Prêle des champs	Field horsetail																	
1	H	Equisetum fluviatile	Prêle fluviatile	Water horsetail				3	1	1											
1	H	Equisetum sylvaticum	Prêle des bois	Woodland horsetail													3				
	H	Eriophorum angustifolium subsp. angustifolium	Linaigrette à feuilles étroites	Narrow-leaved cottongrass																	
	H	Eriophorum russeolum subsp. russeolum	Linaigrette rousse	Russet cottongrass																	
	H	Eriophorum tenellum	Linaigrette ténue	Rough cottongrass																	
1	H	Eriophorum vaginatum subsp. spissum	Linaigrette dense	Dense cottongrass																	1
	H	Euphrasia wettsteinii	Euphraise de Wettstein	Wettstein's eyebright																	
	H	Eurybia radula	Aster rude	Low rough aster																	
	H	Festuca brachyphylla subsp. brachyphylla	Fétuque à feuilles courtes	Short-leaved fescue																	
	H	Festuca rubra subsp. arctica	Fétuque de Richardson	Arctic red fescue																	
	H	Fragaria virginiana subsp. glauca	Fraisier glauque	Smooth wild strawberry																	
	H	Galium trifidum s.l.	Gaillet trifide	Three-petalled bedstraw																	
	H	Galium triflorum	Gaillet à trois fleurs	Three-flowered bedstraw																	
	H	Geocaulon lividum	Comandre livide	Northern comandra																	
	H	Gymnocarpium dryopteris	Gymnocarpe fougère-du-chêne	Common oak fern																	
	H	Halerpestes cymbalaria	Renoncule cymbalaire	Seaside buttercup																	
	H	Hieracium robinsonii	Épervière de Robinson	Robinson's kawkaweed																	
1	H	Hippuris vulgaris	Pesse commune	Common mare's-tail		1												1			
	H	Honckenya peploides subsp. diffusa	Honckénye diffusa	Northern seabeach sandwort																	
	H	Hupercia selago	Lycopode sélagine	Northern firmoss																	
1	H	Isoetes echinospora subsp. muricata	Isoète à spores hérissées	Spiny-spored quillwort						3											
	H	Isoetes lacustris	Isoète lacustre	Lake quillwort																	
	H	Juncus alpinoarticulatus subsp. americanus	Jonc alpin	Alpine rush																	
	H	Juncus balticus subsp. littoralis	Jonc des rivages	Shoreline rush																	
1	H	Juncus brevicaudatus	Jonc brévicaudé	Short-tailed rush				1	1												
	H	Juncus filiformis	Jonc filiforme	Thread rush																	
1	H	Juncus pelocarpus	Jonc à fruits bruns	Brown-fruited rush				1													
1	H	Juncus stygius subsp. americanus	Jonc d'Amérique	American moor rush														3			
	H	Koeleria spicata	Trisète à épi	Spike trisetum																	
	H	Koenigia islandica	Koenigie d'Islande	Iceland purslane																	
	H	Lathyrus japonicus	Gesse maritime	Beach pea																	
	H	Leymus mollis subsp. mollis	Élyme des sables d'Amérique	Sea limegrass																	
	H	Ligusticum scoticum subsp. scoticum	Livèche d'Ecosse	Scotch lovage																	
	H	Luzula parviflora s.l.	Luzule parviflore	Small-flowered woodrush																	
1	H	Lycopodium clavatum	Lycopode claviforme	Running clubmoss																1	
1	H	Lysimachia borealis	Trientale boréale	Northern starflower												1	1				
1	H	Maianthemum canadense subsp. canadense	Maianthème du Canada	Wild lily-of-the-valley								15				1					
1	H	Maianthemum trifolium	Smilacine trifoliée	Three-leaved false Solomon's seal	1	1				1	1			1							
	H	Malaxis unifolia	Malaxis unifolié	Green adder's-mouth																	
1	H	Melampyrum lineare	Mélampyre linéaire	American cow-wheat												3					
1	H	Menyanthes trifoliata	Tréfle d'eau	Bog buckbean				1										3			
	H	Mitella nuda	Mitrelle nue	Naked mitrewort																	
	H	Moneses uniflora	Monésés unifiore	One-flowered wintergreen																	
	H	Mononeuria groenlandica	Minuartie du Groenland	Greenland stitchwort																	
	H	Muhlenbergia uniflora	Muhlenbergie unifiore	Late-flowering muhly																	
	H	Neottia cordata	Listère cordée	Heart-leaved twayblade																	
1	H	Nuphar variegata	Grand nénuphar jaune	Variegated pond-lily					1									38			3
	H	Oclemena nemoralis	Aster des tourbières	Bog aster																	
	H	Orthilia secunda	Pyrole unilatérale	One-sided wintergreen																	
	H	Packera aurea	Sénéçon doré	Golden groundsel																	
1	H	Petasites frigidus var. palmatus	Pétasite palmé	Palmate coltsfoot								3									
	H	Phegopteris connectilis	Phégoptère du hêtre	Northern beech fern																	
1	H	Piptatheropsis canadensis	Oryzopsis du Canada	Canada ricegrass								3				1					
1	H	Piptatheropsis pungens	Oryzopsis piquant	Slender ricegrass								3	1			1			1		
	H	Plantago maritima	Plantain maritime	Seaside plantain																	
	H	Platanthera aquilonis	Platanthère du Nord	Tall northern green orchid																	
	H	Platanthera dilatata var. dilatata	Platanthère dilatée	Tall white bog orchid																	
	H	Platanthera huronensis	Platanthère du lac Huron	Lake Huron green orchid																	
	H	Platanthera obtusata subsp. obtusata	Platanthère à feuille obtuse	Blunt-leaved orchid																	
	H	Poa alpina subsp. alpina	Pâturin alpin	Alpine bluegrass																	
	H	Poa glauca subsp. glauca	Pâturin glauque	Glaucous bluegrass																	
	H	Poa palustris	Pâturin des marais	Fowl bluegrass																	
	H	Potamogeton alpinus	Potamot alpin	Alpine pondweed																	
1	H	Potamogeton epihydrus	Potamot émergé	Ribbon-leaved pondweed																	
	H	Potentilla anserina subsp. groenlandica	Potentille du Groenland	Greenland silverweed																	
	H	Potentilla litoralis	Potentille du littoral	Coast cinquefoil																	
	H	Potentilla norvegica	Potentille de Norvège	Rough cinquefoil																	
	H	Puccinellia phryganodes subsp. neoarctica	Puccinellie néarctique	Creeping alkaligrass																	
	H	Pyrola grandiflora	Pyrole à grandes fleurs	Arctic pyrola																	
	H	Pyrola minor	Pyrole mineure	Lesser pyrola																	
	H	Ranunculus flammula var. reptans	Renoncule radicante	Creeping spearwort																	
	H	Ranunculus trichophyllus	Renoncule capillaire	Thread-leaved water-crowfoot																	
	H	Rhinanthus minor subsp. groenlandicus	Rhinanthe du Groenland	Greenland yellow rattle																	
1	H	Rhynchospora alba	Rhynchospore blanc	White beaksrush														38			
1	H	Rubus arcticus subsp. acaulis	Ronce acaule	Stemless raspberry													3				
1	H	Rubus chamaemorus	Chicouté	Cloudberry	15		15							38			1	1		15	
	H	Rubus pubescens	Ronce pubescente	Dwarf raspberry																	
	H	Sagina nodosa subsp. borealis	Sagine boréale	Northern knotted pearlwort																	
1	H	Sagittaria cuneata	Sagittaire cunéaire	Northern arrowhead					15	3											
1	H	Sarracenia purpurea subsp. purpurea	Sarracénie pourpre	Northern pitcher plant														3			
	H	Saxifraga cespitosa	Saxifrage cespiteuse	Tufted saxifrage																	
	H	Saxifraga paniculata subsp. laestadii	Saxifrage de Laestadius	Laestadius' saxifrage																	
	H	Saxifraga tricuspidata	Saxifrage à trois dents	Three-toothed saxifrage																	
1	H	Scheuchzeria palustris	Scheuchzérie des marais	Marsh scheuchzeria																	15
1	H	Schizachne purpurascens subsp. purpurascens	Schizachné pourpré	Purple false melic								3									
	H	Selaginella selaginoides	Sélaginelle fausse-sélagine	Low spikemoss																	
1	H	Sibbaldia tridentata	Potentille tridentée	Three-toothed cinquefoil								1	1			3					
1	H	Solidago hispida var. hispida	Verge d'or hispide	Hairy goldenrod								3	1			1			1		
1	H	Solidago macrophylla	Verge d'or à grandes feuilles	Large-leaved goldenrod								1									
	H	Solidago multiradiata	Verge d'or à rayons nombreux	Multi-rayed goldenrod																	
	H	Solidago uliginosa var. peracuta	Verge d'or à feuilles pointues	Bog goldenrod																	
1	H	Sparganium angustifolium	Rubanier à feuilles étroites	Narrow-leaved burreed					38	15								3			
1	H	Sparganium emersum	Rubanier à fruits verts	Green-fruited burreed					15												
1	H	Sparganium fluctuans	Rubanier flottant	Floating burreed					15									15			
1	H	Sparganium hyperboreum	Rubanier hyperborénal	Northern burreed		1															
	H	Spiraea alnifolia subsp. alpestre	Spirée alpestre	Stiff clubmoss																	
	H	Spinulum annotinum subsp. annotinum	Lycopode innovant	Stiff clubmoss																	
	H	Spiranthes romanzoffiana	Spiranthe de Romanzoff	Hooded ladies'-tresses																	
	H	Stellaria borealis subsp. borealis	Stellaire boréale	Boreal starwort																	
	H	Stellaria longipes subsp. longipes	Stellaire à longs pédicelles	Long-stalked starwort																	
	H	Streptopus amplexifolius	Streptope à feuilles embrassantes	Clasping-leaved twisted-stalk																	
	H	Subularia aquatica subsp. americana	Subulaire d'Amérique	American water awlwort																	
1	H	Symphyotrichum puniceum var. puniceum	Aster ponceau	Purple-stemmed aster													1				
	H	Taraxacum ceratophorum	Pissenlit tuberculé	Horned dandelion																	
	H	Trichophorum alpinum	Trichophore des Alpes	Alpine clubrush																	
1

APPENDIX E-2 (1/2) Survey of vegetation and wetlands - Central area of ZE2

Sampling station (n = 23)	BB-09.2	BB-09.3	BB-09.1	B-11.2	B-11.1	A-11.1	A-11.3	A-11.2	B-12.1	B-13.1	A-12.3	A-12.4	A-12.5	A-12.1	A-12.2
Location	Central	Central	Central	Central	Central	Central	Central	Central	Central	Central	Central	Central	Central	Central	Central
Date	2022-08-05	2022-08-05	2022-08-05	2022-08-12	2022-08-12	2022-08-05	2022-08-05	2022-08-05	2022-08-12	2022-08-12	2022-08-05	2022-08-05	2022-08-05	2022-08-05	2022-08-05
Lat °N	54°18'13"N	54°18'14"N	54°18'15"N	54°20'34"N	54°20'34"N	54°21'50"N	54°21'50"N	54°21'51"N	54°25'16"N	54°27'55"N	54°30'12"N	54°30'13"N	54°30'14"N	54°30'14"N	54°30'14"N
Long °W	77°26'08"W	77°26'10"W	77°26'06"W	77°21'03"W	77°20'58"W	77°19'15"W	77°19'10"W	77°19'13"W	77°23'42"W	77°24'43"W	77°19'03"W	77°19'18"W	77°19'18"W	77°19'09"W	77°19'04"W
Vegetation type (remark)	Riverine bog	Outcrop	Aspen stand	Feathermoss-spruce forest	Shrub swamp	Shallow/Open water (depth: 15cm-1m+)	Lichen-spruce forest	Feathermoss-spruce forest	Treed bog	String fen	Forested bog	Boulder field	Forested swamp	Lichen-Spruce forest	Shallow/Open water (depth: 1m+)
Type de végétation	Bog riverain	Affleurement	Tremblaie	Pessière noire à mousses	Marécage arbustif	Eau peu profonde	Pessière noire à lichens	Pessière noire à mousses	Bog boisé	Fen réticulé	Bog boisé	Champ de blocs	Marécage arborescent	Pessière noire à lichens	Eau peu profonde
Substrate (depth)	Peat(>100cm)	Bedrock	Bedrock	Clay	Peat/Alluvium	Boulders+pebbles/Clay	Drift	Sand+clay	Peat(>100cm)	Peat(>100cm)	Peat(>100cm)	Boulders	Sand+alluvium/Boulders	Sand/Bedrock	Clay
Drainage	Very poor	n/a	Rapid	Imperfect	Very poor	None	Good	Poor	Very poor	Very poor	Poor	Very rapid	Imperfect	Good	None
Soil features								Mottles							
Groundwater level (cm)	0	n/d	n/d	n/d	0	Flooded	n/d	n/d	n/d	0	10	n/d	n/d	n/d	Flooded
Wetland?	Yes	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes(?)	No	Yes
	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
Total Tree layer	—	—	17	76	—	—	16	39	15	—	16	—	39	67	—
Total Shrub layer	78	16	130	44	72	—	84	103	87	47	84	5	145	75	19
Total Herb/Forb layer	36	30	55	24	104	77	5	4	38	255	16	6	164	16	122
Total Lichen/Moss layer	91	53	53	106	—	—	88	106	106	63	106	41	15	101	—
Total Bare ground/Litter	—	63	41	3	88	15	3	3	—	15	3	88	88	3	—
Open water	3	—	—	—	—	88	—	—	—	38	—	—	1	—	88

Species observed (n = 146)	Vegetation layer	Species code (latin)	Nom commun	Common name	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
	Tree layer (T :> 4m)																		
(1)	T	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch													3		
(1)	T	Larix laricina	Mélèze laricin	Tamarack				38			1	3			1			3	
	T	Picea glauca	Épinette blanche	White spruce															
(1)	T	Picea mariana	Épinette noire	Black spruce			1	38			15	38	15		15		38	63	
1	T	Pinus banksiana	Pin gris	Jack pine			1											1	
(1)	T	Populus tremuloides	Peuplier faux-tremble	Trembling aspen			15												
	Shrub layer (S : < 4m)																		
1	S	Alnus alnobetula subsp. crispa	Aulne crispé	American green alder			38	3								1	63		
1	S	Alnus incana subsp. rugosa	Aulne rugueux	Speckled alder					3								15		1
1	S	Amelanchier bartramiana	Amélanchier de Bartram	Bartram's serviceberry			1	1									1		
1	S	Andromeda polifolia var. polifolia	Andromède à feuilles de Polium	Northern bog rosemary											15				
	S	Arctous alpina	Busserole alpine	Alpine bearberry															
1	S	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch												1			
1	S	Betula glandulosa	Bouleau glanduleux	Glandular birch		1		1			15				1				
1	S	Betula pumila var. glandulifera	Bouleau glandulifère	Northern bog birch													(hors parcelle)		
1	S	Chamaedaphne calyculata	Cassandre caliculé	Leatherleaf	38				1			15	15	1	15				3
1	S	Cornus stolonifera	Cornouiller hart-rouge	Red-osier dogwood													15		
1	S	Dasiphora fruticosa	Potentille frutescente	Shrubby cinquefoil											1				
1	S	Empetrum nigrum subsp. nigrum	Camarine noire	Black crowberry								1	1	1	1			1	
1	S	Epigaea repens	Épigée rampante	Trailing arbutus							3								
	S	Gaultheria hispidula	Petit thé	Creeping snowberry															
1	S	Juniperus communis var. depressa	Genévrier commun déprimé	Depressed juniper		1													
	S	Kalmia angustifolia var. angustifolia	Kalmia à feuilles étroites	Sheep laurel															
1	S	Kalmia polifolia	Kalmia à feuilles d'andromède	Pale bog laurel	3							1	3	3	1				
	S	Kalmia procumbens	Azalée des Alpes	Alpine azalea															
1	S	Larix laricina	Mélèze laricin	Tamarack	1	1						1		3					
	S	Linnaea borealis subsp. longiflora	Linnée à longues fleurs	Long-tube twinflower															
1	S	Lonicera villosa	Chèvrefeuille velu	Mountain fly-honeysuckle										1					
1	S	Myrica gale	Myrique baumier	Sweet gale	15				38					15			15		15
	S	Picea glauca	Épinette blanche	White spruce															
1	S	Picea mariana	Épinette noire	Black spruce	3	1	3	15			3	15	3	3		1		15	
	S	Pinus banksiana	Pin gris	Jack pine															
1	S	Populus tremuloides	Peuplier faux-tremble	Trembling aspen			15												
1	S	Prunus pensylvanica	Cerisier de Pennsylvanie	Pin cherry		3	15												
1	S	Rhododendron groenlandicum	Thé du Labrador	Common Labrador tea	15			15			15	63	63		63	1	1	38	
	S	Rhododendron tomentosum	Petit thé du Labrador	Northern Labrador tea															
1	S	Ribes glandulosum	Gadellier glanduleux	Skunk currant			1												
1	S	Ribes hirtellum	Groseillier hérissé	Swamp gooseberry													1		
1	S	Ribes lacustre	Gadellier lacustre	Bristly black currant													1		
1	S	Ribes triste	Gadellier amer	Swamp red currant													1		
1	S	Rubus idaeus subsp. strigosus	Framboisier sauvage	North American red raspberry			1												
	S	Salix arctophila	Saule arctophile	Northern willow															
1	S	Salix argyrocarpa	Saule à fruits argentés	Labrador willow					15										
1	S	Salix balli	Saule de Bali	Bali's willow															
1	S	Salix bebbiana	Saule de Bebb	Bebbi's willow															
	S	Salix glauca var. cordifolia	Saule à beaux fruits	Beautiful willow															
1	S	Salix humilis var. humilis	Saule humble	Tall prairie willow		3	3				3								
1	S	Salix pedicellaris	Saule pédicellé	Bog willow					15										
1	S	Salix pellita	Saule satiné	Satiny willow															
1	S	Salix planifolia	Saule à feuilles planes	Tea-leaved willow							1						15		
1	S	Salix pyrifolia	Saule à feuilles de poirier	Balsam willow				3											
	S	Salix uva-ursi	Saule raisin d'ours	Bearberry willow															
	S	Salix vestita	Saule pubescent	Hairy willow															
	S	Shepherdia canadensis	Shépherdie du Canada	Soapberry															
1	S	Sorbus americana	Sorbier d'Amérique	American mountain-ash													1		
1	S	Vaccinium angustifolium	Bleuet à feuilles étroites	Early lowbush blueberry		3		3			38	3						15	
1	S	Vaccinium cespitosum	Airelle gazonnante	Dwarf bilberry				1											
1	S	Vaccinium myrtilloides	Bleuet fausse-myrtille	Velvet-leaved blueberry															
1	S	Vaccinium oxycoccos	Canneberge commune	Small cranberry	3			1				1	1	3	1				
1	S	Vaccinium uliginosum	Airelle des marécages	Bog bilberry		3	38				3					1	1	3	
1	S	Vaccinium vitis-idaea	Airelle rouge	Mountain cranberry				1			3	3	1		3			3	
1	S	Viburnum edule	Viorne comestible	Squashberry			15										15		
	Herb and forb layer (H)																		
1	H	Achillea borealis var. borealis	Achillée boréale	Boreal yarrow															
1	H	Agrostis mertensii	Agrostide de Mertens	Northern bentgrass										1		1	1		
1	H	Agrostis scabra	Agrostide scabre	Rough bentgrass		1								3		1			
	H	Anthoxanthum monticola subsp. monticola	Hiérochloé des montagnes	Alpine sweetgrass															
	H	Arctanthemum arcticum subsp. arcticum	Chrysanthème arctique	Arctic daisy															
	H	Arctopoa eminens	Pâturin superbe	Eminent bluegrass															
	H	Armeria maritima subsp. sibirica	Arméria de Sibérie	Sea thrift															
1	H	Avenella flexuosa	Deschampsie flexueuse	Wavy hairgrass		3					1								
	H	Bistorta vivipara	Renouée vivipare	Alpine bistort															
1	H	Bromus ciliatus	Brome cilié	Fringed brome															
1	H	Calamagrostis canadensis s.l.	Calamagrostide du Canada	Bluejoint reedgrass			15							1		1	15		
	H	Calamagrostis deschampsioides	Calamagrostide fausse-deschampsie	Circumpolar reedgrass															
1	H	Calla palustris	Calla des marais	Wild calla						1									
1	H	Callitriche palustris	Callitriche des marais	Spring water-starwort						3									
1	H	Caltha palustris	Populage des marais	Yellow marsh marigold													1		
	H	Campanula gieseckeana	Campanule de Giesecke	Giesecke's bellflower															
1	H	Capnoides sempervirens	Corydale toujours verte	Pink corydalis															
1	H	Carex aquatilis s.l.	Carex aquatique	Water sedge					88										3
	H	Carex arctogena	Carex arctogène	Tufted black sedge															
	H	Carex bigelowii subsp. bigelowii	Carex de Bigelow	Bigelow's sedge															
	H	Carex brunnescens s.l.	Carex brunâtre	Brownish sedge															
1	H	Carex canescens s.l.	Carex blanchâtre	Hoary sedge															
	H	Carex capillaris subsp. capillaris	Carex capillaire	Hair-like sedge															
1	H	Carex deflexa var. deflexa	Carex déprimé	Bent northern sedge		1										1			
1	H	Carex disperma	Carex disperme	Two-seeded sedge															
	H	Carex echinata subsp. echinata	Carex étoilé	Star sedge															
1	H	Carex exilis	Carex maigre	Meagre sedge	1										3				
	H	Carex glareosa subsp. glareosa	Carex des graviers	Gravel sedge															
1	H	Carex leptalea	Carex à tiges grêles	Bristle-stalked sedge													1		
	H	Carex lasiocarpa subsp. americana	Carex à fruits tomenteux d'Amérique	American wooly-fruited sedge															
1	H	Carex limosa	Carex des bourbiers	Mud sedge	15										3				
	H	Carex magellanica subsp. irrigua	Carex chétif	Boreal bog sedge															
	H	Carex michauxiana	Carex de Michaux	Michaux's sedge															
	H	Carex norvegica	Carex de Norvège	Norway sedge															
1	H	Carex oligosperma	Carex oligosperme	Few-seeded sedge	3														
	H	Carex paleacea	Carex paléacé	Chaffy sedge															
1	H	Carex pauciflora	Carex pauciflore	Few-flowered sedge											3				
	H	Carex rariflora	Carex rariflore	Loose-flowered alpine sedge															
1	H	Carex rostrata	Carex rostré	Swollen beaked sedge						3					1				38
	H	Carex saxatilis	Carex saxatile	Russet sedge															
	H	Carex scirpoides subsp. scirpoides	Carex faux-scirpe	Single-spike sedge															
	H	Carex stylosa	Carex à long style	Long-styled sedge															
	H	Carex tenuiflora	Carex tenuiflore	Sparse-flowered sedge															
1	H	Carex tonsa s.l.	Carex à fruits glabres	Deep green sedge		1													
1	H	Carex trisperma	Carex trisperme	Three-seeded sedge													1		
	H	Carex vaginata	Carex engainé	Sheated sedge															
	H	Castilleja raupii	Castillèjie de Raup	Raup's paintbrush															
1	H	Chamaenerion angustifolium subsp. angustifolium	Épilobe à feuilles étroites	Fireweed			3	1											
1	H	Cinna latifolia	Cinna à larges feuilles	Drooping woodreed													1		
1	H	Comarum palustre	Comaret des marais	Marsh cinquefoil					15										15
1	H	Coptidium lapponicum	Renoncule de Laponie	Lapland buttercup															
1	H	Coptis trifolia	Savoyane	Goldthread											3		15		
1	H	Corallorhiza trifida	Corallorhize trifide	Early coralroot															
1	H	Cornus canadensis	Quatre-temps	Bunchberry				3				1					38	15	
1	H	Danthonia spicata	Danthonie à épi	Poverty oatgrass		1													
	H	Dendrolycopodium dendroideum	Lycopode dendroïde	Round-branched tree-clubmoss															
	H	Deschampsia cespitosa subsp. cespitosa	Deschampsie cespiteuse	Tufted hairgrass															
	H	Diphasiastrum complanatum	Lycopode aplati	Northern ground-cedar															
1	H	Diphasiastrum sitchense	Lycopode de Sitka	Sitka ground-cedar								1							
	H	Draba glabella	Drave glabre	Smooth draba															
1	H	Drosera anglica	Droséra d'Angleterre	English sundew											1				
1	H	Drosera rotundifolia	Droséra à feuilles rondes	Round-leaved sundew	1										3				
1	H	Eleocharide acicularis	Éléocharide aciculaire	Needle spikerush															3
	H	Elymus trachycaulus subsp. trachycaulus	Élyme à chaumes rudes	Slender wildrye															
	H	Epilobium ciliatum subsp. glandulosum	Épilobe glanduleux	Glandular willowherb															
1	H	Epilobium palustre	Épilobe palustre	Marsh willowherb											1				
1	H	Equisetum arvense	Prêle des champs	Field horsetail															
1	H	Equisetum fluviatile	Prêle fluviatile	Water horsetail					1	15					3				3
1	H	Equisetum sylvaticum	Prêle des bois	Woodland horsetail				15					3	1			3		
	H	Eriophorum angustifolium subsp. angustifolium	Linaigrette à feuilles étroites	Narrow-leaved cottongrass															
1	H	Eriophorum russeolum subsp. russeolum	Linaigrette rousse	Russet cottongrass															
1	H	Eriophorum tenellum	Linaigrette ténue	Rough cottongrass											1				
1	H	Eriophorum vaginatum subsp. spissum	Linaigrette dense	Dense cottongrass											1				
	H	Euphrasia wettsteinii	Euphraise de Wettstein	Wettstein's eyebright															
1	H	Eurybia radula	Aster rude	Low rough aster											3				
	H	Festuca brachyphylla subsp. brachyphylla	Fétuque à feuilles courtes	Short-leaved fescue															
	H	Festuca rubra subsp. arctica	Fétuque de Richardson	Arctic red fescue															
1	H	Fragaria virginiana subsp. glauca	Fraisier glauque	Smooth wild strawberry															
	H	Galium trifidum s.l.	Gaillet trifide	Three-petalled bedstraw															
	H	Galium triflorum	Gaillet à trois fleurs	Three-flowered bedstraw															
1	H	Geocaulon lividum	Comandre livide	Northern comandra														1	
1	H	Gymnocarpium dryopteris	Gymnocarpe fougère-du-chêne	Common oak fern													15		
	H	Halerpestes cymbalaria	Renoncule cymbalaire	Seaside buttercup															
1	H	Hieracium robinsonii	Épervière de Robinson	Robinson's kawkweed															
1	H	Hippuris vulgaris	Pesse commune	Common mare's-tail						3									3
	H	Honckenya peploides subsp. diffusa	Honckénye diffusa	Northern seabeach sandwort															
	H	Huperzia selago	Lycopode sélagine	Northern firmoss															
1	H	Isoetes echinospora subsp. muricata	Isoète à spores hérissées	Spiny-spored quillwort						3									
1	H	Isoetes lacustris	Isoète lacustre	Lake quillwort						3									
	H	Juncus alpinoarticulatus subsp. americanus	Jonc alpin	Alpine rush															
1	H	Juncus balticus subsp. littoralis	Jonc des rivages	Shoreline rush															
	H	Juncus brevicaudatus	Jonc brevicaudé	Short-tailed rush															
1	H	Juncus filiformis	Jonc filiforme	Thread rush															
	H	Juncus pelocarpus	Jonc à fruits bruns	Brown-fruited rush															
1	H	Juncus stygius subsp. americanus	Jonc d'Amérique	American moor rush											3				
	H	Koeleria spicata	Trisète à épi	Spike trisetum															
	H	Koenigia islandica	Koenigie d'Islande	Iceland purslane															
	H	Lathyrus japonicus	Gesse maritime	Beach pea															
	H	Leymus mollis subsp. mollis	Élyme des sables d'Amérique	Sea limegrass															
	H	Ligusticum scoticum subsp. scoticum	Liveche d'Ecosse	Scotch lovage															
	H	Luzula parviflora s.l.	Luzule parviflore	Small-flowered woodrush															
1	H	Lycopodium clavatum	Lycopode claviforme	Running clubmoss															
1	H	Lysimachia borealis	Trientale boréale	Northern starflower			1										3		
1	H	Maianthemum canadense subsp. canadense	Maianthème du Canada	Wild lily-of-the-valley															
1	H	Maianthemum trifolium	Smilacine trifoliée	Three-leaved false Solomon's seal	1										15				
1	H	Malaxis unifolia	Malaxis unifolié	Green adder's-mouth											1				
	H	Melampyrum lineare	Mélampyre linéaire	American cow-wheat															
1	H	Menyanthes trifoliata	Trèfle d'eau	Bog buckbean	3										38				
1	H	Mitella nuda	Mitrelle nue	Naked mitrewort													3		
	H	Moneses uniflora	Monésès uniflore	One-flowered wintergreen															
1	H	Mononeuria groenlandica	Minuartie du Groenland	Greenland stitchwort		1													
1	H	Muhlenbergia uniflora	Muhlenbergie uniflore	Late-flowering muhly											1				
	H	Neottia cordata	Listère cordée	Heart-leaved twayblade															
1	H	Nuphar variegata	Grand nénuphar jaune	Variegated pond-lily	3					3									38
1	H	Oclemena nemoralis	Aster des tourbières	Bog aster											15				
1	H	Orthilia secunda	Pyrole unilatérale	One-sided wintergreen															
1	H	Packera aurea	Sénéçon doré	Golden groundsel															
1	H	Petasites frigidus var. palmatus	Pétasite palmé	Palmate coltsfoot				3											
1	H	Phegopteris connectilis	Phégoptère du hêtre	Northern beech fern													15		
1	H	Piptatheropsis canadensis	Oryzopsis du Canada	Canada ricegrass		3									3				
1	H	Piptatheropsis pungens	Oryzopsis piquant	Slender ricegrass		1	3				1								
	H	Plantago maritima	Plantain maritime	Seaside plantain															
1	H	Platanthera aquilonis	Platanthère du Nord	Tall northern green orchid															
1	H	Platanthera dilatata var. dilatata	Platanthère dilatée	Tall white bog orchid											1				
1	H	Platanthera huronensis	Platanthère du lac Huron	Lake Huron green orchid															
	H	Platanthera obtusata subsp. obtusata	Platanthère à feuille obtuse	Blunt-leaved orchid															
	H	Poa alpina subsp. alpina	Pâturin alpin	Alpine bluegrass															
1	H	Poa glauca subsp. glauca	Pâturin glauque	Glaucous bluegrass		1													
	H	Poa palustris	Pâturin des marais	Fowl bluegrass															
1	H	Potamogeton alpinus	Potamot alpin	Alpine pondweed						3									15
	H	Potamogeton epihydrus	Potamot émergé	Ribbon-leaved pondweed															
	H	Potentilla anserina subsp. groenlandica	Potentille du Groenland	Greenland silverweed															
	H	Potentilla litoralis	Potentille du littoral	Coast cinquefoil															
1	H	Potentilla norvegica	Potentille de Norvège	Rough cinquefoil												1			
	H	Puccinellia phryganodes subsp. neoarctica	Puccinellie néarctique	Creeping alkaligrass															
	H	Pyrola grandiflora	Pyrole à grandes fleurs	Arctic pyrola															
	H	Pyrola minor	Pyrole mineure	Lesser pyrola															
1	H	Ranunculus flammula var. reptans	Renoncule radicante	Creeping spearwort						3									
1	H	Ranunculus trichophyllus	Renoncule capillaire	Thread-leaved water-crowfoot											1				
	H	Rhinanthus minor subsp. groenlandicus	Rhinanthe du Groenland	Greenland yellow rattle															
1	H	Rhynchospora alba	Rhynchospore blanc	White beaksrush	3										15				
1	H	Rubus arcticus subsp. acaulis	Ronce acaule	Stemless raspberry															
1	H	Rubus chamaemorus	Chicouté	Cloudberry	3			1				1	38	15	15				
1	H	Rubus pubescens	Ronce pubescente	Dwarf raspberry													15		
	H	Sagina nodosa subsp. borealis	Sagine boréale	Northern knotted pearlwort															
	H	Sagittaria cuneata	Sagittaire cunéaire	Northern arrowhead															
	H	Sarracenia purpurea subsp. purpurea	Sarracénie pourpre	Northern pitcher plant															
	H	Saxifraga cespitosa	Saxifrage cespiteuse	Tufted saxifrage															
	H	Saxifraga paniculata subsp. laestadii	Saxifrage de Laestadius	Laestadius' saxifrage															
	H	Saxifraga tricuspidata	Saxifrage à trois dents	Three-toothed saxifrage															
1	H	Scheuchzeria palustris	Scheuchzérie des marais	Marsh scheuchzeria											15				
1	H	Schizachne purpurascens subsp. purpurascens	Schizachné pourpré	Purple false melic			15												
	H	Selaginella selaginoides	Sélaginelle fausse-sélagine	Low spikemoss															
1	H	Sibbaldia tridentata	Potentille tridentée	Three-toothed cinquefoil		15	15												
1	H	Solidago hispida var. hispida	Verge d'or hispide	Hairy goldenrod							1								
1	H	Solidago macrophylla	Verge d'or à grandes feuilles	Large-leaved goldenrod		1	3									1	15		
	H	Solidago multiradiata	Verge d'or à rayons nombreux	Multi-rayed goldenrod															
1	H	Solidago uliginosa var. peracuta	Verge d'or à feuilles pointues	Bog goldenrod											3				
1	H	Sparganium angustifolium	Rubanier à feuilles étroites	Narrow-leaved burreed						3									
	H	Sparganium emersum	Rubanier à fruits verts	Green-fruited burreed															
1	H	Sparganium fluctuans	Rubanier flottant	Floating burreed						15									
1	H	Sparganium hyperboreum	Rubanier hyperboréal	Northern burreed											1				1
1	H	Spinulum annotinum subsp. alpestre	Lycopode alpestre	Stiff clubmoss				1											
1	H	Spinulum annotinum subsp. annotinum	Lycopode innovant	Stiff clubmoss													15		
	H	Spiranthes romanzoffiana	Spiranthe de Romanzoff	Hooded ladies'-tresses															
	H	Stellaria borealis subsp. borealis	Stellaire boréale	Boreal starwort															
	H	Stellaria longipes subsp. longipes	Stellaire à longs pédicelles	Long-stalked starwort															
1	H	Streptopus amplexifolius	Streptope à feuilles embrassantes	Clasping-leaved twisted-stalk													3		
1	H	Subularia aquatica subsp. americana	Subulaire d'Amérique	American water awlwort						1									
1	H	Symphyotrichum puniceum var. puniceum	Aster ponceau	Purple-stemmed aster													3		
	H	Taraxacum ceratophorum	Pissenlit tuberculé	Horned dandelion															
	H	Trichophorum alpinum	Trichophore des Alpes	Alpine clubrush															
1	H	Trichophorum cespitosum	Trichophore cespiteux	Tufted clubrush	3										63				
	H	Triglochin palustris	Troscart des marais	Marsh arrowgrass															
1	H	Utricularia cornuta	Utriculaire cornue	Horned bladderwort											15				
1	H	Utricularia intermedia	Utriculaire intermédiaire	Flat-leaved bladderwort						3					15				3
1	H	Utricularia minor	Utriculaire mineure	Lesser bladderwort											1				
1	H	Utricularia vulgaris subsp. macrorhiza	Utriculaire à longues racines	Greater bladderwort						15					3				
	H	Vahlodea atropurpurea	Deschampsie pourpre	Mountain hairgrass															
	H	Viola blanda	Violette agréable	Sweet white violet															
1	H	Viola labradorica	Violette du Labrador	Labrador violet															
	H	Viola macloskeyi	Violette pâle	Macloskey's violet															
	H	Viola renifolia	Violette reniforme	Kidney-leaved violet															
1	H	Viola selkirkii	Violette de Selkirk	Selkirk's violet													1		
	H	Viscaria alpina	Silène de Suède	Alpine catchfly															
1	H	Woodsia ilvensis	Woodsie d'Elbe	Rusty woodsia		1													
	Moss layer (M)	Species group				

Sampling station (n = 23)	A-09.1	A-09.2	A-09.3	A-09.4	A-09.5	B-16.1	A-10.1	A-10.2
Location	Central	Central	Central	Central	Central	Central	Central	Central
Date	2022-08-04	2022-08-04	2022-08-04	2022-08-05	2022-08-05	2022-08-12	2022-08-04	2022-08-04
Lat °N	54°31'13"N	54°31'14"N	54°31'18"N	54°31'25"N	54°31'26"N	54°32'02"N	54°32'50"N	54°32'51"N
Long °W	77°30'48"W	77°30'47"W	77°30'51"W	77°30'58"W	77°30'56"W	77°28'50"W	77°32'46"W	77°32'45"W
Vegetation type (remark)	Forested swamp	Open Lichen-Spruce forest (fire > 30yrs)	Jack Pine stand (fire > 30-50yrs)	Lichen-Spruce forest (open)	Forested bog	Regeneration (steep slope)	Forested swamp	Regeneration (fire ± 30yrs)
Type de végétation	Marécage arborescent	Pessière noire à lichens ouverte	Pinède à pin gris	Pessière noire à lichens	Bog boisé	Régénération	Marécage arborescent	Régénération
Substrate (depth)	Peat(25cm)/Sand	Sand	Sand	Sand	Peat(70cm)/Drift	Bedrock	Clay	Clay
Drainage	Very poor	Good	Very good	Good	Poor	Very rapid	Poor	Imperfect
Soil features	—	—	—	—	—	—	Mottles	—
Groundwater level (cm)	0	n/d	n/d	n/d	10	n/d	30	n/d
Wetland?	Yes	No	No	No	Yes	No	Yes	No
	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
Total Tree layer	53	53	38	15	39	9	41	—
Total Shrub layer	109	135	70	67	150	159	111	79
Total Herb/Forb layer	37	3	6	4	41	40	96	46
Total Lichen/Moss layer	53	41	63	91	104	63	63	78
Total Bare ground/Litter	38	63	88	3	15	53	15	4
Open water	3	—	—	—	—	—	3	—

Species observed (n = 146)	Vegetation layer	Species code (latin)	Nom commun	Common name	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
	Tree layer (T :> 4m)											
(1)	T	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch								
(1)	T	Larix laricina	Mélèze laricin	Tamarack	38	15			1	3	38	
	T	Picea glauca	Épinette blanche	White spruce								
(1)	T	Picea mariana	Épinette noire	Black spruce	15	38		15	38	3	3	
1	T	Pinus banksiana	Pin gris	Jack pine			38					
(1)	T	Populus tremuloides	Peuplier faux-tremble	Trembling aspen						3		
	Shrub layer (S : < 4m)											
1	S	Alnus alnobetula subsp. crispa	Aulne crispé	American green alder								
1	S	Alnus incana subsp. rugosa	Aulne rugueux	Speckled alder	63							
1	S	Amelanchier bartramiana	Amélanchier de Bartram	Bartram's serviceberry								
1	S	Andromeda polifolia var. polifolia	Andromède à feuilles de Polium	Northern bog rosemary								
	S	Arctous alpina	Busserole alpine	Alpine bearberry								
1	S	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch								
1	S	Betula glandulosa	Bouleau glanduleux	Glandular birch	1		1	15		15	15	3
1	S	Betula pumila var. glandulifera	Bouleau glandulifère	Northern bog birch								
1	S	Chamaedaphne calyculata	Cassandre caliculé	Leatherleaf					63			
1	S	Cornus stolonifera	Cornouiller hart-rouge	Red-osier dogwood								
1	S	Dasiphora fruticosa	Potentille frutescente	Shrubby cinquefoil								
1	S	Empetrum nigrum subsp. nigrum	Camarine noire	Black crowberry					15			
1	S	Epigaea repens	Épigée rampante	Trailing arbutus								1
	S	Gaultheria hispidula	Petit thé	Creeping snowberry								
1	S	Juniperus communis var. depressa	Genévrier commun déprimé	Depressed juniper						3		
	S	Kalmia angustifolia var. angustifolia	Kalmia à feuilles étroites	Sheep laurel								
1	S	Kalmia polifolia	Kalmia à feuilles d'andromède	Pale bog laurel					1			
	S	Kalmia procumbens	Azalée des Alpes	Alpine azalea								
1	S	Larix laricina	Mélèze laricin	Tamarack		3					3	15
	S	Linnaea borealis subsp. longiflora	Linnée à longues fleurs	Long-tube twinflower								
1	S	Lonicera villosa	Chèvrefeuille velu	Mountain fly-honeysuckle							15	
1	S	Myrica gale	Myrique baumier	Sweet gale	15							
	S	Picea glauca	Épinette blanche	White spruce								
1	S	Picea mariana	Épinette noire	Black spruce		3	1	3	15	15	15	38
	S	Pinus banksiana	Pin gris	Jack pine								
1	S	Populus tremuloides	Peuplier faux-tremble	Trembling aspen						38		
1	S	Prunus pensylvanica	Cerisier de Pennsylvanie	Pin cherry						15		
1	S	Rhododendron groenlandicum	Thé du Labrador	Common Labrador tea	15	63	15	15	38	3	1	1
	S	Rhododendron tomentosum	Petit thé du Labrador	Northern Labrador tea								
1	S	Ribes glandulosum	Gadellier glanduleux	Skunk currant						1	1	
1	S	Ribes hirtellum	Groseillier hérissé	Swamp gooseberry							1	
1	S	Ribes lacustre	Gadellier lacustre	Bristly black currant								
1	S	Ribes triste	Gadellier amer	Swamp red currant								
1	S	Rubus idaeus subsp. strigosus	Framboisier sauvage	North American red raspberry						1		
	S	Salix arctophila	Saule arctophile	Northern willow								
1	S	Salix argyrocarpa	Saule à fruits argentés	Labrador willow								
1	S	Salix balli	Saule de Bali	Bali's willow							1	3
1	S	Salix bebbiana	Saule de Bebb	Bebbi's willow				1		3		
	S	Salix glauca var. cordifolia	Saule à beaux fruits	Beautiful willow								
1	S	Salix humilis var. humilis	Saule humble	Tall prairie willow								
1	S	Salix pedicellaris	Saule pédicellé	Bog willow							1	
1	S	Salix pellita	Saule satiné	Satiny willow							15	
1	S	Salix planifolia	Saule à feuilles planes	Tea-leaved willow	15						38	
1	S	Salix pyrifolia	Saule à feuilles de poirier	Balsam willow						1	1	
	S	Salix uva-ursi	Saule raisin d'ours	Bearberry willow								
	S	Salix vestita	Saule pubescent	Hairy willow								
	S	Shepherdia canadensis	Shépherdie du Canada	Soapberry								
1	S	Sorbus americana	Sorbier d'Amérique	American mountain-ash								
1	S	Vaccinium angustifolium	Bleuet à feuilles étroites	Early lowbush blueberry		63	15	15		63	1	15
1	S	Vaccinium cespitosum	Airelle gazonnante	Dwarf bilberry							3	1
1	S	Vaccinium myrtilloides	Bleuet fausse-myrtille	Velvet-leaved blueberry								1
1	S	Vaccinium oxycoccos	Canneberge commune	Small cranberry					3			
1	S	Vaccinium uliginosum	Airelle des marécages	Bog bilberry				3	15			1
1	S	Vaccinium vitis-idaea	Airelle rouge	Mountain cranberry		3	38	15				
1	S	Viburnum edule	Viorne comestible	Squashberry						1		
	Herb and forb layer (H)											
1	H	Achillea borealis var. borealis	Achillée boréale	Boreal yarrow								1
1	H	Agrostis mertensii	Agrostide de Mertens	Northern bentgrass						1		
1	H	Agrostis scabra	Agrostide scabre	Rough bentgrass								1
	H	Anthoxanthum monticola subsp. monticola	Hiérochloé des montagnes	Alpine sweetgrass								
	H	Arctanthemum arcticum subsp. arcticum	Chrysanthème arctique	Arctic daisy								
	H	Arctopoa eminens	Pâturin superbe	Eminent bluegrass								
	H	Armeria maritima subsp. sibirica	Arméria de Sibérie	Sea thrift								
1	H	Avenella flexuosa	Deschampsie flexueuse	Wavy hairgrass		1	1	1				1
	H	Bistorta vivipara	Renouée vivipare	Alpine bistort								
1	H	Bromus ciliatus	Brome ciliè	Fringed brome							3	
1	H	Calamagrostis canadensis s.l.	Calamagrostide du Canada	Bluejoint reedgrass	15					1	1	
	H	Calamagrostis deschampsioides	Calamagrostide fausse-deschampsie	Circumpolar reedgrass								
1	H	Calla palustris	Calla des marais	Wild calla								
1	H	Callitriche palustris	Callitriche des marais	Spring water-starwort								
1	H	Caltha palustris	Populage des marais	Yellow marsh marigold								
	H	Campanula gieseckeana	Campanule de Giesecke	Giesecke's bellflower								
1	H	Capnoides sempervirens	Corydale toujours verte	Pink corydalis						1		
1	H	Carex aquatilis s.l.	Carex aquatique	Water sedge	3						15	
	H	Carex arctogena	Carex arctogène	Tufted black sedge								
	H	Carex bigelowii subsp. bigelowii	Carex de Bigelow	Bigelow's sedge								
	H	Carex brunnescens s.l.	Carex brunâtre	Brownish sedge								
1	H	Carex canescens s.l.	Carex blanchâtre	Hoary sedge	3						3	
	H	Carex capillaris subsp. capillaris	Carex capillaire	Hair-like sedge								
1	H	Carex deflexa var. deflexa	Carex déprimé	Bent northern sedge		1				1		
1	H	Carex disperma	Carex disperme	Two-seeded sedge							3	
	H	Carex echinata subsp. echinata	Carex étoilé	Star sedge								
1	H	Carex exilis	Carex maigre	Meagre sedge								
	H	Carex glareosa subsp. glareosa	Carex des gravières	Gravel sedge								
1	H	Carex leptalea	Carex à tiges grêles	Bristle-stalked sedge								
	H	Carex lasiocarpa subsp. americana	Carex à fruits tomenteux d'Amérique	American wooly-fruited sedge								
1	H	Carex limosa	Carex des bourbiers	Mud sedge								
	H	Carex magellanica subsp. irrigua	Carex chétif	Boreal bog sedge								
	H	Carex michauxiana	Carex de Michaux	Michaux's sedge								
	H	Carex norvegica	Carex de Norvège	Norway sedge								
1	H	Carex oligosperma	Carex oligosperme	Few-seeded sedge								
	H	Carex paleacea	Carex paléacé	Chaffy sedge								
1	H	Carex pauciflora	Carex pauciflore	Few-flowered sedge								
	H	Carex rariflora	Carex rariflore	Loose-flowered alpine sedge								
1	H	Carex rostrata	Carex rostré	Swollen beaked sedge								
	H	Carex saxatilis	Carex saxatile	Russet sedge								
	H	Carex scirpoides subsp. scirpoides	Carex faux-scirpe	Single-spike sedge								
	H	Carex stylosa	Carex à long style	Long-styled sedge								
	H	Carex tenuiflora	Carex tenuiflore	Sparse-flowered sedge								
1	H	Carex tonsa s.l.	Carex à fruits glabres	Deep green sedge								
1	H	Carex trisperma	Carex trisperme	Three-seeded sedge					1			
	H	Carex vaginata	Carex engainé	Sheated sedge								
	H	Castilleja raupii	Castillèjie de Raup	Raup's paintbrush								
1	H	Chamaenerion angustifolium subsp. angustifolium	Épilobe à feuilles étroites	Fireweed			1			1	3	3
1	H	Cinna latifolia	Cinna à larges feuilles	Drooping woodreed								
1	H	Comarum palustre	Comaret des marais	Marsh cinquefoil							1	
1	H	Coptidium lapponicum	Renoncule de Laponie	Lapland buttercup							1	
1	H	Coptis trifolia	Savoyane	Goldthread								
1	H	Corallorhiza trifida	Corallorhize trifide	Early coralroot							1	
1	H	Cornus canadensis	Quatre-temps	Bunchberry				1		15	15	1
1	H	Danthonia spicata	Danthonie à épi	Poverty oatgrass								
	H	Dendrolycopodium dendroideum	Lycopode dendroïde	Round-branched tree-clubmoss								
	H	Deschampsia cespitosa subsp. cespitosa	Deschampsie cespiteuse	Tufted hairgrass								
	H	Diphasiastrum complanatum	Lycopode aplati	Northern ground-cedar								
1	H	Diphasiastrum sitchense	Lycopode de Sitka	Sitka ground-cedar			1	1		3		1
	H	Draba glabella	Drave glabre	Smooth draba								
1	H	Drosera anglica	Droséra d'Angleterre	English sundew								
1	H	Drosera rotundifolia	Droséra à feuilles rondes	Round-leaved sundew								
1	H	Eleocharis acicularis	Éléocharide aciculaire	Needle spikerush								
	H	Elymus trachycaulus subsp. trachycaulus	Élyme à chaumes rudes	Slender wildrye								
	H	Epilobium ciliatum subsp. glandulosum	Épilobe glanduleux	Glandular willowherb								
1	H	Epilobium palustre	Épilobe palustre	Marsh willowherb							1	
1	H	Equisetum arvense	Prêle des champs	Field horsetail								3
1	H	Equisetum fluviatile	Prêle fluviatile	Water horsetail								
1	H	Equisetum sylvaticum	Prêle des bois	Woodland horsetail	15	1			3	1	15	
	H	Eriophorum angustifolium subsp. angustifolium	Linaigrette à feuilles étroites	Narrow-leaved cottongrass								
1	H	Eriophorum russeolum subsp. russeolum	Linaigrette rousse	Russet cottongrass							1	
1	H	Eriophorum tenellum	Linaigrette ténue	Rough cottongrass								
1	H	Eriophorum vaginatum subsp. spissum	Linaigrette dense	Dense cottongrass								
	H	Euphrasia wettsteinii	Euphraise de Wettstein	Wettstein's eyebright								
1	H	Eurybia radula	Aster rude	Low rough aster								
	H	Festuca brachyphylla subsp. brachyphylla	Fétuque à feuilles courtes	Short-leaved fescue								
	H	Festuca rubra subsp. arctica	Fétuque de Richardson	Arctic red fescue								
1	H	Fragaria virginiana subsp. glauca	Fraisier glauque	Smooth wild strawberry							3	1
	H	Galium trifidum s.l.	Gaillet trifide	Three-petalled bedstraw								
	H	Galium triflorum	Gaillet à trois fleurs	Three-flowered bedstraw								
1	H	Geocaulon lividum	Comandre livide	Northern comandra						1		
1	H	Gymnocarpium dryopteris	Gymnocarpe fougère-du-chêne	Common oak fern								
	H	Halerpestes cymbalaria	Renoncule cymbalaire	Seaside buttercup								
1	H	Hieracium robinsonii	Épervière de Robinson	Robinson's kawkweed						1		
1	H	Hippuris vulgaris	Presse commune	Common mare's-tail								
	H	Honckenya peploides subsp. diffusa	Honckénye diffusa	Northern seabeach sandwort								
	H	Huperzia selago	Lycopode sélagine	Northern firmoss								
1	H	Isoetes echinospora subsp. muricata	Isoète à spores hérissées	Spiny-spored quillwort								
1	H	Isoetes lacustris	Isoète lacustre	Lake quillwort								
	H	Juncus alpinoarticulatus subsp. americanus	Jonc alpin	Alpine rush								
1	H	Juncus balticus subsp. littoralis	Jonc des rivages	Shoreline rush								1
	H	Juncus brevicaudatus	Jonc brevicaudé	Short-tailed rush								
1	H	Juncus filiformis	Jonc filiforme	Thread rush							3	
	H	Juncus pelocarpus	Jonc à fruits bruns	Brown-fruited rush								
1	H	Juncus stygius subsp. americanus	Jonc d'Amérique	American moor rush								
	H	Koeleria spicata	Trisète à épi	Spike trisetum								
	H	Koenigia islandica	Koenigie d'Islande	Iceland purslane								
	H	Lathyrus japonicus	Gesse maritime	Beach pea								
	H	Leymus mollis subsp. mollis	Élyme des sables d'Amérique	Sea limegrass								
	H	Ligusticum scoticum subsp. scoticum	Liveche d'Ecosse	Scotch lovage								
	H	Luzula parviflora s.l.	Luzule parviflore	Small-flowered woodrush								
1	H	Lycopodium clavatum	Lycopode claviforme	Running clubmoss								1
1	H	Lysimachia borealis	Trientale boréale	Northern starflower						1		
1	H	Maianthemum canadense subsp. canadense	Maianthème du Canada	Wild lily-of-the-valley			1					
1	H	Maianthemum trifolium	Smilacine trifoliée	Three-leaved false Solomon's seal	1				1		3	
1	H	Malaxis unifolia	Malaxis unifolié	Green adder's-mouth								
	H	Melampyrum lineare	Mélampyre linéaire	American cow-wheat								
1	H	Menyanthes trifoliata	Trèfle d'eau	Bog buckbean								
1	H	Mitella nuda	Mitrelle nue	Naked mitrewort								
	H	Moneses uniflora	Monésès uniflore	One-flowered wintergreen								
1	H	Monroeuria groenlandica	Minuartie du Groenland	Greenland stitchwort								
1	H	Muhlenbergia uniflora	Muhlenbergie uniflore	Late-flowering muhly								
	H	Neottia cordata	Listère cordée	Heart-leaved twayblade								
1	H	Nuphar variegata	Grand nénuphar jaune	Variegated pond-lily								
1	H	Oclemena nemoralis	Aster des tourbières	Bog aster							1	
1	H	Orthilia secunda	Pyrole unilatérale	One-sided wintergreen							3	1
1	H	Packera aurea	Séneçon doré	Golden groundsel						1	15	15
1	H	Petasites frigidus var. palmatus	Pétasite palmé	Palmate coltsfoot								
1	H	Phegopteris connectilis	Phégoptère du hêtre	Northern beech fern						3		3
1	H	Piptatheropsis canadensis	Oryzopsis du Canada	Canada ricegrass						3		
1	H	Piptatheropsis pungens	Oryzopsis piquant	Slender ricegrass			1	1				1
	H	Plantago maritima	Plantain maritime	Seaside plantain								
1	H	Platanthera aquilonis	Platanthère du Nord	Tall northern green orchid								1
1	H	Platanthera dilatata var. dilatata	Platanthère dilatée	Tall white bog orchid								
1	H	Platanthera huronensis	Platanthère du lac Huron	Lake Huron green orchid								3
	H	Platanthera obtusata subsp. obtusata	Platanthère à feuille obtuse	Blunt-leaved orchid								
	H	Poa alpina subsp. alpina	Pâturin alpin	Alpine bluegrass								
1	H	Poa glauca subsp. glauca	Pâturin glauque	Glaucous bluegrass						1		
	H	Poa palustris	Pâturin des marais	Fowl bluegrass								
1	H	Potamogeton alpinus	Potamot alpin	Alpine pondweed								
	H	Potamogeton epihydrus	Potamot émergé	Ribbon-leaved pondweed								
	H	Potentilla anserina subsp. groenlandica	Potentille du Groenland	Greenland silverweed								
	H	Potentilla litoralis	Potentille du littoral	Coast cinquefoil								
1	H	Potentilla norvegica	Potentille de Norvège	Rough cinquefoil						1		
	H	Puccinellia phryganodes subsp. neoarctica	Puccinellie néarctique	Creeping alkaligrass								
	H	Pyrola grandiflora	Pyrole à grandes fleurs	Arctic pyrola								
	H	Pyrola minor	Pyrole mineure	Lesser pyrola								
1	H	Ranunculus flammula var. reptans	Renoncule radicante	Creeping spearwort								
1	H	Ranunculus trichophyllus	Renoncule capillaire	Thread-leaved water-crowfoot								
	H	Rhinanthus minor subsp. groenlandicus	Rhinanthe du Groenland	Greenland yellow rattle								
1	H	Rhynchospora alba	Rhynchospore blanc	White beaksrush								
1	H	Rubus arcticus subsp. acaulis	Ronce acaule	Stemless raspberry							1	
1	H	Rubus chamaemorus	Chicouté	Cloudberry					38			
1	H	Rubus pubescens	Ronce pubescente	Dwarf raspberry								
	H	Sagina nodosa subsp. borealis	Sagine boréale	Northern knotted pearlwort								
	H	Sagittaria cuneata	Sagittaire cunéaire	Northern arrowhead								
	H	Sarracenia purpurea subsp. purpurea	Sarracénie pourpre	Northern pitcher plant								
	H	Saxifraga cespitosa	Saxifrage cespiteuse	Tufted saxifrage								
	H	Saxifraga paniculata subsp. laestadii	Saxifrage de Laestadius	Laestadius' saxifrage								
	H	Saxifraga tricuspidata	Saxifrage à trois dents	Three-toothed saxifrage								
1	H	Scheuchzeria palustris	Scheuchzérie des marais	Marsh scheuchzeria								
1	H	Schizachne purpurascens subsp. purpurascens	Schizachné pourpré	Purple false melic								
	H	Selaginella selaginoides	Sélaginelle fausse-sélagine	Low spikemoss								
1	H	Sibbaldia tridentata	Potentille tridentée	Three-toothed cinquefoil			1			3		1
1	H	Solidago hispida var. hispida	Verge d'or hispide	Hairy goldenrod						1		3
1	H	Solidago macrophylla	Verge d'or à grandes feuilles	Large-leaved goldenrod								
	H	Solidago multiradiata	Verge d'or à rayons nombreux	Multi-rayed goldenrod								
1	H	Solidago uliginosa var. peracuta	Verge d'or à feuilles pointues	Bog goldenrod							3	3
1	H	Sparganium angustifolium	Rubanier à feuilles étroites	Narrow-leaved burreed								
	H	Sparganium emersum	Rubanier à fruits verts	Green-fruited burreed								
1	H	Sparganium fluctuans	Rubanier flottant	Floating burreed								
1	H	Sparganium hyperboreum	Rubanier hyperboréal	Northern burreed								
1	H	Spinulum annotinum subsp. alpestre	Lycopode alpestre	Stiff clubmoss								
1	H	Spinulum annotinum subsp. annotinum	Lycopode innovant	Stiff clubmoss								
	H	Spiranthes romanzoffiana	Spiranthe de Romanzoff	Hooded ladies'-tresses								
	H	Stellaria borealis subsp. borealis	Stellaire boréale	Boreal starwort								
	H	Stellaria longipes subsp. longipes	Stellaire à longs pédicelles	Long-stalked starwort								
1	H	Streptopus amplexifolius	Streptope à feuilles embrassantes	Clasping-leaved twisted-stalk								
1	H	Subularia aquatica subsp. americana	Subulaire d'Amérique	American water awlwort								
1	H	Symphyotrichum puniceum var. puniceum	Aster ponceau	Purple-stemmed aster								
	H	Taraxacum ceratophorum	Pissenlit tuberculé	Horned dandelion								
	H	Trichophorum alpinum	Trichophore des Alpes	Alpine clubrush								
1	H	Trichophorum cespitosum	Trichophore cespiteux	Tufted clubrush								
	H	Triglochin palustris	Troscart des marais	Marsh arrowgrass								
1	H	Utricularia cornuta	Utriculaire cornue	Horned bladderwort								
1	H	Utricularia intermedia	Utriculaire intermédiaire	Flat-leaved bladderwort								
1	H	Utricularia minor	Utriculaire mineure	Lesser bladderwort								
1	H	Utricularia vulgaris subsp. macrorhiza	Utriculaire à longues racines	Greater bladderwort								
	H	Vahlodea atropurpurea	Deschampsie pourpre	Mountain hairgrass								
	H	Viola blanda	Violette agréable	Sweet white violet								
1	H	Viola labradorica	Violette du Labrador	Labrador violet							1	1
	H	Viola macloskeyi	Violette pâle	Macloskey's violet								
	H	Viola renifolia	Violette reniforme	Kidney-leaved violet								
1	H	Viola selkirkii	Violette de Selkirk	Selkirk's violet								
	H	Viscaria alpina	Silène de Suède	Alpine catchfly								
1	H	Woodsia ilvensis	Woodsie d'Elbe	Rusty woodsia								
	Moss layer (M)	Species group										
	M	Lichens				38	63	88	3	63		15
	M	Mosses			15	3		3	38			63
	M	Sphagnum mosses			38				63		63	
	Ground layer	Ground features										
	—	Litter			38	63	88	3	15	38	15	3
	—	Bare ground								15		1
	—	Boulders										
	—	Bedrock										
	—	Open water			3						3	

Sampling station (n = 17)	A-13.1	A-14.1	A-15.1	A-16.1	B-22.2	B-22.1	A-17.1	A-17.2	B-23.1	A-19.1	A-20.1	A-21.1	A-22.1	A-22.5	A-22.4	A-22.3	A-22.2
Location	North	North	North	North	North	North	North	North	North	North	North	North	North	North	North	North	North
Date	2022-08-07	2022-08-07	2022-08-07	2022-08-07	2022-08-09	2022-08-09	2022-08-07	2022-08-07	2022-08-09	2022-08-09	2022-08-09	2022-08-09	2022-08-08	2022-08-08	2022-08-08	2022-08-08	2022-08-08
Lat °N	54°39'42"N	54°45'05"N	54°51'09"N	54°52'50"N	54°55'56"N	54°55'57"N	54°58'02"N	54°58'02"N	55°08'03"N	55°11'07"N	55°13'51"N	55°15'30"N	55°16'34"N	55°16'35"N	55°16'44"N	55°16'47"N	55°16'47"N
Long °W	77°37'44"W	77°37'33"W	77°40'52"W	77°40'48"W	77°42'14"W	77°42'19"W	77°42'07"W	77°42'06"W	77°40'12"W	77°37'46"W	77°34'27"W	77°34'58"W	77°35'16"W	77°35'25"W	77°35'40"W	77°35'25"W	77°35'16"W
Vegetation type (remark)	Outcrop (with potholes)	Shrub swamp	Riverine fen	Regeneration (fire ± 40yrs)	Feathermoss-spruce forest	Shrub swamp	Riverine fen	Treed fen	Shrub fen	String fen	Spring fen	Shrub swamp	Shrub swamp	Lichen heath	Grass fen	Lichen-spruce forest	Grass fen (on landslide)
Type de végétation	Affleurement	Marécage arbustif	Fen riverain	Régénération	Pessière noire à mousses	Marécage arbustif	Fen riverain	Fen boisé	Fen arbustif	Fen réticulé	Fen gazonnant	Marécage arbustif	Marécage arbustif	Lande à lichens	Fen herbacé	Pessière noire à lichens	Fen herbacé
Substrate (depth)	Bedrock	Alluvium(25cm)/Clay	Peat(>100cm)	Drift	Clay	Alluvium/Sand	Peat(>100cm)	Peat(50cm)/Drift	Peat(>100cm)	Peat(<50cm)/Sand	Peat(<50cm)/Bedrock	Alluvium/Sand	Peat/Sand+alluvium	Sand	Peat(>100cm)	Sand	Peat(>100cm)
Drainage	Very rapid	Poor	Very poor	Rapid	Imperfect	Poor (sandy loam)	Very poor	Poor	Very poor	Very poor	Very poor	Poor	Poor	Good	Very poor	Good	Very poor
Soil features																	
Groundwater level (cm)	n/d	30	0	n/d	n/d	n/d	0	0	0	0	0	n/d	30	n/d	0	n/d	0
Wetland?	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
Total Tree layer	3	3	3	—	78	—	3	18	15	—	1	15	—	3	—	41	—
Total Shrub layer	60	166	88	78	36	110	59	69	109	69	39	191	67	22	48	73	2
Total Herb/Forb layer	32	173	155	59	44	148	156	77	186	212	113	67	160	25	145	10	123
Total Lichen/Moss layer	44	126	63	88	116	3	15	91	88	—	30	15	15	88	38	88	78
Total Bare ground/Litter	88	15	3	18	15	88	88	3	15	76	88	88	88	—	88	15	15
Open water	—	3	15	—	—	—	15	—	—	38	—	15	3	—	15	—	15

Species observed (n = 123)	Vegetation layer	Species code (latin)	Nom commun	Common name	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
	Tree layer (T :> 4m)																				
	T	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch																	
(1)	T	Larix laricina	Mélèze laricin	Tamarack		3	3		15		3	3									
1	T	Picea glauca	Épinette blanche	White spruce															3		
(1)	T	Picea mariana	Épinette noire	Black spruce	3				63			15	15		1	15		3		38	
	T	Pinus banksiana	Pin gris	Jack pine																	
	T	Populus tremuloides	Peuplier faux-tremble	Trembling aspen																	
	Shrub layer (S : < 4m)																				
	S	Alnus alnobetula subsp. crispa	Aulne crispé	American green alder																	
	S	Alnus incana subsp. rugosa	Aulne rugueux	Speckled alder																	
1	S	Amelanchier bartramiana	Amélanchier de Bartram	Bartram's serviceberry		1		1													
1	S	Andromeda polifolia var. polifolia	Andromède à feuilles de Polium	Northern bog rosemary			1						15	15	3	1			38		
	S	Arctous alpina	Busserole alpine	Alpine bearberry																	
	S	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch																	
1	S	Betula glandulosa	Bouleau glanduleux	Glandular birch	3	1		38	15	3		3	1		3	38	3	15	1	38	
	S	Betula pumila var. glandulifera	Bouleau glandulifère	Northern bog birch																	
1	S	Chamaedaphne calyculata	Cassandre caliculé	Leatherleaf								1	3	3	15	15			3		
	S	Cornus stolonifera	Cornouiller hart-rouge	Red-osier dogwood																	
1	S	Dasiphora fruticosa	Potentille frutescente	Shrubby cinquefoil							1					15					
1	S	Empetrum nigrum subsp. nigrum	Camarine noire	Black crowberry	15		1		3		3	15			3	15		3	1	1	
	S	Epigaea repens	Épigée rampante	Trailing arbutus																	
1	S	Gaultheria hispidula	Petit thé	Creeping snowberry					1			1									
1	S	Juniperus communis var. depressa	Genévrier commun déprimé	Depressed juniper	3		1	1	1		1	1	3	3	1	1				1	
	S	Kalmia angustifolia var. angustifolia	Kalmia à feuilles étroites	Sheep laurel																	
1	S	Kalmia polifolia	Kalmia à feuilles d'andromède	Pale bog laurel			3					1	15	3	3				1		
	S	Kalmia procumbens	Azalée des Alpes	Alpine azalea																	
1	S	Larix laricina	Mélèze laricin	Tamarack	1		3	1	1		3	3	1	1							
1	S	Linnaea borealis subsp. longiflora	Linnée à longues fleurs	Long-tube twinflower					3			3				1					
1	S	Lonicera villosa	Chèvrefeuille velu	Mountain fly-honeysuckle		38	15		1	15			15	3		15					
1	S	Myrica gale	Myrique baumier	Sweet gale			63			1	15	3	38	38	1	38					
	S	Picea glauca	Épinette blanche	White spruce																	
1	S	Picea mariana	Épinette noire	Black spruce	3		1	1	3		3	15	15	3	3	15		1	3	15	1
	S	Pinus banksiana	Pin gris	Jack pine																	
1	S	Populus tremuloides	Peuplier faux-tremble	Trembling aspen	1																
	S	Prunus pensylvanica	Cerisier de Pennsylvanie	Pin cherry																	
1	S	Rhododendron groenlandicum	Thé du Labrador	Common Labrador tea	15			1	1			1			3	3			1	1	
	S	Rhododendron tomentosum	Petit thé du Labrador	Northern Labrador tea																	
1	S	Ribes glandulosum	Gadellier glanduleux	Skunk currant				1													
1	S	Ribes hirtellum	Groseillier hérissé	Swamp gooseberry						1											
	S	Ribes lacustre	Gadellier lacustre	Bristly black currant																	
	S	Ribes triste	Gadellier amer	Swamp red currant																	
	S	Rubus idaeus subsp. strigosus	Framboisier sauvage	North American red raspberry																	
1	S	Salix arctophila	Saule arctophile	Northern willow												15					
1	S	Salix argyrocarpa	Saule à fruits argentés	Labrador willow		88				88	15	3					1				
1	S	Salix balli	Saule de Bali	Bali's willow						1											
1	S	Salix bebbiana	Saule de Bebb	Bebbi's willow				1													
1	S	Salix glauca var. cordifolia	Saule à beaux fruits	Beautiful willow						1											
1	S	Salix humilis var. humilis	Saule humble	Tall prairie willow				1													
1	S	Salix pedicellaris	Saule pédicellé	Bog willow							15										1
	S	Salix pellita	Saule satiné	Satiny willow																	
1	S	Salix planifolia	Saule à feuilles planes	Tea-leaved willow					1		3					15	63				
	S	Salix pyrifolia	Saule à feuilles de poirier	Balsam willow																	
	S	Salix uva-ursi	Saule raisin d'ours	Bearberry willow																	
	S	Salix vestita	Saule pubescent	Hairy willow																	
	S	Shepherdia canadensis	Shépherdie du Canada	Soapberry																	
	S	Sorbus americana	Sorbier d'Amérique	American mountain-ash																	
1	S	Vaccinium angustifolium	Bleuet à feuilles étroites	Early lowbush blueberry	1			15				3								1	
1	S	Vaccinium cespitosum	Airelle gazonnante	Dwarf bilberry		38		1	3												
	S	Vaccinium myrtilloides	Bleuet fausse-myrtille	Velvet-leaved blueberry																	
1	S	Vaccinium oxycoccos	Canneberge commune	Small cranberry								1	3		1						
1	S	Vaccinium uliginosum	Airelle des marécages	Bog bilberry	15			15				15			3	3			1		
1	S	Vaccinium vitis-idaea	Airelle rouge	Mountain cranberry	3			1	3							1		3		15	
	S	Viburnum edule	Viorne comestible	Squashberry																	
	Herb and forb layer (H)																				
1	H	Achillea borealis var. borealis	Achillée boréale	Boreal yarrow		1			1	3											
1	H	Agrostis mertensii	Agrostide de Mertens	Northern bentgrass	1	3				1			3	15			3				
1	H	Agrostis scabra	Agrostide scabre	Rough bentgrass		3	3														3
1	H	Anthoxanthum monticola subsp. monticola	Hiérochloé des montagnes	Alpine sweetgrass	1																
	H	Arctanthemum arcticum subsp. arcticum	Chrysanthème arctique	Arctic daisy																	
	H	Arctopoa eminens	Pâturin superbe	Eminent bluegrass																	
1	H	Armeria maritima subsp. sibirica	Arméria de Sibérie	Sea thrift														1			
1	H	Avenella flexuosa	Deschampsie flexueuse	Wavy hairgrass	1	1		3	1	38								3		1	
1	H	Bistorta vivipara	Renouée vivipare	Alpine bistort						1		1									
1	H	Bromus ciliatus	Brome ciliè	Fringed brome		3				3											
1	H	Calamagrostis canadensis s.l.	Calamagrostide du Canada	Bluejoint reedgrass		1				1						1	15				
	H	Calamagrostis deschampsioides	Calamagrostide fausse-deschampsie	Circumpolar reedgrass																	
	H	Calla palustris	Calla des marais	Wild calla																	
	H	Callitriche palustris	Callitriche des marais	Spring water-starwort																	
1	H	Caltha palustris	Populage des marais	Yellow marsh marigold						1											
	H	Campanula gieseckeana	Campanule de Giesecke	Giesecke's bellflower																	
	H	Capnoides sempervirens	Corydale toujours verte	Pink corydalis																	
1	H	Carex aquatilis s.l.	Carex aquatique	Water sedge	1	15	15		3	88	1	1			3	3	3		15		63
1	H	Carex arctogena	Carex arctogène	Tufted black sedge	3													1			
1	H	Carex bigelowii subsp. bigelowii	Carex de Bigelow	Bigelow's sedge	3													3			
1	H	Carex brunnescens s.l.	Carex brunâtre	Brownish sedge	1	38			1												
1	H	Carex canescens s.l.	Carex blanchâtre	Hoary sedge	1																
	H	Carex capillaris subsp. capillaris	Carex capillaire	Hair-like sedge																	
1	H	Carex deflexa var. deflexa	Carex déprimé	Bent northern sedge	1			1													
1	H	Carex disperma	Carex disperme	Two-seeded sedge		3			3												
1	H	Carex echinata subsp. echinata	Carex étoilé	Star sedge							15	3									
1	H	Carex exilis	Carex maigre	Meagre sedge			3						3	38							
	H	Carex glareosa subsp. glareosa	Carex des graviers	Gravel sedge																	
1	H	Carex leptalea	Carex à tiges grêles	Bristle-stalked sedge								1									
	H	Carex lasiocarpa subsp. americana	Carex à fruits tomenteux d'Amérique	American wooly-fruited sedge																	
1	H	Carex limosa	Carex des bourbiers	Mud sedge			3							3							
1	H	Carex magellanica subsp. irrigua	Carex chétif	Boreal bog sedge	1		3					1									
	H	Carex michauxiana	Carex de Michaux	Michaux's sedge																	
	H	Carex norvegica	Carex de Norvège	Norway sedge																	
1	H	Carex oligosperma	Carex oligosperme	Few-seeded sedge			3				15		38								
	H	Carex paleacea	Carex paléacé	Chaffy sedge																	
1	H	Carex pauciflora	Carex pauciflore	Few-flowered sedge			3					3	1	1							
1	H	Carex rariflora	Carex rariflore	Loose-flowered alpine sedge								1	15		3			38			
	H	Carex rostrata	Carex rostré	Swollen beaked sedge																	
1	H	Carex saxatilis	Carex saxatile	Russet sedge												3					
	H	Carex scirpoides subsp. scirpoides	Carex faux-scirpe	Single-spike sedge																	
1	H	Carex stylosa	Carex à long style	Long-styled sedge	1										3				1		
1	H	Carex tenuiflora	Carex tenuiflore	Sparse-flowered sedge								1									
	H	Carex tonsa s.l.	Carex à fruits glabres	Deep green sedge																	
1	H	Carex trisperma	Carex trisperme	Three-seeded sedge										1							
1	H	Carex vaginata	Carex engainé	Sheated sedge					1			15									
	H	Castilleja raupii	Castillèjie de Raup	Raup's paintbrush																	
1	H	Chamaenerion angustifolium subsp. angustifolium	Épilobe à feuilles étroites	Fireweed		3		1	1	15							15				
	H	Cinna latifolia	Cinna à larges feuilles	Drooping woodreed																	
1	H	Comarum palustre	Comaret des marais	Marsh cinquefoil		1	3			1	15						38				15
	H	Coptidium lapponicum	Renoncule de Laponie	Lapland buttercup																	
1	H	Coptis trifolia	Savoyane	Goldthread					1	3		1	3		1	3					
	H	Corallorhiza trifida	Corallorhize trifide	Early coralroot																	
1	H	Cornus canadensis	Quatre-temps	Bunchberry	3			15	3			1	1			15				1	
	H	Danthonia spicata	Danthonie à épi	Poverty oatgrass																	
	H	Dendrolycopodium dendroideum	Lycopode dendroïde	Round-branched tree-clubmoss																	
1	H	Deschampsia cespitosa subsp. cespitosa	Deschampsie cespiteuse	Tufted hairgrass									1	3							
1	H	Diphasiastrum complanatum	Lycopode aplati	Northern ground-cedar	1													15		3	
1	H	Diphasiastrum sitchense	Lycopode de Sitka	Sitka ground-cedar				15												3	
	H	Draba glabella	Drave glabre	Smooth draba																	
1	H	Drosera anglica	Drosséra d'Angleterre	English sundew			1							1							
1	H	Drosera rotundifolia	Drosséra à feuilles rondes	Round-leaved sundew			3				1		3	3	1				3		
	H	Eleocharis acicularis	Éléocharide aciculaire	Needle spikerush																	
1	H	Elymus trachycaulus subsp. trachycaulus	Élyme à chaumes rudes	Slender wildrye		1				1											
1	H	Epilobium ciliatum subsp. glandulosum	Épilobe glanduleux	Glandular willowherb													1				
1	H	Epilobium palustre	Épilobe palustre	Marsh willowherb		3	1						1								
1	H	Equisetum arvense	Prêle des champs	Field horsetail													15				
	H	Equisetum fluviatile	Prêle fluviatile	Water horsetail																	
1	H	Equisetum sylvaticum	Prêle des bois	Woodland horsetail		15		1	15			1					15				
1	H	Eriophorum angustifolium subsp. angustifolium	Linaigrette à feuilles étroites	Narrow-leaved cottongrass											1						
1	H	Eriophorum russeolum subsp. russeolum	Linaigrette rousse	Russet cottongrass											1						38
	H	Eriophorum tenellum	Linaigrette ténue	Rough cottongrass																	
1	H	Eriophorum vaginatum subsp. spissum	Linaigrette élevée	Dense cottongrass	1										1						
	H	Euphrasia wettsteinii	Euphraise de Wettstein	Wettstein's eyebright																	
1	H	Eurybia radula	Aster rude	Low rough aster			15					3	15	3	3	1					
	H	Festuca brachyphylla subsp. brachyphylla	Fétuque à feuilles courtes	Short-leaved fescue																	
	H	Festuca rubra subsp. arctica	Fétuque de Richardson	Arctic red fescue																	
1	H	Fragaria virginiana subsp. glauca	Fraisier glauque	Smooth wild strawberry		3				3											
1	H	Galium trifidum s.l.	Gaillet trifide	Three-petalled bedstraw		3				1											
1	H	Galium triflorum	Gaillet à trois fleurs	Three-flowered bedstraw													3				
1	H	Geocaulon lividum	Comandre livide	Northern comandra								15									
	H	Gymnocarpium dryopteris	Gymnocarpe fougère-du-chêne	Common oak fern																	
	H	Halerpestes cymbalaria	Renoncule cymbalaire	Seaside buttercup																	
	H	Hieracium robinsonii	Épervière de Robinson	Robinson's kawkaweed																	
	H	Hippuris vulgaris	Presse commune	Common mare's-tail																	
	H	Honckenya peploides subsp. diffusa	Honckénye diffusa	Northern seabeach sandwort																	
1	H	Huperzia selago	Lycopode sélaginе	Northern firmoss	1																
	H	Isoetes echinospora subsp. muricata	Isoète à spores hérissées	Spiny-spored quillwort																	
	H	Isoetes lacustris	Isoète lacustre	Lake quillwort																	
	H	Juncus alpinoarticulatus subsp. americanus	Jonc alpin	Alpine rush																	
	H	Juncus balticus subsp. littoralis	Jonc des rivages	Shoreline rush																	
	H	Juncus brevicaudatus	Jonc brevicaudé	Short-tailed rush																	
1	H	Juncus filiformis	Jonc filiforme	Thread rush						1	1										
	H	Juncus pelocarpus	Jonc à fruits bruns	Brown-fruited rush																	
1	H	Juncus stygius subsp. americanus	Jonc d'Amérique	American moor rush			1							3							
	H	Koeleria spicata	Trisète à épi	Spike trisetum																	
	H	Koenigia islandica	Koenigie d'Islande	Iceland purslane																	
	H	Lathyrus japonicus	Gesse maritime	Beach pea																	
	H	Leymus mollis subsp. mollis	Élyme des sables d'Amérique	Sea limegrass																	
	H	Ligusticum scoticum subsp. scoticum	Livèche d'Écosse	Scotch lovage																	
1	H	Luzula parviflora s.l.	Luzule parviflore	Small-flowered woodrush													3				
1	H	Lycopodium clavatum	Lycopode claviforme	Running clubmoss				1													
1	H	Lysimachia borealis	Trientale boréale	Northern starflower	1			1				1	3	1	1	1	1				
	H	Maianthemum canadense subsp. canadense	Maianthème du Canada	Wild lily-of-the-valley																	
1	H	Maianthemum trifolium	Smilacine trifoliée	Three-leaved false Solomon's seal		1						1									
	H	Malaxis unifolia	Malaxis unifolié	Green adder's-mouth																	
	H	Melampyrum lineare	Mélampyre linéaire	American cow-wheat																	
1	H	Menyanthes trifoliata	Trèfle d'eau	Bog buckbean			38						38	38							
1	H	Mitella nuda	Mitrelle nue	Naked mitrewort		1															
	H	Moneses uniflora	Monésès uniflore	One-flowered wintergreen																	
1	H	Mononeuria groenlandica	Minuartie du Groenland	Greenland stitchwort	3																
1	H	Muhlenbergia uniflora	Muhlenbergie uniflore	Late-flowering muhly			1						1	1							
	H	Neottia cordata	Listère cordée	Heart-leaved twayblade																	
1	H	Nuphar variegata	Grand nénuphar jaune	Variegated pond-lily			15														
1	H	Oclemena nemoralis	Aster des tourbières	Bog aster									1								
	H	Orthilia secunda	Pyrole unilatérale	One-sided wintergreen																	
1	H	Packera aurea	Séneçon doré	Golden groundsel		3				15											
1	H	Petasites frigidus var. palmatus	Pétasite palmé	Palmate coltsfoot		15		3	15	15		1									
	H	Phegopteris connectilis	Phégoptère du hêtre	Northern beech fern																	
1	H	Piptatheropsis canadensis	Oryzopsis du Canada	Canada ricegrass	1	1		15						15							
	H	Piptatheropsis pungens	Oryzopsis piquant	Slender ricegrass																	
	H	Plantago maritima	Plantain maritime	Seaside plantain																	
	H	Platanthera aquilonis	Platanthère du Nord	Tall northern green orchid																	
1	H	Platanthera dilatata var. dilatata	Platanthère dilatée	Tall white bog orchid									1	1	1						3
	H	Platanthera huronensis	Platanthère du lac Huron	Lake Huron green orchid																	
	H	Platanthera obtusata subsp. obtusata	Platanthère à feuille obtuse	Blunt-leaved orchid																	
	H	Poa alpina subsp. alpina	Pâturin alpin	Alpine bluegrass																	
	H	Poa glauca subsp. glauca	Pâturin glauque	Glaucous bluegrass																	
1	H	Poa palustris	Pâturin des marais	Fowl bluegrass		1															
	H	Potamogeton alpinus	Potamot alpin	Alpine pondweed																	
1	H	Potamogeton epihydrus	Potamot émergé	Ribbon-leaved pondweed										3							
	H	Potentilla anserina subsp. groenlandica	Potentille du Groenland	Greenland silverweed																	
	H	Potentilla litoralis	Potentille du littoral	Coast cinquefoil																	
	H	Potentilla norvegica	Potentille de Norvège	Rough cinquefoil																	
	H	Puccinellia phryganodes subsp. neoarctica	Puccinellie néarctique	Creeping alkaligrass																	
	H	Pyrola grandiflora	Pyrole à grandes fleurs	Arctic pyrola																	
1	H	Pyrola minor	Pyrole mineure	Lesser pyrola		15															
	H	Ranunculus flammula var. reptans	Renoncule radicante	Creeping spearwort																	
	H	Ranunculus trichophyllus	Renoncule capillaire	Thread-leaved water-crowfoot																	
	H	Rhinanthus minor subsp. groenlandicus	Rhinanthe du Groenland	Greenland yellow rattle																	
	H	Rhynchospora alba	Rhynchospore blanc	White beaksrush																	
1	H	Rubus arcticus subsp. acaulis	Ronce acaule	Stemless raspberry		15				15		1				15	15				1
1	H	Rubus chamaemorus	Chicouté	Cloudberry					3			15	15		1	3	15				
	H	Rubus pubescens	Ronce pubescente	Dwarf raspberry																	
	H	Sagina nodosa subsp. borealis	Sagine boréale	Northern knotted pearlwort																	
	H	Sagittaria cuneata	Sagittaire cunéaire	Northern arrowhead																	
	H	Sarracenia purpurea subsp. purpurea	Sarracénie pourpre	Northern pitcher plant																	
	H	Saxifraga cespitosa	Saxifrage cespiteuse	Tufted saxifrage																	
	H	Saxifraga paniculata subsp. laestadii	Saxifrage de Laestadius	Laestadius' saxifrage																	
	H	Saxifraga tricuspidata	Saxifrage à trois dents	Three-toothed saxifrage																	
	H	Scheuchzeria palustris	Scheuchzérie des marais	Marsh scheuchzeria																	
1	H	Schizachne purpurascens subsp. purpurascens	Schizachné pourpré	Purple false melic		3			3												
1	H	Selaginella selaginoides	Sélaginelle fausse-sélagine	Low spikemoss			3			1	1										
1	H	Sibbaldia tridentata	Potentille tridentée	Three-toothed cinquefoil	3	1		3	1	1								1		1	
	H	Solidago hispida var. hispida	Verge d'or hispide	Hairy goldenrod																	
1	H	Solidago macrophylla	Verge d'or à grandes feuilles	Large-leaved goldenrod											1	3					
	H	Solidago multiradiata	Verge d'or à rayons nombreux	Multi-rayed goldenrod																	
1	H	Solidago uliginosa var. peracuta	Verge d'or à feuilles pointues	Bog goldenrod		1	15		1	1		3	1	3	1						
	H	Sparganium angustifolium	Rubanier à feuilles étroites	Narrow-leaved burreed																	
	H	Sparganium emersum	Rubanier à fruits verts	Green-fruited burreed																	
	H	Sparganium fluctuans	Rubanier flottant	Floating burreed																	
1	H	Sparganium hyperboreum	Rubanier hyperboréal	Northern burreed			1							15							
1	H	Spinulum annotinum subsp. alpestre	Lycopode alpestre	Stiff clubmoss									1		3				1		
	H	Spinulum annotinum subsp. annotinum	Lycopode innovant	Stiff clubmoss																	
1	H	Spiranthes romanzoffiana	Spiranthe de Romanzoff	Hooded ladies'-tresses										1							
1	H	Stellaria borealis subsp. borealis	Stellaire boréale	Boreal starwort		15															
	H	Stellaria longipes subsp. longipes	Stellaire à long

APPENDIX E-4 Survey of vegetation and wetlands - Hudson Bay area of ZE2

Sampling station (n = 9)	A-25.5	A-25.3	A-25.2	A-25.1	A-25.4	A-23.1	A-24.1	A-23.2	A-24.2
Location	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area	Hudson Bay Area
Date	2022-08-09	2022-08-08	2022-08-08	2022-08-08	2022-08-08	2022-08-09	2022-08-08	2022-08-08	2022-08-08
Lat °N	55°18'46"N	55°18'48"N	55°18'48"N	55°18'49"N	55°18'50"N	55°18'53"N	55°18'54"N	55°18'56"N	55°18'57"N
Long °W	77°44'37"W	77°44'16"W	77°44'15"W	77°44'13"W	77°44'15"W	77°37'48"W	77°42'02"W	77°37'49"W	77°42'04"W
Vegetation type (remark)	Salt marsh (tidal regime)	Coastal meadow (coastal upper shore)	Shrub stand (coastal upper shore)	White spruce stand (coastal)	Coastal outcrop (with potholes) (coastal upper shore)	Treed fen	Shrub swamp (moderate slope)	Feathermoss-spruce forest	Outcrop (with potholes)
Type de végétation	Marais salé	Prairie littorale	Arbustaie	Pessière blanche	Affleurement côtier	Fen boisé	Marécage arbustif	Pessière noire à mousses	Affleurement
Substrate (depth)	Sand+boulders/Bedrock	Sand	Boulders/Bedrock	Boulders/Bedrock	Bedrock	Peat(>100cm)/Sand	Alluvium/Boulders	Sand	Bedrock
Drainage	Poor	Rapid	Rapid	Rapid	Very rapid	Very poor	Imperfect	Good	Very rapid
Soil features									
Groundwater level (cm)	n/d (tidal regime)	n/d	n/d	n/d	n/d	0	30	n/d	n/d
Wetland?	Yes	No	No	No	No	Yes	Yes(?)	No	No
	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
Total Tree layer	—	—	—	63	—	16	6	38	—
Total Shrub layer	—	—	120	146	7	114	115	37	51
Total Herb/Forb layer	174	171	67	28	31	181	48	20	19
Total Lichen/Moss layer	38	—	1	103	—	39	—	101	18
Total Bare ground/Litter	53	103	104	15	88	88	88	15	103
Open water	15	—	—	—	—	15	—	—	—

Species observed (n = 107)	Vegetation layer	Species code (latin)	Nom commun	Common name	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)	Cover (%)
	Tree layer (T :> 4m)												
	T	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch									
(1)	T	Larix laricina	Mélèze laricin	Tamarack						1	3		
(1)	T	Picea glauca	Épinette blanche	White spruce				63					
(1)	T	Picea mariana	Épinette noire	Black spruce						15	3	38	
	T	Pinus banksiana	Pin gris	Jack pine									
	T	Populus tremuloides	Peuplier faux-tremble	Trembling aspen									
	Shrub layer (S : < 4m)												
1	S	Alnus alnobetula subsp. crispa	Aulne crispé	American green alder			1	38	1		15		
	S	Alnus incana subsp. rugosa	Aulne rugueux	Speckled alder									
	S	Amelanchier bartramiana	Amélanchier de Bartram	Bartram's serviceberry									
1	S	Andromeda polifolia var. polifolia	Andromède à feuilles de Polium	Northern bog rosemary						15			
1	S	Arctous alpina	Busserole alpine	Alpine bearberry									1
	S	Betula cordifolia	Bouleau à feuilles cordées	Heart-leaved birch									
1	S	Betula glandulosa	Bouleau glanduleux	Glandular birch				15		3	3	15	15
	S	Betula pumila var. glandulifera	Bouleau glandulifère	Northern bog birch									
	S	Chamaedaphne calyculata	Cassandre caliculé	Leatherleaf									
	S	Cornus stolonifera	Cornouiller hart-rouge	Red-osier dogwood									
1	S	Dasiphora fruticosa	Potentille frutescente	Shrubby cinquefoil							15		
1	S	Empetrum nigrum subsp. nigrum	Camarine noire	Black crowberry			15	38	1	15		15	15
	S	Epigaea repens	Épigée rampante	Trailing arbutus									
	S	Gaultheria hispidula	Petit thé	Creeping snowberry									
1	S	Juniperus communis var. depressa	Genévrier commun déprimé	Depressed juniper				15		3	3	3	
	S	Kalmia angustifolia var. angustifolia	Kalmia à feuilles étroites	Sheep laurel									
1	S	Kalmia polifolia	Kalmia à feuilles d'andromède	Pale bog laurel						3			
1	S	Kalmia procumbens	Azalée des Alpes	Alpine azalea									1
1	S	Larix laricina	Mélèze laricin	Tamarack							1		
1	S	Linnaea borealis subsp. longiflora	Linnée à longues fleurs	Long-tube twinflower				15		3	3		
1	S	Lonicera villosa	Chèvrefeuille velu	Mountain fly-honeysuckle						1			
1	S	Myrica gale	Myrique baumier	Sweet gale						15	63		
1	S	Picea glauca	Épinette blanche	White spruce			3		1				
1	S	Picea mariana	Épinette noire	Black spruce						38	1		
	S	Pinus banksiana	Pin gris	Jack pine									
	S	Populus tremuloides	Peuplier faux-tremble	Trembling aspen									
	S	Prunus pensylvanica	Cerisier de Pennsylvanie	Pin cherry									
1	S	Rhododendron groenlandicum	Thé du Labrador	Common Labrador tea							1		1
1	S	Rhododendron tomentosum	Petit thé du Labrador	Northern Labrador tea									15
	S	Ribes glandulosum	Gadellier glanduleux	Skunk currant									
	S	Ribes hirtellum	Groseillier hérissé	Swamp gooseberry									
	S	Ribes lacustre	Gadellier lacustre	Bristly black currant									
1	S	Ribes triste	Gadellier amer	Swamp red currant				1					
	S	Rubus idaeus subsp. strigosus	Framboisier sauvage	North American red raspberry									
1	S	Salix arctophila	Saule arctophile	Northern willow					1		3		
	S	Salix argyrocarpa	Saule à fruits argentés	Labrador willow									
	S	Salix balli	Saule de Bali	Bali's willow									
	S	Salix bebbiana	Saule de Bebb	Bebbi's willow									
1	S	Salix glauca var. cordifolia	Saule à beaux fruits	Beautiful willow			63	3	3				
	S	Salix humilis var. humilis	Saule humble	Tall prairie willow									
	S	Salix pedicellaris	Saule pédicellé	Bog willow									
	S	Salix pellita	Saule satiné	Satiny willow									
	S	Salix planifolia	Saule à feuilles planes	Tea-leaved willow									
	S	Salix pyrifolia	Saule à feuilles de poirier	Balsam willow									
1	S	Salix uva-ursi	Saule raisin d'ours	Bearberry willow									1
1	S	Salix vestita	Saule pubescent	Hairy willow							3		
1	S	Shepherdia canadensis	Shépherdie du Canada	Soapberry			38	3					
	S	Sorbus americana	Sorbier d'Amérique	American mountain-ash									
	S	Vaccinium angustifolium	Bleuet à feuilles étroites	Early lowbush blueberry									
1	S	Vaccinium cespitosum	Airelle gazonnante	Dwarf bilberry								3	
	S	Vaccinium myrtilloides	Bleuet fausse-myrtille	Velvet-leaved blueberry									
1	S	Vaccinium oxycoccos	Canneberge commune	Small cranberry						3			
1	S	Vaccinium uliginosum	Airelle des marécages	Bog bilberry				15		15	3		1
1	S	Vaccinium vitis-idaea	Airelle rouge	Mountain cranberry				3				1	1
1	S	Viburnum edule	Viorne comestible	Squashberry							1		
	Herb and forb layer (H)												
1	H	Achillea borealis var. borealis	Achillée boréale	Boreal yarrow		3	3		1				
1	H	Agrostis mertensii	Agrostide de Mertens	Northern bentgrass					1		1		1
	H	Agrostis scabra	Agrostide scabre	Rough bentgrass									
	H	Anthoxanthum monticola subsp. monticola	Hiérochloé des montagnes	Alpine sweetgrass									
1	H	Arctanthemum arcticum subsp. arcticum	Chrysanthème arctique	Arctic daisy	1				1				
1	H	Arctopoa eminens	Pâturin superbe	Eminent bluegrass	15	3			1				
	H	Armeria maritima subsp. sibirica	Sea thrift										
1	H	Avenella flexuosa	Deschampsie flexueuse	Wavy hairgrass						1	1	1	
	H	Bistorta vivipara	Renouée vivipare	Alpine bistort									
	H	Bromus ciliatus	Brome cilié	Fringed brome									
1	H	Calamagrostis canadensis s.l.	Calamagrostide du Canada	Bluejoint reedgrass						1	1		1
1	H	Calamagrostis deschampsioides	Calamagrostide fausse-deschampsie	Circumpolar reedgrass	15								
	H	Calla palustris	Calla des marais	Wild calla									
	H	Callitriche palustris	Callitriche des marais	Spring water-starwort									
	H	Caltha palustris	Populage des marais	Yellow marsh marigold									
1	H	Campanula gieseckeana	Campanule de Giesecke	Giesecke's bellflower			3	1	1				
	H	Capnoides sempervirens	Corydale toujours verte	Pink corydalis									
1	H	Carex aquatilis s.l.	Carex aquatique	Water sedge						38			
1	H	Carex arctogena	Carex arctogène	Tufted black sedge									1
1	H	Carex bigelowii subsp. bigelowii	Carex de Bigelow	Bigelow's sedge				1			3	1	1
	H	Carex brunnescens s.l.	Carex brunâtre	Brownish sedge									
	H	Carex canescens s.l.	Carex blanchâtre	Hoary sedge									
1	H	Carex capillaris subsp. capillaris	Carex capillaire	Hair-like sedge									1
	H	Carex deflexa var. deflexa	Carex déprimé	Bent northern sedge									
	H	Carex disperma	Carex disperme	Two-seeded sedge									
	H	Carex echinata subsp. echinata	Carex étoilé	Star sedge									
	H	Carex exilis	Carex maigre	Meagre sedge									
1	H	Carex glareosa subsp. glareosa	Carex des graviers	Gravel sedge	1								
	H	Carex leptalea	Carex à tiges grêles	Bristle-stalked sedge									
	H	Carex lasiocarpa subsp. americana	Carex à fruits tomenteux d'Amérique	American wooly-fruited sedge									
	H	Carex limosa	Carex des bourbiers	Mud sedge									
	H	Carex magellanica subsp. irrigua	Carex chétif	Boreal bog sedge									
	H	Carex michauxiana	Carex de Michaux	Michaux's sedge									
1	H	Carex norvegica	Carex de Norvège	Norway sedge					1				
	H	Carex oligosperma	Carex oligosperme	Few-seeded sedge									
1	H	Carex paleacea	Carex paléacé	Chaffy sedge	38								
1	H	Carex pauciflora	Carex pauciflore	Few-flowered sedge						3			
1	H	Carex rariflora	Carex rariflore	Loose-flowered alpine sedge					1	15			1
	H	Carex rostrata	Carex rostré	Swollen beaked sedge									
1	H	Carex saxatilis	Carex saxatile	Russet sedge					3				1
1	H	Carex scirpoidea subsp. scirpoidea	Carex faux-scirpe	Single-spike sedge									(hors parcelle)
1	H	Carex stylosa	Carex à long style	Long-styled sedge						3			
	H	Carex tenuiflora	Carex tenuiflore	Sparse-flowered sedge									
	H	Carex torta s.l.	Carex à fruits glabres	Deep green sedge									
	H	Carex trisperma	Carex trisperme	Three-seeded sedge									
1	H	Carex vaginata	Carex engainé	Sheated sedge						3			
1	H	Castilleja raupii	Castillèjie de Raup	Raup's paintbrush					1				
1	H	Chamaenerion angustifolium subsp. angustifolium	Épilobe à feuilles étroites	Fireweed								1	
	H	Cinna latifolia	Cinna à larges feuilles	Drooping woodreed									
	H	Comarum palustre	Comaret des marais	Marsh cinquefoil									
	H	Coptidium lapponicum	Renoncule de Laponie	Lapland buttercup									
1	H	Coptis trifolia	Savoyane	Goldthread						3			
	H	Corallorhiza trifida	Corallorhize trifide	Early coralroot									
1	H	Cornus canadensis	Quatre-temps	Bunchberry						3	1	15	1
	H	Danthonia spicata	Danthonie à épi	Poverty oatgrass									
	H	Dendrolycopodium dendroideum	Lycopode dendroïde	Round-branched tree-clubmoss									
1	H	Deschampsia cespitosa subsp. cespitosa	Deschampsie cespiteuse	Tufted hairgrass					1				
	H	Diphasiastrum complanatum	Lycopode aplati	Northern ground-cedar									
	H	Diphasiastrum sitchense	Lycopode de Sitka	Sitka ground-cedar									
1	H	Draba glabella	Drave glabre	Smooth draba			1						
	H	Drosera anglica	Drosséra d'Angleterre	English sundew									
1	H	Drosera rotundifolia	Drosséra à feuilles rondes	Round-leaved sundew						3			
	H	Eleocharis acicularis	Éléocharide aciculaire	Needle spikerush									
1	H	Elymus trachycaulus subsp. trachycaulus	Élyme à chaumes rudes	Slender wildrye							1		
	H	Epilobium ciliatum subsp. glandulosum	Épilobe glanduleux	Glandular willowherb									
	H	Epilobium palustre	Épilobe palustre	Marsh willowherb									
	H	Equisetum arvense	Prêle des champs	Field horsetail									
	H	Equisetum fluviatile	Prêle fluviatile	Water horsetail									
1	H	Equisetum sylvaticum	Prêle des bois	Woodland horsetail						3			
	H	Eriophorum angustifolium subsp. angustifolium	Linaigrette à feuilles étroites	Narrow-leaved cottongrass									
	H	Eriophorum russeolum subsp. russeolum	Linaigrette rousse	Russet cottongrass									
	H	Eriophorum tenellum	Linaigrette ténue	Rough cottongrass									
1	H	Eriophorum vaginatum subsp. spissum	Linaigrette dense	Dense cottongrass									1
1	H	Euphrasia wettsteinii	Euphraise de Wettstein	Wettstein's eyebright			1		1				
1	H	Eurybia radula	Aster rude	Low rough aster						3			
1	H	Festuca brachyphylla subsp. brachyphylla	Fétuque à feuilles courtes	Short-leaved fescue			1		1				1
1	H	Festuca rubra subsp. arctica	Fétuque de Richardson	Arctic red fescue	15	15	3	1	3				
	H	Fragaria virginiana subsp. glauca	Fraisier glauque	Smooth wild strawberry									
	H	Galium trifidum s.l.	Gaillet trifide	Three-petalled bedstraw									
	H	Galium triflorum	Gaillet à trois fleurs	Three-flowered bedstraw									
1	H	Geocaulon lividum	Comandre livide	Northern comandra						15		1	
	H	Gymnocarpium dryopteris	Gymnocarpe fougère-du-chêne	Common oak fern									
1	H	Halerpestes cymbalaria	Renoncule cymbalaire	Seaside buttercup	15								
	H	Hieracium robinsonii	Épervière de Robinson	Robinson's kawkweed									
	H	Hippuris vulgaris	Pesse commune	Common mare's-tail									
1	H	Honckenya peploides subsp. diffusa	Honckénye diffusa	Northern seabeach sandwort	1	38							
	H	Huperzia selago	Lycopode sélaginé	Northern firmoss									
	H	Isoetes echinospora subsp. muricata	Isoète à spores hérissées	Spiny-spored quillwort									
	H	Isoetes lacustris	Isoète lacustre	Lake quillwort									
1	H	Juncus alpinoarticulatus subsp. americanus	Jonc alpin	Alpine rush					1				
	H	Juncus balticus subsp. littoralis	Jonc des rivages	Shoreline rush									
	H	Juncus brevicaudatus	Jonc brévicaudé	Short-tailed rush									
1	H	Juncus filiformis	Jonc filiforme	Thread rush						3			
	H	Juncus pelocarpus	Jonc à fruits bruns	Brown-fruited rush									
	H	Juncus stygius subsp. americanus	Jonc d'Amérique	American moor rush									
1	H	Koeleria spicata	Trisète à épi	Spike trisetum			1		1				
1	H	Koenigia islandica	Koenigie d'Islande	Iceland purslane	1								
1	H	Lathyrus japonicus	Gesse maritime	Beach pea		38	15		1				
1	H	Leymus mollis subsp. mollis	Élyme des sables d'Amérique	Sea limegrass	1	38	1						
1	H	Ligusticum scoticum subsp. scoticum	Livèche d'Écosse	Scotch lovage		3	3						
	H	Luzula parviflora s.l.	Luzule parviflore	Small-flowered woodrush									
	H	Lycopodium clavatum	Lycopode claviforme	Running clubmoss									
1	H	Lysimachia borealis	Trientale boréale	Northern starflower				1		1			
	H	Maianthemum canadense subsp. canadense	Maianthème du Canada	Wild lily-of-the-valley									
	H	Maianthemum trifolium	Smilacine trifoliée	Three-leaved false Solomon's seal									
	H	Malaxis unifolia	Malaxis unifolié	Green adder's-mouth									
	H	Melampyrum lineare	Mélampyre linéaire	American cow-wheat									
	H	Menyanthes trifoliata	Trèfle d'eau	Bog buckbean									
1	H	Mitella nuda	Mitrelle nue	Naked mitrewort							3		
1	H	Moneses uniflora	Monésès uniflore	One-flowered wintergreen				1					
1	H	Mononeuria groenlandica	Minuartie du Groenland	Greenland stitchwort									1
	H	Muhlenbergia uniflora	Muhlenbergie uniflore	Late-flowering muhly									
1	H	Neottia cordata	Listère cordée	Heart-leaved twayblade								(hors parcelle)	
	H	Nuphar variegata	Grand nénuphar jaune	Variegated pond-lily									
	H	Oclemena nemoralis	Aster des tourbières	Bog aster									
1	H	Orthilia secunda	Pyrole unilatérale	One-sided wintergreen					1				
	H	Packera aurea	Sénéçon doré	Golden groundsel									
1	H	Petasites frigidus var. palmatus	Pétasite palmé	Palmate coltsfoot						1			
	H	Phegopteris connectilis	Phégoptère du hêtre	Northern beech fern									
	H	Piptatheropsis canadensis	Oryzopsis du Canada	Canada ricegrass									
	H	Piptatheropsis pungens	Oryzopsis piquant	Slender ricegrass									
1	H	Plantago maritima	Plantain maritime	Seaside plantain	15		1		1				
	H	Platanthera aquilonis	Platanthère du Nord	Tall northern green orchid									
	H	Platanthera dilatata var. dilatata	Platanthère dilatée	Tall white bog orchid									
	H	Platanthera huronensis	Platanthère du lac Huron	Lake Huron green orchid									
1	H	Platanthera obtusata subsp. obtusata	Platanthère à feuille obtuse	Blunt-leaved orchid				3					
1	H	Poa alpina subsp. alpina	Pâturin alpin	Alpine bluegrass			1	1					
1	H	Poa glauca subsp. glauca	Pâturin glauque	Glaucous bluegrass					1				
	H	Poa palustris	Pâturin des marais	Fowl bluegrass									
	H	Potamogeton alpinus	Potamot alpin	Alpine pondweed									
	H	Potamogeton epihydrus	Potamot émergé	Ribbon-leaved pondweed									
1	H	Potentilla anserina subsp. groenlandica	Potentille du Groenland	Greenland silverweed	38	1							
1	H	Potentilla litoralis	Potentille du littoral	Coast cinquefoil			1						
	H	Potentilla norvegica	Potentille de Norvège	Rough cinquefoil									
1	H	Puccinellia phryganodes subsp. neoarctica	Puccinellie nésarctique	Creeping alkaligrass	15								
1	H	Pyrola grandiflora	Pyrole à grandes fleurs	Arctic pyrola			15	3					
	H	Pyrola minor	Pyrole mineure	Lesser pyrola									
	H	Ranunculus flammula var. reptans	Renoncule radicante	Creeping spearwort									
	H	Ranunculus trichophyllus	Renoncule capillaire	Thread-leaved water-crowfoot									
1	H	Rhinanthus minor subsp. groenlandicus	Rhinanthe du Groenland	Greenland yellow rattle		3							
	H	Rhynchospora alba	Rhynchospore blanc	White beakrush									
	H	Rubus arcticus subsp. acaulis	Ronce acaule	Stemless raspberry									
1	H	Rubus chamaemorus	Chicouté	Cloudberry						15			3
	H	Rubus pubescens	Ronce pubescente	Dwarf raspberry									
1	H	Sagina nodosa subsp. borealis	Sagine boréale	Northern knotted pearlwort					1				
	H	Sagittaria cuneata	Sagittaire cunéaire	Northern arrowhead									
	H	Sarracenia purpurea subsp. purpurea	Sarracénie pourpre	Northern pitcher plant									
1	H	Saxifraga cespitosa	Saxifrage cespiteuse	Tufted saxifrage					1				
1	H	Saxifraga paniculata subsp. laestadii	Saxifrage de Laestadius	Laestadius' saxifrage			1						
1	H	Saxifraga tricuspidata	Saxifrage à trois dents	Three-toothed saxifrage					1				1
	H	Scheuchzeria palustris	Scheuchzérie des marais	Marsh scheuchzeria									
	H	Schizachne purpurascens subsp. purpurascens	Schizachné pourpré	Purple false melic									
	H	Selaginella selaginoides	Sélaginelle fausse-sélagine	Low spikemoss									
1	H	Sibbaldia tridentata	Potentille tridentée	Three-toothed cinquefoil					1				1
	H	Solidago hispida var. hispida	Verge d'or hispide	Hairy goldenrod									
1	H	Solidago macrophylla	Verge d'or à grandes feuilles	Large-leaved goldenrod			1	15			15		
1	H	Solidago multiradiata	Verge d'or à rayons nombreux	Multi-rayed goldenrod			15		1				
1	H	Solidago uliginosa var. peracuta	Verge d'or à feuilles pointues	Bog goldenrod						3	3		
	H	Sparganium angustifolium	Rubanier à feuilles étroites	Narrow-leaved bureed									
	H	Sparganium emersum	Rubanier à fruits verts	Green-fruited bureed									
	H	Sparganium fluctuans	Rubanier flottant	Floating bureed									
	H	Sparganium hyperboreum	Rubanier hyperboréal	Northern bureed									
1	H	Spiraea alnifolia	Spirée à feuilles d'aulne	Mountain-spirea									
	H	Spiranthes romanzoffiana	Spiranthe de Romanzoff	Hooded ladies'-tresses									
	H	Stellaria borealis subsp. borealis	Stellaire boréale	Boreal starwort									
1	H	Stellaria longipes subsp. longipes	Stellaire à longs pédicelles	Long-stalked starwort		3			1				
	H	Streptopus amplexifolius	Streptope à feuilles embrassantes	Clasping-leaved twisted-stalk									
	H	Subularia aquatica subsp. americana	Subulaire d'Amérique	American water awlwort									
	H	Symphyotrichum puniceum var. puniceum	Aster ponceau	Purple-stemmed aster									
1	H	Taraxacum ceratophorum	Pissenlit tuberculé	Horned dandelion		1			1				
	H	Trichophorum alpinum	Trichophore des Alpes	Alpine clubrush									
1	H	Trichophorum cespitosum	Trichophore cespiteux	Tufted clubrush						63	3		3
1	H	Triglochin palustris	Troscart des marais	Marsh arrowgrass	3								
	H	Utricularia cornuta	Utriculaire cornue	Horned bladderwort									
	H	Utricularia intermedia	Utriculaire intermédiaire	Flat-leaved bladderwort									
	H	Utricularia minor	Utriculaire mineure	Lesser bladderwort									
	H	Utricularia vulgaris subsp. macrorhiza	Utriculaire à longues racines	Greater bladderwort									
1	H	Vahlodea atropurpurea	Deschampsie pourpre	Mountain hairgrass						1			
	H	Viola blanda	Violette agréable	Sweet white violet									
	H	Viola labradorica	Violette du Labrador	Labrador violet									
1	H	Viola macloskeyi	Violette pâle	Macloskey's violet							1		
1	H	Viola renifolia	Violette reniforme	Kidney-leaved violet				1					
	H	Viola selkirkii	Violette de Selkirk	Selkirk's violet									
1	H	Viscaria alpina	Silène de Suède	Alpine catchfly					1				
	H	Woodsia ilvensis	Woodsie d'Elbe	Rusty woodsia									
	Moss layer (M)	Species group											
	M	Lichens					1	15		1		38	3
	M	Mosses			38			88				63	15
	M	Sphagnum mosses								38			
	Ground layer	Ground features											
	—	Litter			15	88	63	15		88	88	15	15
	—	Bare ground			38	15	3						
	—	Boulders					38						
	—	Bedrock							88				88
	—	Open water			15					15			

APPENDIX

F

VEGETATION AND WETLAND INVENTORY SHEETS

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**		
Station number (field) :	A1.1		**Station number (office) :**		
Sample number :			**Date :**	August 6th 2022	
GPS Points :	**Lat :**	53.8619	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye	
	Lon :	-77.4058			
	Alt :	139.3341			
Status of the observation :	Observed - Validate				

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	5	Sandy loam	Dark grey Brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	113%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	116%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Chamaedaphne calyculata	0.5%	%	N	OBL
Myrica gale	0.5%	%	N	OBL
▼No-woody				
Sparganium emersum	15%	13%	Y	OBL
Sparganium angustifolium	35%	31%	Y	OBL
Eleocharis acicularis	15%	13%	Y	OBL
Utricularia intermedia	15%	13%	N	OBL
Sagittaria cuneata	15%	13%	N	OBL
Juncus brevicaudatus	0.5%	0%	N	OBL
Viola macloskeyi	0.5%	0%	N	OBL
Equisetum fluviatile	0.5%	0%	N	OBL
Carex lasiocarpa subsp. americana	3%	3%	N	OBL
Nuphar variegata	0.5%	0%	N	OBL
Sparganium fluctuans	15%	13%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shallow waters
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shallow waters		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8619, -77.4058, 139.3341	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8619, -77.4058, 139.3341	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8619, -77.4058, 139.3341	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8619, -77.4058, 139.3341	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8619, -77.4058, 139.3341	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A1.2		**Station number (office) :**	
Sample number :			**Date :**	August 6th 2022
GPS Points :	**Lat :**	53.862	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4058		
	Alt :	136.9992		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	60 / 25		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

▼**Description of the soil profile** (mineral horizons)

4B

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Inferior horizon no 1	20	Loam	Grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	123%
No-woody (%) :	62%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	186%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Myrica gale	85%	69%	O	OBL
Chamaedaphne calyculata	35%	28%	O	OBL
Kalmia polifolia	3%	2%	N	OBL
▼No-woody				
Carex michauxiana	3%	5%	O	OBL
Carex aquatilis var. aquatilis	15%	24%	O	OBL
Equisetum fluviatile	3%	5%	N	OBL
Carex lasiocarpa subsp. americana	35%	56%	O	OBL
Drosera rotundifolia	3%	5%	O	OBL
Menyanthes trifoliata	0.5%	1%	N	OBL
Carex limosa	3%	5%	O	OBL
Carex echinata subsp. echinata	0.5%	1%	O	
Juncus brevicaudatus	0.5%	1%	N	OBL
Comarum Palustrine	0.5%	1%	O	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp (-1m)		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.862, -77.4058, 136.9992	**Orientation :**	

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Title :			
Coordinates (lat., lon., alt.) :	53.862, -77.4058, 136.9992	**Orientation :**	

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Coordinates (lat., lon., alt.) :	53.862, -77.4058, 136.9992	**Orientation :**	Nord

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ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.862, -77.4058, 136.9992	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.862, -77.4058, 136.9992	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.862, -77.4058, 136.9992	**Orientation :**	Ouest

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A1.3		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	53.8621	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4063		
	Alt :	134.283		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	50 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	20
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Decomposed sphagnum, fibric		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	119%
No-woody (%) :	30%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	100%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

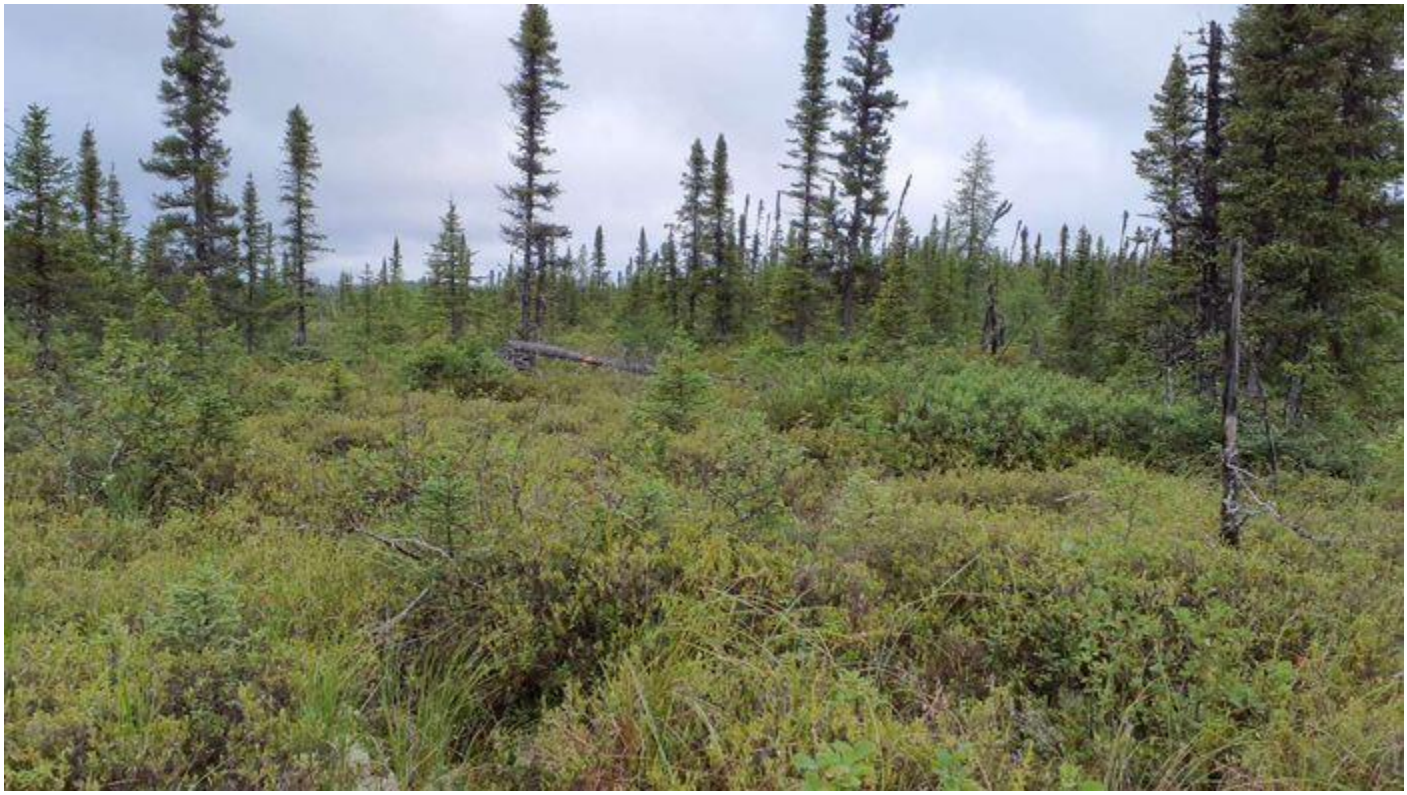
SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
Picea mariana	15%	100%	O	FACH
▼Shrub				
Picea mariana	15%	13%	N	FACH
Alnus incana subsp. rugosa	3%	3%	N	FACH
Chamaedaphne calyculata	65%	55%	O	OBL
Rhododendron groenlandicum	15%	13%	N	OBL
Vaccinium oxycoccos	3%	3%	N	OBL
Empetrum nigrum subsp. nigrum	15%	13%	N	NI
Vaccinium angustifolium	3%	3%	N	NI
Kalmia polifolia	0.5%	0%	N	OBL
Vaccinium vitis-idaea	0.5%	0%	N	NI
▼No-woody				
Rubus chamaemorus	15%	50%	O	FACH
Carex aquatilis var. aquatilis	15%	50%	O	OBL
Carex trisperma	0.5%	2%	N	OBL
Drosera rotundifolia	0.5%	2%	N	OBL
Carex pauciflora	0.5%	2%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Forested bog, fire from 1989.		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8621, -77.4063, 134.283	**Orientation :**	Nord



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Coordinates (lat., lon., alt.) :	53.8621, -77.4063, 134.283	**Orientation :**	Sud

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Coordinates (lat., lon., alt.) :	53.8621, -77.4063, 134.283	**Orientation :**	Ouest

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Coordinates (lat., lon., alt.) :	53.8621, -77.4063, 134.283	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8621, -77.4063, 134.283	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A10.1		**Station number (office) :**	
Sample number :			**Date :**	4 août 2022
GPS Points :	**Lat :**	54.547	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5461		
	Alt :	92.069		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	25 / 15		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	1	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	Yes	**Redoxic soil – Depth :**	9
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	30
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼Description of the soil profile (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	9	Clay	Brown		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	30	Clay	Brown Grey	Dark orange	Very abundant (more than 20%)	Average (5 to 15mm)	Distinct

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	38%
Shrub (%) :	101%
No-woody (%) :	87%
Dominance test	
Number of dominant OBL or FACW species (A) :	6
Number of dominant NW species (B) :	1
Total absolute cover of OBL species (%) :	79%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Larix laricina	35%	92%	O	FACH
Picea mariana	3%	8%	N	FACH
▼Shrub				
Larix laricina	3%	3%	N	FACH
Picea mariana	15%	15%	O	FACH
Salix planifolia	35%	35%	O	OBL*
Salix pellita	15%	15%	O	OBL
Betula glandulosa	15%	15%	O	FACH
Ribes glandulosum	0.5%	0%	N	FACH
Lonicera villosa	15%	15%	O	NI
Rhododendron groenlandicum	0.5%	0%	N	OBL
Vaccinium caespitosum	3%	3%	N	NI
Ribes hirtellum	0.5%	0%	N	NI
Salix pedicellaris	0.5%	0%	N	OBL
Salix pyrifolia	0.5%	0%	N	FACH
Vaccinium angustifolium	0.5%	0%	N	NI
Salix ballii	0.5%	0%	N	
▼No-woody				
Carex aquatilis var. aquatilis	15%	17%	O	OBL
Bromus ciliatus	3%	3%	N	FACH
Petasites frigidus var. palmatus	15%	17%	O	FACH
Rubus arcticus subsp. acaulis	0.5%	1%	N	
Fragaria virginiana subsp. glauca	3%	3%	N	
Cornus canadensis	15%	17%	O	NI
Equisetum sylvaticum	15%	17%	O	FACH
Solidago uliginosa	3%	3%	N	OBL
Chamaenerion angustifolium subsp. angustifolium	3%	3%	N	NI
Viola labradorica	0.5%	1%	N	
Carex canescens	3%	3%	N	OBL
Comarum Palustrine	0.5%	1%	N	OBL
Packera aurea	3%	3%	N	FACH
Juncus filiformis	3%	3%	N	FACH
Maianthemum trifolium	3%	3%	N	OBL
Epilobium Palustrine	0.5%	1%	N	OBL
Calamagrostis canadensis var. canadensis	0.5%	1%	N	FACH
Coptidium lapponicum	0.5%	1%	N	OBL
Carex disperma	3%	3%	N	OBL
Orthilia secunda	0.5%	1%	N	NI

Corallorhiza trifida	0.5%	1%	N	

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Tree swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Tree swamp		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Nord

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Est

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Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Sud

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Ouest

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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A10.2		**Station number (office) :**	
Sample number :			**Date :**	4 août 2022
GPS Points :	**Lat :**	54.5475	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5459		
	Alt :	91.8117		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	10 / 15		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	2	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	4 - Imparfait	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon		Silty clay	Light grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	74%
No-woody (%) :	43%
Dominance test	
Number of dominant OBL or FACW species (A) :	5
Number of dominant NW species (B) :	4
Total absolute cover of OBL species (%) :	3%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Picea mariana	35%	48%	O	FACH
Larix laricina	15%	20%	O	FACH
Vaccinium angustifolium	15%	20%	O	NI
Vaccinium myrtilloides	0.5%	1%	N	NI
Vaccinium uliginosum	0.5%	1%	N	NI
Betula glandulosa	3%	4%	N	FACH
Rhododendron groenlandicum	0.5%	1%	N	OBL
Vaccinium caespitosum	0.5%	1%	N	NI
Epigaea repens	0.5%	1%	N	NI
Salix ballii	3%	4%	N	
▼No-woody				
Equisetum arvense	3%	7%	O	NI
Chamaenerion angustifolium subsp. angustifolium	3%	7%	O	NI
Piptatheropsis canadensis	3%	7%	O	
Petasites frigidus var. palmatus	15%	35%	O	FACH
Achillea borealis var. borealis	0.5%	1%	N	
Packera aurea	0.5%	1%	N	FACH
Solidago uliginosa	3%	7%	O	OBL
Solidago hispida	3%	7%	O	NI
Agrostis scabra	0.5%	1%	N	
Platanthera huronensis	3%	7%	O	FACH
Platanthera canadensis	3%	7%	O	
Platanthera pungens	0,5%	1%	N	
Platanthera aquilonis	0,5%	1%	N	
Sibbaldia tridentata	0.5%	1%	N	
Viola labradorica	0.5%	1%	N	
Lycopodium clavatum	0.5%	1%	N	NI
Cornus canadensis	0.5%	1%	N	NI
Avenella flexuosa	0.5%	1%	N	
Fragaria virginiana subsp. glauca	0.5%	1%	N	
Juncus balticus subsp. littoralis	0.5%	1%	N	FACH
Diphasiastrum sitchense	0.5%	1%	N	
Piptatheropsis pungens	0.5%	1%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :	Old fire	
Initial state of the water environment :		
General remarks :		
Regeneration from fire of 30 years		
Field notes :		

PHOTOGRAPHY

ID :			
Title :	Charbon de bois		
Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	

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Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	

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Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	

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Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	Nord

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5475, -77.5459, 91.8117	**Orientation :**	Ouest

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A11.1		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.364	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3207		
	Alt :	128.9859		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	Yes	**Stoniness – Depth :**	0
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	1 - Rapid	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	25	Silty clay	Light grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	75%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	72%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
▼No-woody				
Calla palustris	0.5%	1%	N	OBL
Equisetum fluviatile	15%	20%	O	OBL
Carex rostrata	3%	4%	N	OBL
Ranunculus flammula var. reptans	3%	4%	N	FACH
Hippuris vulgaris	3%	4%	N	OBL
Utricularia vulgaris subsp. macrorhiza	15%	20%	O	OBL
Utricularia intermedia	3%	4%	N	OBL
Sparganium fluctuans	15%	20%	O	OBL
Sparganium angustifolium	3%	4%	N	OBL
Potamogeton alpinus	3%	4%	N	OBL*
Nuphar variegata	3%	4%	N	OBL
Isoetes lacustris	3%	4%	N	OBL
Isoetes echinospora	3%	4%	N	OBL
Subularia aquatica subsp. americana	0.5%	1%	N	
Callitriche heterophylla var. heterophylla	3%	4%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shallow waters
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shallow waters.		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.364, -77.3207, 128.9859	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.364, -77.3207, 128.9859	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.364, -77.3207, 128.9859	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.364, -77.3207, 128.9859	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.364, -77.3207, 128.9859	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.364, -77.3207, 128.9859	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A11.2		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.3641	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3202		
	Alt :	133.8513		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	33 / 60		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	3	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	25	Sableuse	Brown Grey		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	10	Silty clay	Light grey	Orange	Moderately abundant (2 to 20%)	Small (less than 5mm)	Distinct

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	38%
Shrub (%) :	101%
No-woody (%) :	3%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	81%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	35%	92%	O	FACH
Larix laricina	3%	8%	N	FACH
▼Shrub				
Picea mariana	15%	15%	N	FACH
Larix laricina	0.5%	0%	N	FACH
Rhododendron groenlandicum	65%	64%	O	OBL
Chamaedaphne calyculata	15%	15%	N	OBL
Vaccinium angustifolium	3%	3%	N	NI
Vaccinium oxycoccos	0.5%	0%	N	OBL
Vaccinium vitis-idaea	3%	3%	N	NI
Empetrum nigrum subsp. nigrum	0.5%	0%	N	NI
Kalmia polifolia	0.5%	0%	N	OBL
▼No-woody				
Rubus chamaemorus	0.5%	17%	N	FACH
Equisetum sylvaticum	3%	100%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-moss forest		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3641, -77.3202, 133.8513	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3641, -77.3202, 133.8513	**Orientation :**	Nord

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.3641, -77.3202, 133.8513	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.3641, -77.3202, 133.8513	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3641, -77.3202, 133.8513	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3641, -77.3202, 133.8513	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A11.3		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.3638	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3195		
	Alt :	137.9693		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☑ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	4	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	6	Sand	Grey		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	10	Sand	Orange Brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	80%
No-woody (%) :	0%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	1
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
Larix laricina	0.5%	3%	N	FACH
▼Shrub				
Picea mariana	3%	4%	N	FACH
Betula glandulosa	15%	19%	O	FACH
Rhododendron groenlandicum	15%	19%	O	OBL
Vaccinium angustifolium	35%	44%	O	NI
Epigaea repens	3%	4%	N	NI
Salix humilis var. humilis	3%	4%	N	NI*
Vaccinium vitis-idaea	3%	4%	N	NI
Salix planifolia	0.5%	1%	N	OBL*
Vaccinium uliginosum	3%	4%	N	NI
▼No-woody				
Piptatherum pungens	0.5%	%	N	
Solidago hispida	0.5%	%	N	NI
Diphasiastrum sitchense	0.5%	%	N	
Avenella flexuosa	0.5%	%	N	
Cornus canadensis	0.5%	%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-lichen forest on De Geer moraine		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3638, -77.3195, 137.9693	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3638, -77.3195, 137.9693	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3638, -77.3195, 137.9693	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3638, -77.3195, 137.9693	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3638, -77.3195, 137.9693	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A12.1		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.5038	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3192		
	Alt :	114.2198		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	4	**Organic horizon – Type :**	Humic
Observed rock :	Yes	**Rock – Depth :**	15
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	3	Other class	Brown litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	10	Accumulation of soil organic matter (SOM) (Ah)	Black, mo a travers Sand		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	2	Sand	Grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	68%
Shrub (%) :	71%
No-woody (%) :	15%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	35%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	65%	96%	O	FACH
Pinus banksiana	0.5%	1%	N	NI
Larix laricina	3%	4%	N	FACH
▼Shrub				
Picea mariana	15%	21%	O	FACH
Rhododendron groenlandicum	35%	49%	O	OBL
Vaccinium vitis-idaea	3%	4%	N	NI
Vaccinium angustifolium	15%	21%	O	NI
Vaccinium uliginosum	3%	4%	N	NI
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
▼No-woody				
Cornus canadensis	15%	100%	O	NI
Geocaulon lividum	0.5%	3%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Mature spruce-lichen forest		
Field notes :		
Near dune		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3192, 114.2198	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3192, 114.2198	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3192, 114.2198	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3192, 114.2198	**Orientation :**	Est

PHOTOGRAPHY

ID :			
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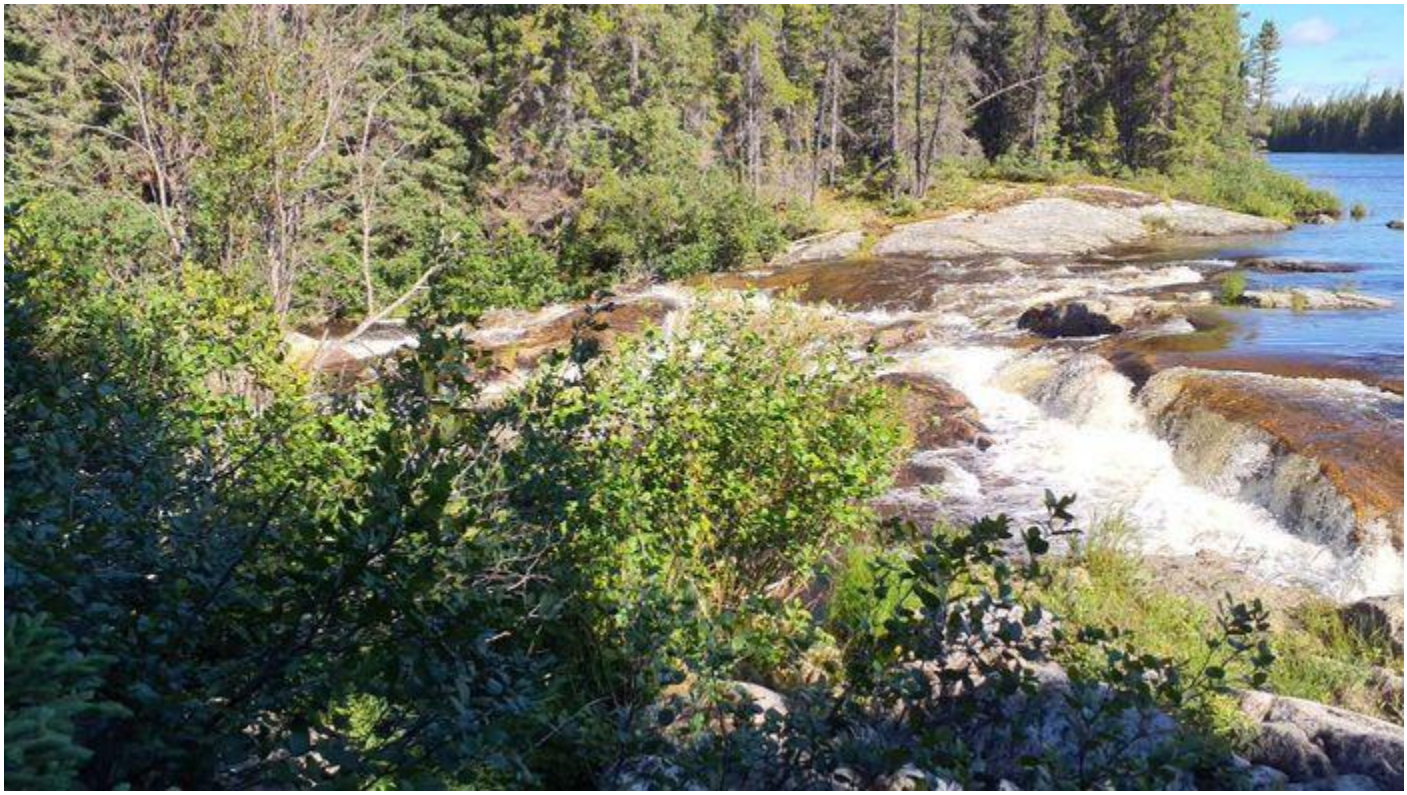
Coordinates (lat., lon., alt.) :	54.5038, -77.3192, 114.2198	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3192, 114.2198	**Orientation :**	



Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A12.2		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.5038	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3179		
	Alt :	106.5418		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☑ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Lake	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	Not evaluated	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	25	Silty clay	Grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	18%
No-woody (%) :	115%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	133%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Myrica gale	15%	83%	O	OBL
Chamaedaphne calyculata	3%	17%	N	OBL
Alnus incana subsp. rugosa	0.5%	3%	N	FACH
▼No-woody				
Equisetum fluviatile	3%	3%	N	OBL
Carex rostrata	35%	30%	O	OBL
Comarum Palustrine	15%	13%	N	OBL
Nuphar variegata	35%	30%	O	OBL
Potamogeton alpinus	15%	13%	N	OBL*
Utricularia intermedia	3%	3%	N	OBL
Hippuris vulgaris	3%	3%	N	OBL
Eleocharis acicularis	3%	3%	N	OBL
Sparganium hyperboreum	0.5%	0%	N	OBL
Carex aquatilis var. aquatilis	3%	3%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shallow waters
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shallow waters		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3179, 106.5418	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3179, 106.5418	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3179, 106.5418	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5038, -77.3179, 106.5418	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A12.3		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.547	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5461		
	Alt :	92.069		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	60 / 40		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	10
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	80	Other class	Organic matter - fibric				
Inferior horizon no 1	20	Other class	Organic matter - mesic		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	83%
No-woody (%) :	15%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	81%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
Larix laricina	0.5%	3%	N	FACH
▼Shrub				
Rhododendron groenlandicum	65%	78%	O	OBL
Chamaedaphne calyculata	15%	18%	N	OBL
Vaccinium oxycoccos	0.5%	1%	N	OBL
Vaccinium vitis-idaea	3%	4%	N	NI
Kalmia polifolia	0.5%	1%	N	OBL
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
▼No-woody				
Rubus chamaemorus	15%	100%	O	FACH
Equisetum sylvaticum	0.5%	3%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Forested bog		
Field notes :		

PHOTOGRAPHY

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Title :			
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PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	

PHOTOGRAPHY

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Nord

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Sud

PHOTOGRAPHY

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Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.547, -77.5461, 92.069	**Orientation :**	Ouest

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A12.4		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.5037	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3215		
	Alt :	119.5861		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	Yes	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	60
Drainage class :	1 - Rapid	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	0%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Picea mariana	0.5%	%	N	FACH
Alnus alnobetula subsp. crispa	0.5%	%	N	NI
Vaccinium uliginosum	0.5%	%	N	NI
Rhododendron groenlandicum	0.5%	%	N	OBL
Betula cordifolia	0.5%	%	N	
▼No-woody				
Potentilla norvegica	0.5%	%	N	NI
Calamagrostis canadensis	0.5%	%	N	FACH
Agrostis mertensii	0.5%	%	N	
Agrostis scabra	0.5%	%	N	
Solidago macrophylla	0.5%	%	N	NI
Carex deflexa var. deflexa	0.5%	%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Block field		
Field notes :		

PHOTOGRAPHY

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PHOTOGRAPHY

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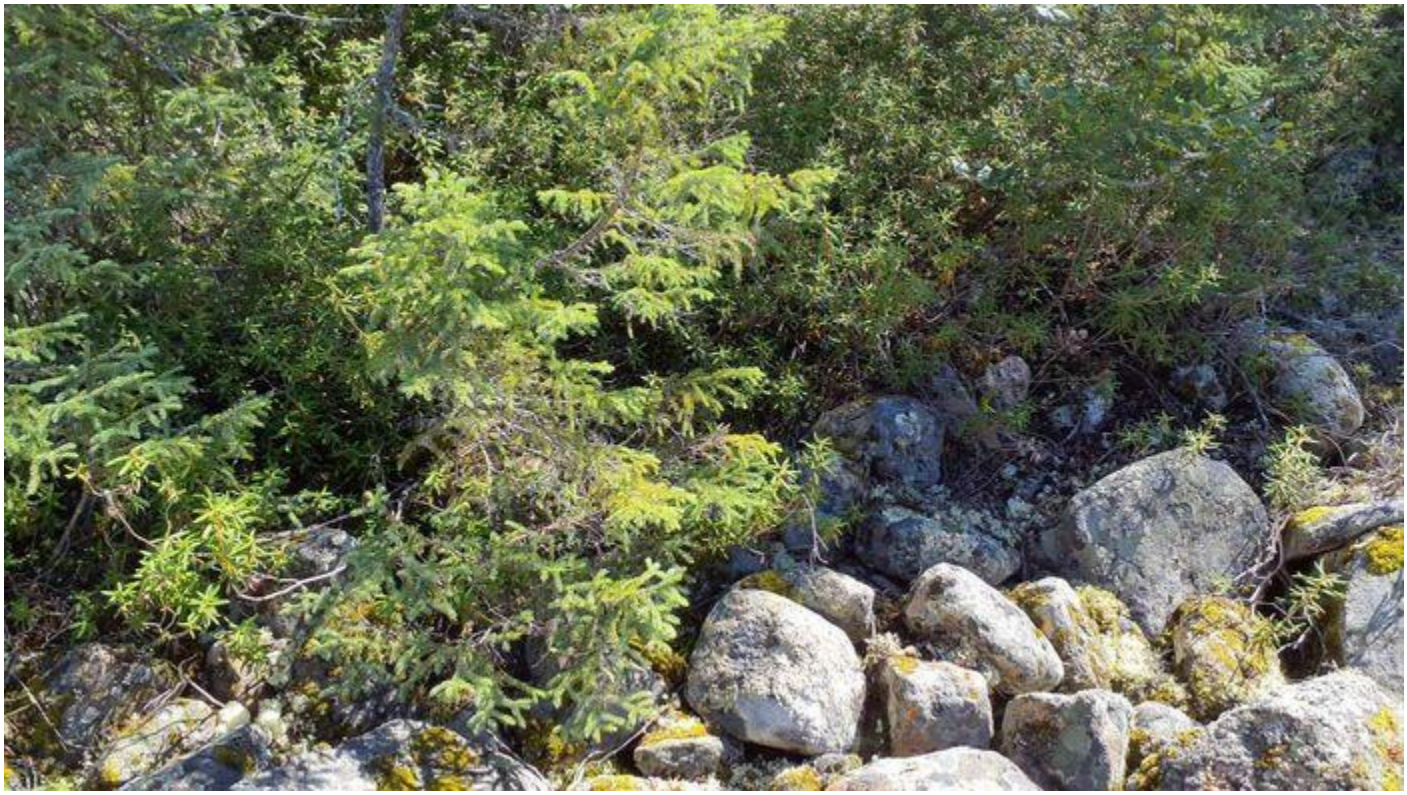

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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5037, -77.3215, 119.5861	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A12.5		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.5039	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3217		
	Alt :	101.0742		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	Yes	**Stoniness – Depth :**	15
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	4 - Imparfait	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	8	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	5	Loamy sand	Brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	38%
Shrub (%) :	156%
No-woody (%) :	170%
Dominance test	
Number of dominant OBL or FACW species (A) :	9
Number of dominant NW species (B) :	7
Total absolute cover of OBL species (%) :	32%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	35%	92%	O	FACH
Betula cordifolia	3%	8%	N	
▼Shrub				
Alnus alnobetula subsp. crispa	65%	41%	O	NI
Viburnum edule	15%	9%	O	FACH
Cornus sericea	15%	9%	O	FACH
Ribes triste	0.5%	0%	N	OBL
Cornus stolonifera	15%	9%	O	FACH
Alnus incana subsp. rugosa	15%	9%	O	FACH
Salix planifolia	15%	9%	O	OBL*
Ribes hirtellum	0.5%	0%	N	NI
Myrica gale	15%	9%	O	OBL
Ribes Lacustrine	0.5%	0%	N	FACH
Sorbus americana	0.5%	0%	N	NI
Amelanchier bartramiana	0.5%	0%	N	
Rhododendron groenlandicum	0.5%	0%	N	OBL
Vaccinium uliginosum	0.5%	0%	N	NI
▼No-woody				
Cornus canadensis	35%	20%	O	NI
Streptopus amplexifolius	3%	2%	N	NI
Rubus pubescens	15%	9%	O	FACH
Lycopodium annotinum	15%	9%	O	NI
Lysimachia borealis	3%	2%	N	NI
Phegopteris connectilis	15%	9%	O	NI
Gymnocarpium dryopteris	15%	9%	O	NI
Calamagrostis canadensis	15%	9%	O	FACH
Spinulum annotinum subsp. annotinum	15%	9%	O	
Coptis trifolia	15%	9%	O	NI
Mitella nuda	3%	2%	N	FACH
Viola selkirkii	0.5%	0%	N	
Solidago macrophylla	15%	9%	O	NI
Caltha palustris	0.5%	0%	N	OBL
Symphyotrichum puniceum var. puniceum	3%	2%	N	FACH
Cinna latifolia	0.5%	0%	N	FACH
Carex leptalea	0.5%	0%	N	OBL
Equisetum sylvaticum	3%	2%	N	FACH
Agrostis mertensii	0.5%	0%	N	
Carex trisperma	0.5%	0%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Tree swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Tree swamp		
Field notes :		

PHOTOGRAPHY

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Title :			
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PHOTOGRAPHY

ID :			
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PHOTOGRAPHY

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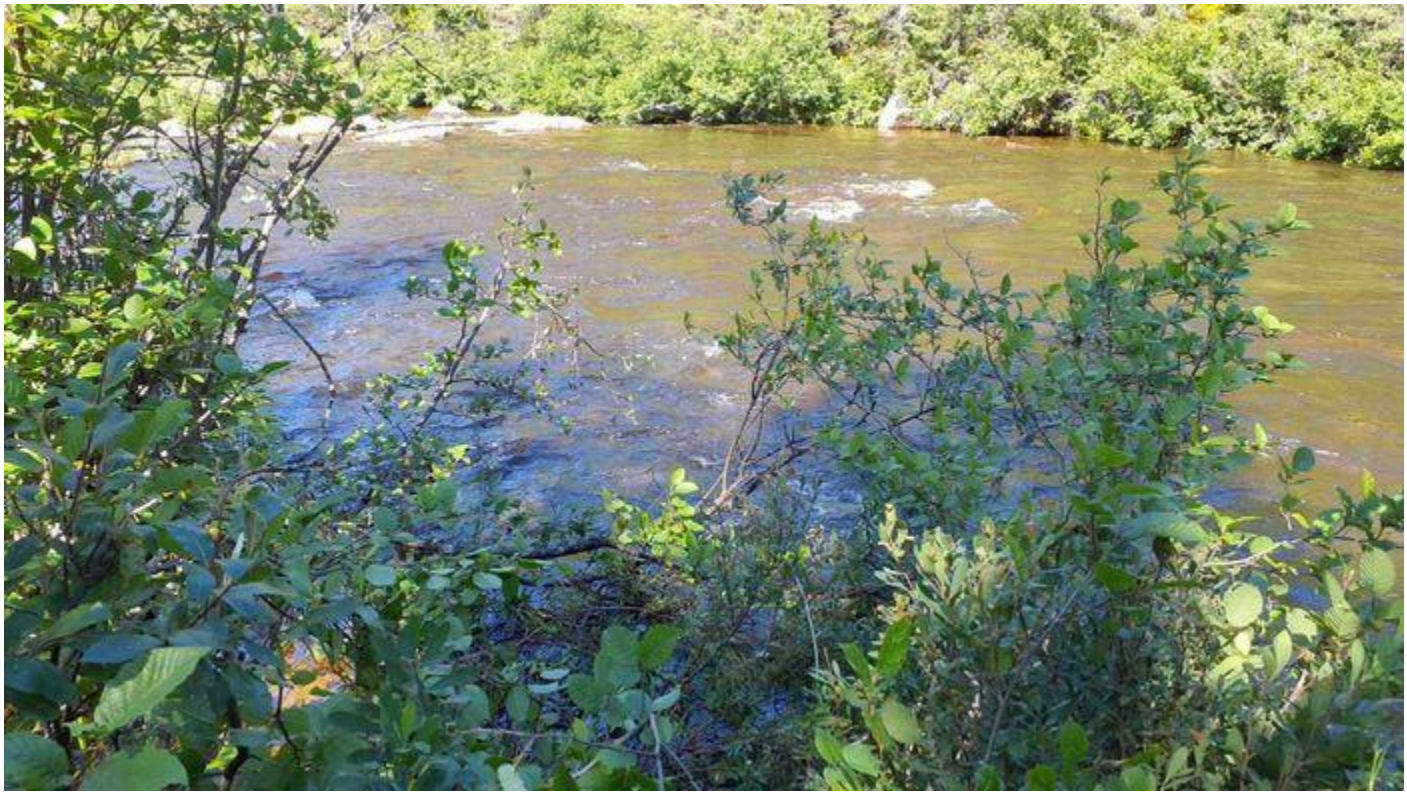

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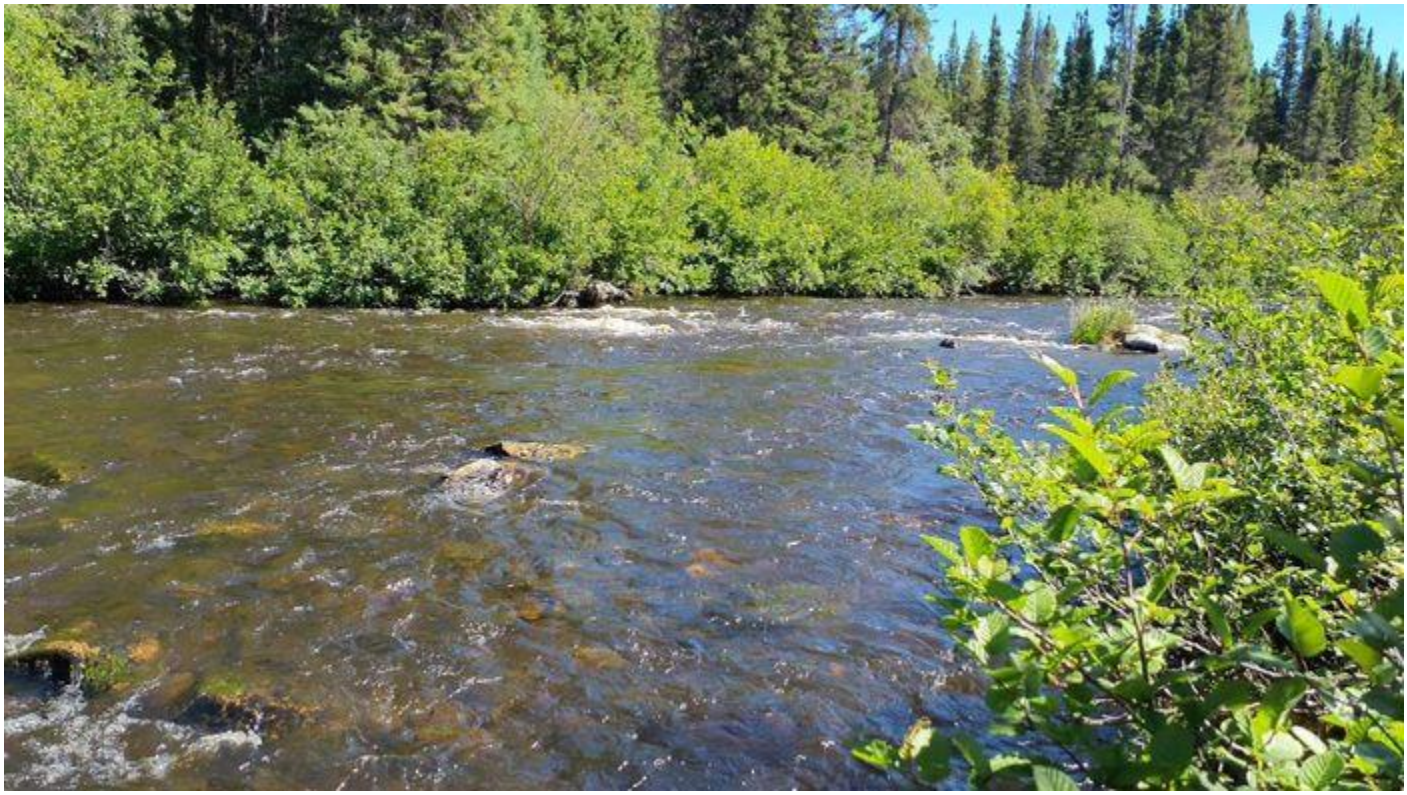
Coordinates (lat., lon., alt.) :	54.5039, -77.3217, 101.0742	**Orientation :**	



Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A13.1		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.6617	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6291		
	Alt :	146.9308		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☐ No	☑ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	
Drainage class :	1 - Rapid	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	5	Other class	Humus lichen		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	3%
Shrub (%) :	57%
No-woody (%) :	18%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	20%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	3%	100%	N	FACH
▼Shrub				
Picea mariana	3%	5%	N	FACH
Larix laricina	0.5%	1%	N	FACH
Empetrum nigrum subsp. nigrum	15%	26%	O	NI
Rhododendron groenlandicum	15%	26%	O	OBL
Betula glandulosa	3%	5%	N	FACH
Vaccinium uliginosum	15%	26%	O	NI
Vaccinium vitis-idaea	3%	5%	N	NI
Juniperus communis var. depressa	3%	5%	N	NI
Populus tremuloides	0.5%	1%	N	NI
Vaccinium angustifolium	0.5%	1%	N	NI
▼No-woody				
Mononeuria groenlandica	3%	17%	O	
Anthoxanthum monticola subsp. alpinum	0.5%	3%	N	
Carex bigelowii subsp. bigelowii	3%	17%	O	FACH
Carex arctogena	3%	17%	O	
Agrostis mertensii	0.5%	3%	N	
Sibbaldia tridentata	3%	17%	O	
Carex brunnescens subsp. brunnescens	0.5%	3%	N	FACH*
Cornus canadensis	3%	17%	O	NI
Carex canescens	0.5%	3%	N	OBL
Trichophorum cespitosum	3%	17%	O	OBL
Eriophorum vaginatum subsp. spissum	0.5%	3%	N	OBL
Carex stylosa	0.5%	3%	N	
Huperzia selago	0.5%	3%	N	
Piptatheropsis canadensis	0.5%	3%	N	
Carex deflexa var. deflexa	0.5%	3%	N	
Carex magellanica subsp. irrigua	0.5%	3%	N	OBL
Avenella flexuosa	0.5%	3%	N	
Diphasiastrum complanatum	0.5%	3%	N	NI
Lysimachia borealis	0.5%	3%	N	NI
Carex aquatilis var. aquatilis	0.5%	3%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Rocky outcrop
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Rocky outcrop		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
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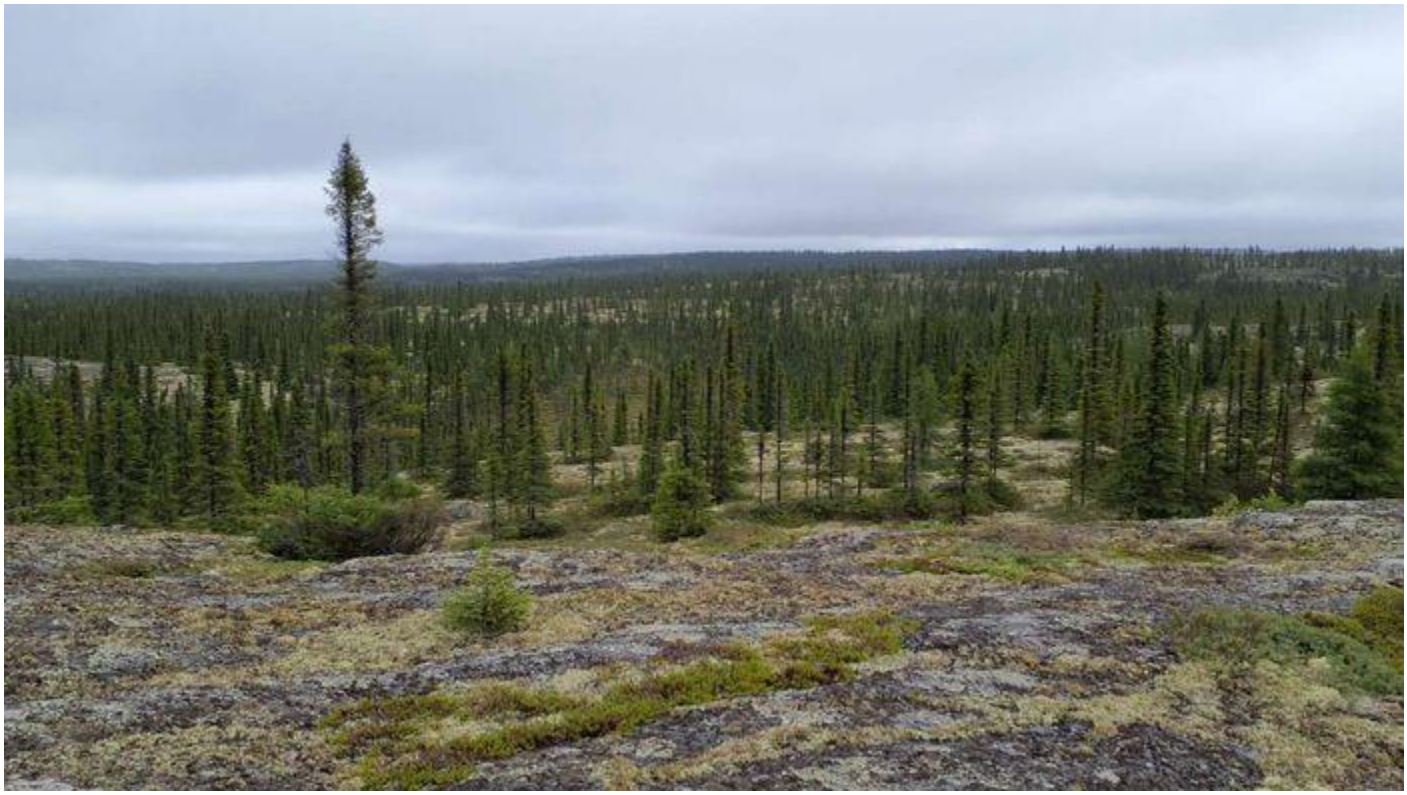

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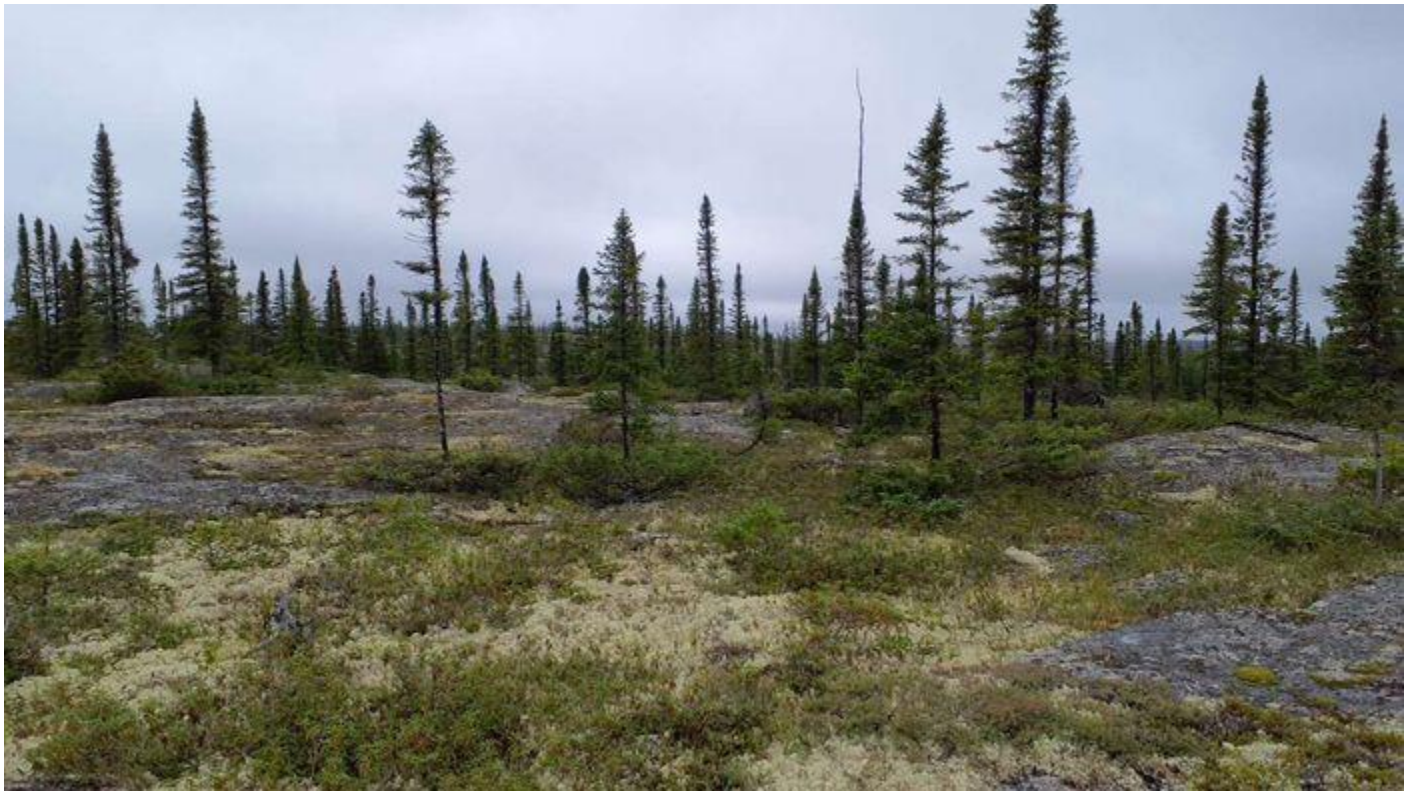

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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.6617, -77.6291, 146.9308	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A14.1		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.7513	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6257		
	Alt :	104.4208		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	30
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☑ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	1	Other class	Litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	25	Silt	Dark brown		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	10	Clay	Grey	Orange pale	Very abundant (more than 20%)	Average (5 to 15mm)	Faible

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	3%
Shrub (%) :	155%
No-woody (%) :	155%
Dominance test	
Number of dominant OBL or FACW species (A) :	5
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	38%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Larix laricina	3%	100%	N	FACH
▼Shrub				
Salix argyrocarpa	85%	55%	O	
Betula glandulosa	0.5%	0%	N	FACH
Lonicera villosa	35%	23%	O	NI
Vaccinium caespitosum	35%	23%	O	NI
Amelanchier bartramiana	0.5%	0%	N	
▼No-woody				
Carex aquatilis var. aquatilis	15%	10%	O	OBL
Carex brunnescens subsp. brunnescens	35%	23%	O	FACH*
Stellaria borealis subsp. borealis	15%	10%	O	OBL
Pyrola minor	15%	10%	O	
Agrostis scabra	3%	2%	N	
Equisetum sylvaticum	15%	10%	O	FACH
Galium trifidum subsp. trifidum	3%	2%	N	
Rubus arcticus subsp. acaulis	15%	10%	O	
Epilobium Palustrine	3%	2%	N	OBL
Symphyotrichum puniceum var. puniceum	0.5%	0%	N	FACH
Viola blanda	0.5%	0%	N	FACH
Viola labradorica	0.5%	0%	N	
Carex disperma	3%	2%	N	OBL
Packera aurea	3%	2%	N	FACH
Petasites frigidus var. palmatus	15%	10%	O	FACH
Chamaenerion angustifolium subsp. angustifolium	3%	2%	N	NI
Bromus ciliatus	3%	2%	N	FACH
Schizachne purpurascens	3%	2%	N	
Fragaria virginiana subsp. glauca	3%	2%	N	
Achillea borealis var. borealis	0.5%	0%	N	
Solidago uliginosa	0.5%	0%	N	OBL
Poa palustris	0.5%	0%	N	FACH
Elymus trachycaulus subsp. trachycaulus	0.5%	0%	N	
Mitella nuda	0.5%	0%	N	FACH
Agrostis mertensii	3%	2%	N	
Sibbaldia tridentata	0.5%	0%	N	
Avenella flexuosa	0.5%	0%	N	
Piptatheropsis canadensis	0.5%	0%	N	
Calamagrostis canadensis	0.5%	0%	N	FACH
Maianthemum trifolium	0.5%	0%	N	OBL

Comarum Palustrine	0.5%	0%	N	OBL
Agrostis scabra	0.5%	0%	N	
Viola macloskeyi	0.5%	0%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp		
Field notes :		

PHOTOGRAPHY

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Title :			
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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.7513, -77.6257, 104.4208	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A15.1		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.8524	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6815		
	Alt :	156.7168		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Mesic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	Yes
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	150	Other class	Humus		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	3%
Shrub (%) :	86%
No-woody (%) :	146%
Dominance test	
Number of dominant OBL or FACW species (A) :	7
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	210%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
Larix laricina	3%	100%	N	FACH
▼Shrub				
Larix laricina	3%	3%	N	FACH
Picea mariana	0.5%	1%	N	FACH
Myrica gale	65%	76%	O	OBL
Lonicera villosa	15%	17%	N	NI
Kalmia polifolia	3%	3%	N	OBL
Juniperus communis var. depressa	0.5%	1%	N	NI
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
▼No-woody				
Eurybia radula	15%	10%	O	OBL
Carex magellanica subsp. irrigua	3%	2%	N	OBL
Carex aquatilis var. aquatilis	15%	10%	O	OBL
Carex oligosperma	3%	2%	N	OBL
Vahlodea atropurpurea	0.5%	0%	N	
Agrostis scabra	3%	2%	N	
Carex pauciflora	3%	2%	N	OBL
Epilobium Palustrine	0.5%	0%	N	OBL
Trichophorum cespitosum	15%	10%	O	OBL
Viola macloskeyi	3%	2%	N	OBL
Comarum Palustrine	3%	2%	N	OBL
Sparganium hyperboreum	0.5%	0%	N	OBL
Menyanthes trifoliata	35%	24%	O	OBL
Solidago uliginosa	15%	10%	O	OBL
Carex limosa	3%	2%	N	OBL
Carex exilis	3%	2%	N	OBL
Nuphar variegata	15%	10%	O	OBL
Selaginella selaginoides	3%	2%	N	FACH
Drosera rotundifolia	3%	2%	N	OBL
Juncus stygius subsp. americanus	0.5%	0%	N	OBL
Utricularia cornuta	3%	2%	N	OBL
Drosera anglica	0.5%	0%	N	OBL
Muhlenbergia uniflora	0.5%	0%	N	OBL
Trichophorum alpinum	3%	2%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Riparian fen		
Field notes :		

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.8524, -77.6815, 156.7168	**Orientation :**	

PHOTOGRAPHY

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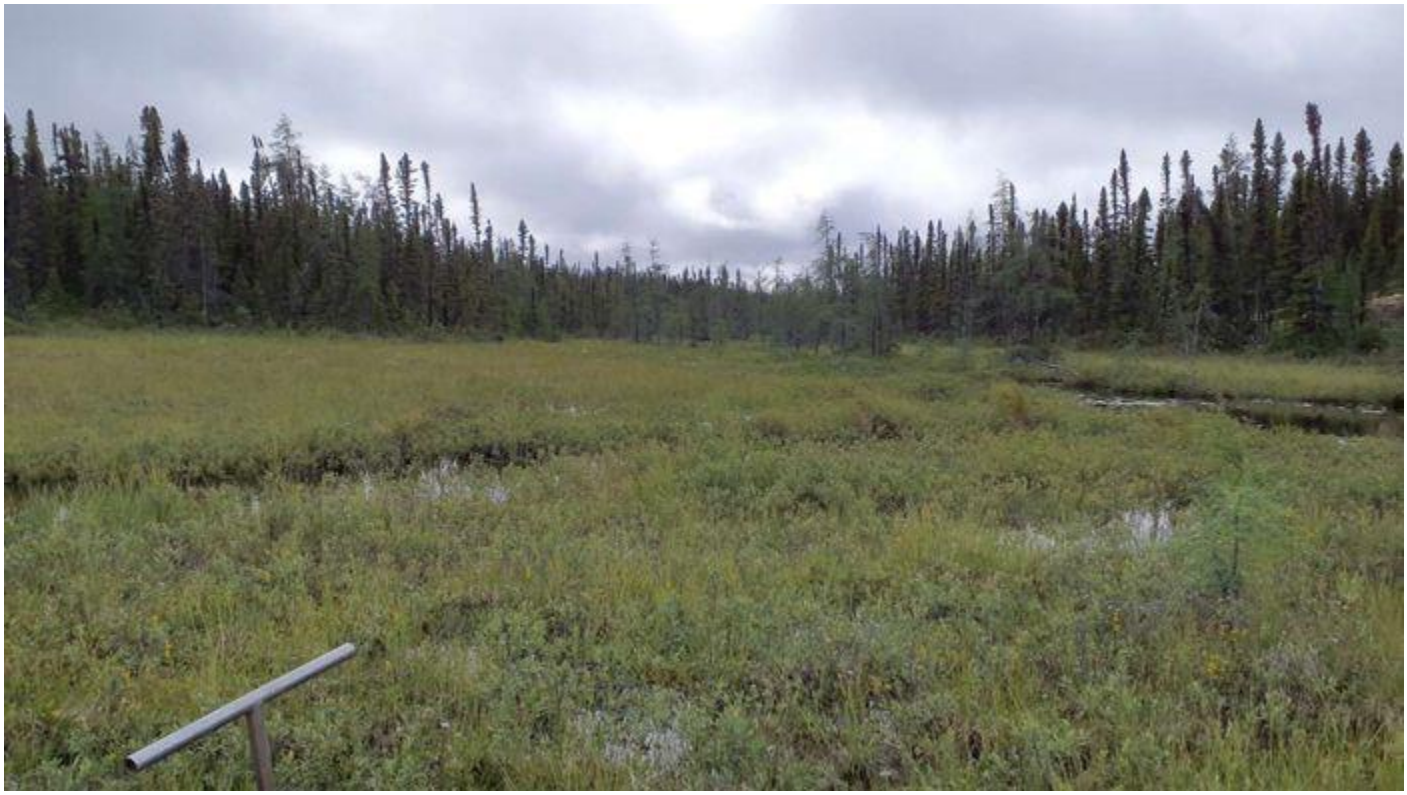

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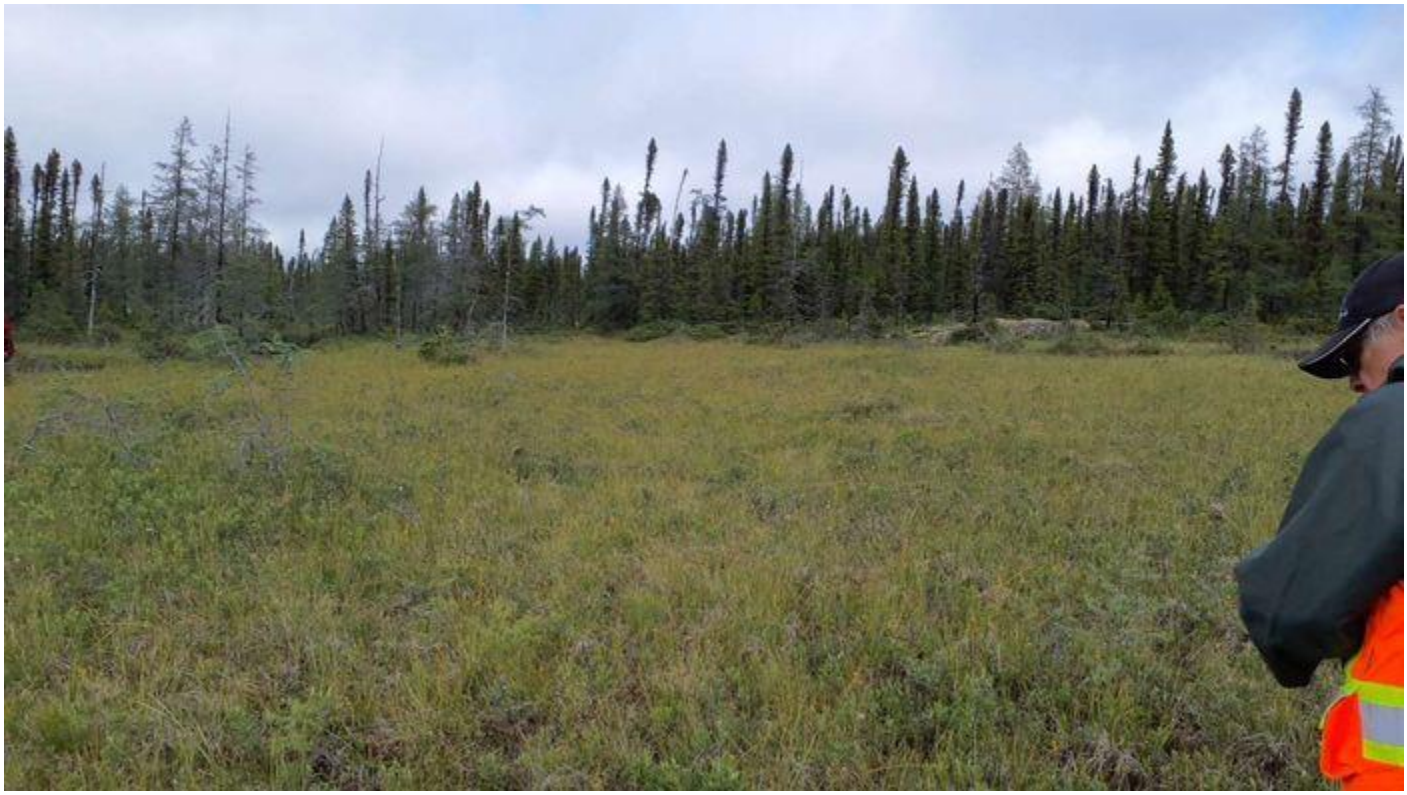

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A16.1		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.8805	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.68		
	Alt :	129.9876		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	Yes	**Rock – Depth :**	0
Significant stoniness :	Yes	**Stoniness – Depth :**	0
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	3	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	40	Sand	Brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	65%
No-woody (%) :	54%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Picea mariana	0.5%	1%	N	FACH
Salix bebbiana	0.5%	1%	N	FACH
Betula glandulosa	35%	54%	O	FACH
Vaccinium angustifolium	15%	23%	O	NI
Rhododendron groenlandicum	0.5%	1%	N	OBL
Vaccinium vitis-idaea	0.5%	1%	N	NI
Vaccinium uliginosum	15%	23%	O	NI
Amelanchier bartramiana	0.5%	1%	N	
Juniperus communis var. depressa	0.5%	1%	N	NI
Larix laricina	0.5%	1%	N	FACH
Salix humilis var. humilis	0.5%	1%	N	NI*
Ribes glandulosum	0.5%	1%	N	FACH
Vaccinium caespitosum	0.5%	1%	N	NI
▼No-woody				
Diphasiastrum sitchense	15%	28%	O	
Cornus canadensis	15%	28%	O	NI
Piptatherum canadense	15%	28%	O	
Avenella flexuosa	3%	6%	N	
Chamaenerion angustifolium subsp. angustifolium	0.5%	1%	N	NI
Petasites frigidus var. palmatus	3%	6%	N	FACH
Sibbaldia tridentata	3%	6%	N	
Lysimachia borealis	0.5%	1%	N	NI
Equisetum sylvaticum	0.5%	1%	N	FACH
Carex deflexa var. deflexa	0.5%	1%	N	
Lycopodium clavatum	0.5%	1%	N	NI

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fire from 1980		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.8805, -77.68, 129.9876	**Orientation :**	Nord

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Coordinates (lat., lon., alt.) :	54.8805, -77.68, 129.9876	**Orientation :**	Ouest

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Coordinates (lat., lon., alt.) :	54.8805, -77.68, 129.9876	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.8805, -77.68, 129.9876	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A17.1		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.9671	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7021		
	Alt :	119.5774		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	100
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Humus Humic		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	3%
Shrub (%) :	57%
No-woody (%) :	151%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	169%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Larix laricina	3%	100%	N	FACH
▼Shrub				
Larix laricina	3%	5%	N	FACH
Picea mariana	3%	5%	N	FACH
Myrica gale	15%	26%	O	OBL
Juniperus communis var. depressa	0.5%	1%	N	NI
Salix pedicellaris	15%	26%	O	OBL
Salix argyrocarpa	15%	26%	O	
Salix planifolia	3%	5%	N	OBL*
Dasiphora fruticosa	0.5%	1%	N	FACH
Empetrum nigrum subsp. nigrum	3%	5%	N	NI
▼No-woody				
Carex aquatilis var. aquatilis	85%	56%	O	OBL
Carex oligosperma	15%	10%	N	OBL
Comarum Palustrine	15%	10%	N	OBL
Trichophorum alpinum	3%	2%	N	OBL
Carex echinata subsp. echinata	15%	10%	N	
Juncus filiformis	0.5%	0%	N	FACH
Viola macloskeyi	3%	2%	N	OBL
Trichophorum cespitosum	15%	10%	N	OBL
Drosera rotundifolia	0.5%	0%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Riparian fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.9671, -77.7021, 119.5774	**Orientation :**	Nord

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Title :			
Coordinates (lat., lon., alt.) :	54.9671, -77.7021, 119.5774	**Orientation :**	Est

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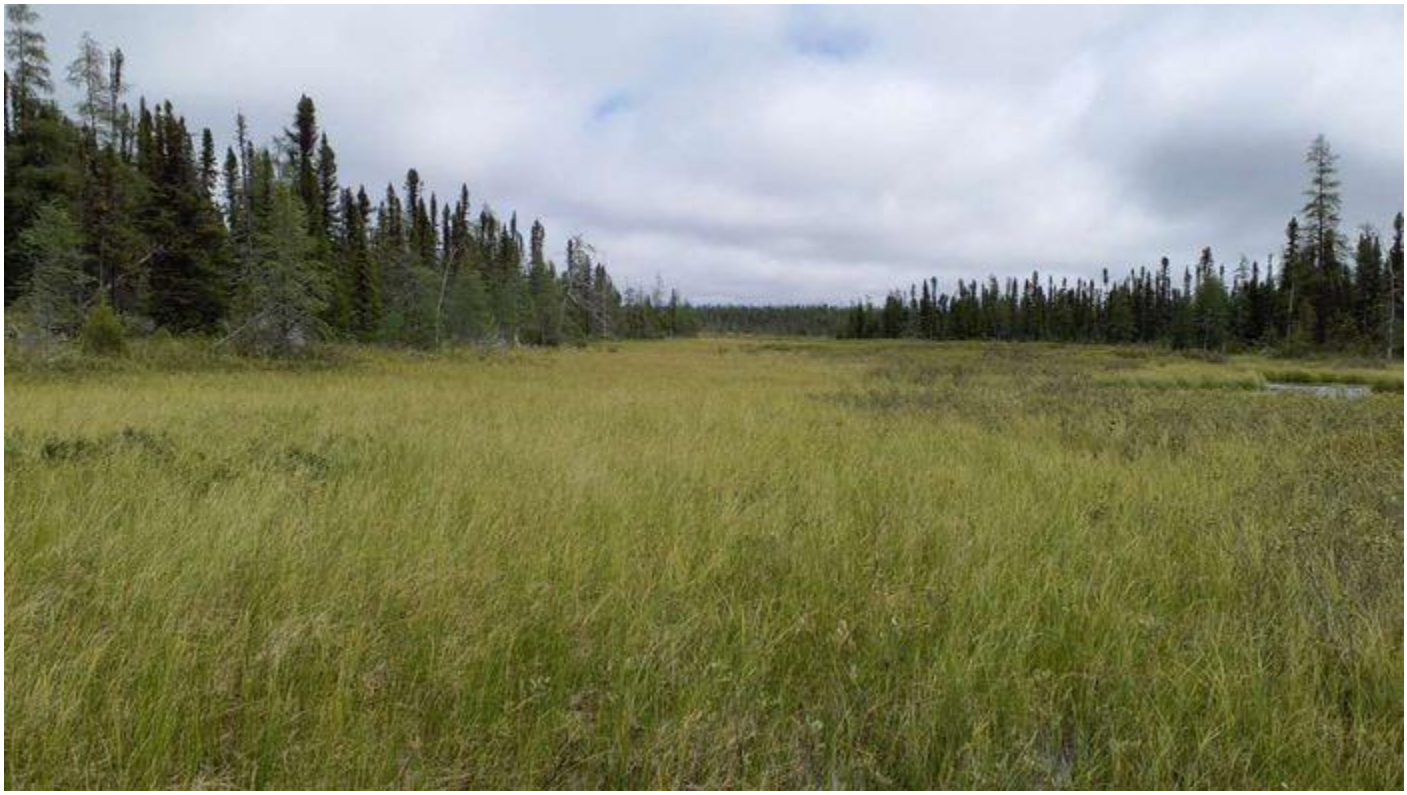
Title :			
Coordinates (lat., lon., alt.) :	54.9671, -77.7021, 119.5774	**Orientation :**	Est



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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.9671, -77.7021, 119.5774	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A17.2		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	54967200	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77701600		
	Alt :			
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	50 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	30
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	50	Other class	Organic matter - fibric				
Inferior horizon no 1	10	Sand	Orange				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	18%
Shrub (%) :	63%
No-woody (%) :	63%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	35%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	83%	O	FACH
Larix laricina	3%	17%	N	FACH
▼Shrub				
Salix argyrocarpa	3%	5%	N	
Juniperus communis var. depressa	0.5%	1%	N	NI
Larix laricina	3%	5%	N	FACH
Picea mariana	15%	24%	O	FACH
Empetrum nigrum subsp. nigrum	15%	24%	O	NI
Gaultheria hispidula	0.5%	1%	N	NI
Betula glandulosa	3%	5%	N	FACH
Myrica gale	3%	5%	N	OBL
Vaccinium uliginosum	15%	24%	O	NI
Kalmia polifolia	0.5%	1%	N	OBL
Vaccinium angustifolium	3%	5%	N	NI
Linnaea borealis subsp. longiflora	3%	5%	N	NI
Vaccinium oxycoccos	0.5%	1%	N	OBL
Rhododendron groenlandicum	0.5%	1%	N	OBL
Chamaedaphne calyculata	0.5%	1%	N	OBL
▼No-woody				
Carex pauciflora	3%	5%	N	OBL
Carex vaginata	15%	24%	O	OBL
Carex aquatilis var. aquatilis	0.5%	1%	N	OBL
Geocaulon lividum	15%	24%	O	NI
Trichophorum cespitosum	3%	5%	N	OBL
Carex magellanica subsp. irrigua	0.5%	1%	N	OBL
Carex rariflora	0.5%	1%	N	
Lysimachia borealis	0.5%	1%	N	NI
Eurybia radula	3%	5%	N	OBL
Petasites frigidus var. palmatus	0.5%	1%	N	FACH
Carex tenuiflora	0.5%	1%	N	OBL
Maianthemum trifolium	0.5%	1%	N	OBL
Rubus chamaemorus	15%	24%	O	FACH
Cornus canadensis	0.5%	1%	N	NI
Carex echinata subsp. echinata	3%	5%	N	
Coptis trifolia	0.5%	1%	N	NI
Equisetum sylvaticum	0.5%	1%	N	FACH
Bistorta vivipara	0.5%	1%	N	
Rubus arcticus subsp. acaulis	0.5%	1%	N	

Solidago uliginosa	3%	5%	N	OBL
Selaginella selaginoides	0.5%	1%	N	FACH
Vahlodea atropurpurea	3%	5%	N	
Carex leptalea	0.5%	1%	N	OBL
Drosera rotundifolia	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Tree fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.9674, -77.7046,	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A19.1		**Station number (office) :**	
Sample number :			**Date :**	August 9th 2022
GPS Points :	**Lat :**	55.1852	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6296		
	Alt :	94.5239		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	30 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	50	**Organic horizon – Type :**	Mesic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	Yes
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	50	Other class	Organic matter - mesic				
Inferior horizon no 1	8	Sand	Dark grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	65%
No-woody (%) :	201%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	211%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Lonicera villosa	3%	5%	N	NI
Juniperus communis var. depressa	3%	5%	N	NI
Kalmia polifolia	3%	5%	N	OBL
Larix laricina	0.5%	1%	N	FACH
Andromeda polifolia var. polifolia	15%	23%	O	
Myrica gale	35%	54%	O	OBL
Picea mariana	3%	5%	N	FACH
Chamaedaphne calyculata	3%	5%	N	OBL
▼No-woody				
Platanthera dilatata var. dilatata	0.5%	0%	N	FACH
Spiranthes romanzoffiana	0.5%	0%	N	FACH
Piptatheropsis canadensis	15%	7%	N	
Drosera rotundifolia	3%	1%	N	OBL
Carex exilis	35%	17%	O	OBL
Trichophorum cespitosum	65%	32%	O	OBL
Deschampsia cespitosa subsp. cespitosa	3%	1%	N	
Sparganium hyperboreum	15%	7%	N	OBL
Solidago uliginosa	3%	1%	N	OBL
Eurybia radula	3%	1%	N	OBL
Agrostis mertensii	15%	7%	N	
Juncus stygius var. americanus	3%	1%	N	OBL
Menyanthes trifoliata	35%	17%	O	OBL
Carex limosa	3%	1%	N	OBL
Potamogeton epihydrus	3%	1%	N	OBL
Muhlenbergia uniflora	0.5%	0%	N	OBL
Drosera anglica	0.5%	0%	N	OBL
Carex trisperma	0.5%	0%	N	OBL
Carex pauciflora	0.5%	0%	N	OBL
Lysimachia borealis	0.5%	0%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.1852, -77.6296, 94.5239	**Orientation :**	Nord

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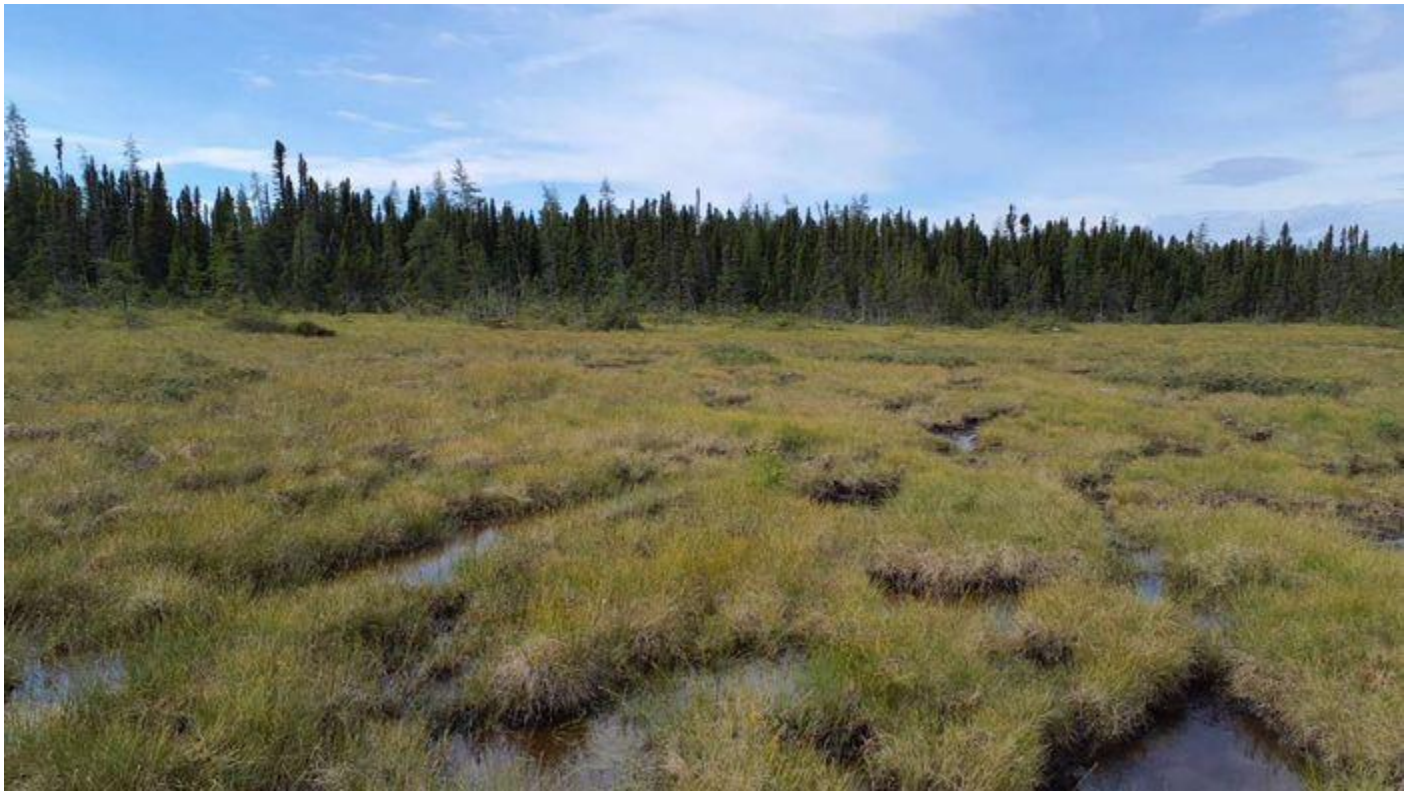

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Coordinates (lat., lon., alt.) :	55.1852, -77.6296, 94.5239	**Orientation :**	

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Coordinates (lat., lon., alt.) :	55.1852, -77.6296, 94.5239	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A2.1		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	53.8848	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4338		
	Alt :	129.3812		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☑ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	50	Silt	Brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	57%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	57%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
▼No-woody				
Sparganium angustifolium	15%	26%	O	OBL
Eleocharis acicularis	15%	26%	O	OBL
Sagittaria cuneata	3%	5%	N	OBL
Utricularia intermedia	15%	26%	O	OBL
Carex rostrata	3%	5%	N	OBL
Carex lasiocarpa subsp. americana	3%	5%	N	OBL
Isoetes echinospora	3%	5%	N	OBL
Equisetum fluviatile	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shallow waters
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shallow waters		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8848, -77.4338, 129.3812	**Orientation :**	Nord

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	53.8848, -77.4338, 129.3812	**Orientation :**	Est

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Coordinates (lat., lon., alt.) :	53.8848, -77.4338, 129.3812	**Orientation :**	Est

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Title :			
Coordinates (lat., lon., alt.) :	53.8848, -77.4338, 129.3812	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8848, -77.4338, 129.3812	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A2.2		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	53.8849	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4336		
	Alt :	131.6232		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	25	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	10
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	25	Accumulation of soil organic matter (SOM) (Ah)	Brown				
Inferior horizon no 1	5	Silt	Light brown				
Inferior horizon no 2	25	Clay	Grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	100%
No-woody (%) :	18%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	119%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Myrica gale	65%	65%	O	OBL
Chamaedaphne calyculata	35%	35%	O	OBL
Salix pedicellaris	0.5%	1%	N	OBL
▼No-woody				
Carex oligosperma	3%	17%	N	OBL
Carex aquatilis var. aquatilis	15%	83%	O	OBL
Comarum Palustrine	0.5%	3%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Riparian fen, fire from 1980		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8849, -77.4336, 131.6232	**Orientation :**	

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Title :			
Coordinates (lat., lon., alt.) :	53.8849, -77.4336, 131.6232	**Orientation :**	

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Title :			
Coordinates (lat., lon., alt.) :	53.8849, -77.4336, 131.6232	**Orientation :**	Est

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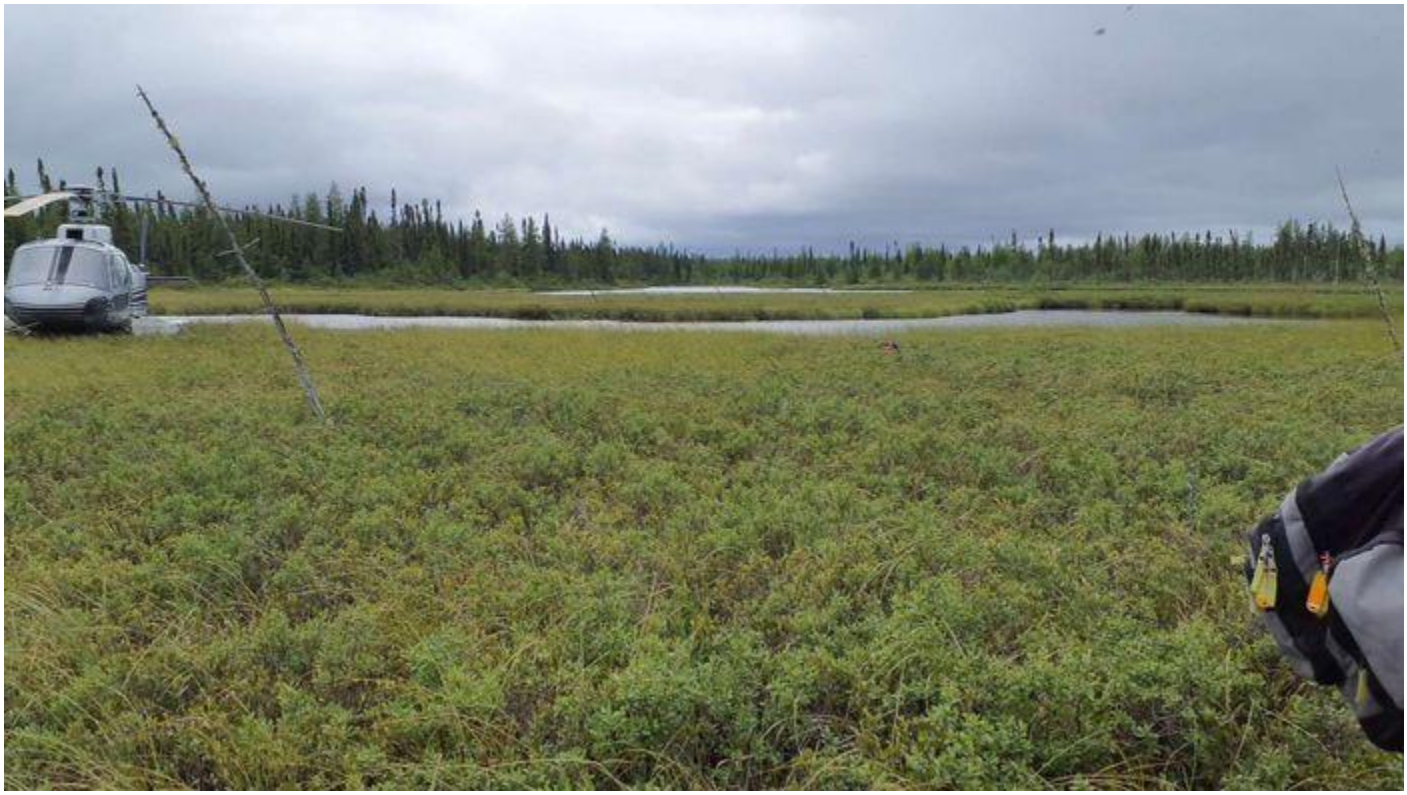
Title :			
Coordinates (lat., lon., alt.) :	53.8849, -77.4336, 131.6232	**Orientation :**	Ouest



Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A20.1		**Station number (office) :**	
Sample number :			**Date :**	August 9th 2022
GPS Points :	**Lat :**	55.2308	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5743		
	Alt :	101.3678		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	5 / 10		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	50	**Organic horizon – Type :**	Mesic
Observed rock :	Yes	**Rock – Depth :**	20
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	50	Other class	Organic matter - mesic				
Inferior horizon no 1	5	Sand	Dark grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	36%
No-woody (%) :	100%
Dominance test	
Number of dominant OBL or FACW species (A) :	6
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	115%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	0.5%	%	N	FACH
▼Shrub				
Picea mariana	3%	8%	O	FACH
Betula glandulosa	3%	8%	O	FACH
Vaccinium uliginosum	3%	8%	O	NI
Kalmia polifolia	3%	8%	O	OBL
Andromeda polifolia var. polifolia	3%	8%	O	
Empetrum nigrum subsp. nigrum	3%	8%	O	NI
Chamaedaphne calyculata	15%	42%	O	OBL
Vaccinium oxycoccos	0.5%	1%	N	OBL
Rhododendron groenlandicum	3%	8%	O	OBL
Myrica gale	0.5%	1%	N	OBL
Juniperus communis var. depressa	0.5%	1%	N	NI
▼No-woody				
Trichophorum cespitosum	85%	85%	O	OBL
Eurybia radula	3%	3%	N	OBL
Eriophorum angustifolium subsp. angustifolium	0.5%	1%	N	OBL
Drosera rotundifolia	0.5%	1%	N	OBL
Coptis trifolia	0.5%	1%	N	NI
Eriophorum vaginatum subsp. spissum	0.5%	1%	N	OBL
Carex aquatilis var. aquatilis	3%	3%	N	OBL
Carex rariflora	3%	3%	N	
Solidago uliginosa	0.5%	1%	N	OBL
Eriophorum russeolum subsp. russeolum	0.5%	1%	N	OBL*
Lycopodium annotinum	3%	3%	N	NI
Lysimachia borealis	0.5%	1%	N	NI
Rubus chamaemorus	0.5%	1%	N	FACH
Solidago macrophylla	0.5%	1%	N	NI
Carex stylosa	3%	3%	N	
Platanthera dilatata var. dilatata	0.5%	1%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spring fen		
Field notes :		

PHOTOGRAPHY

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Title :			
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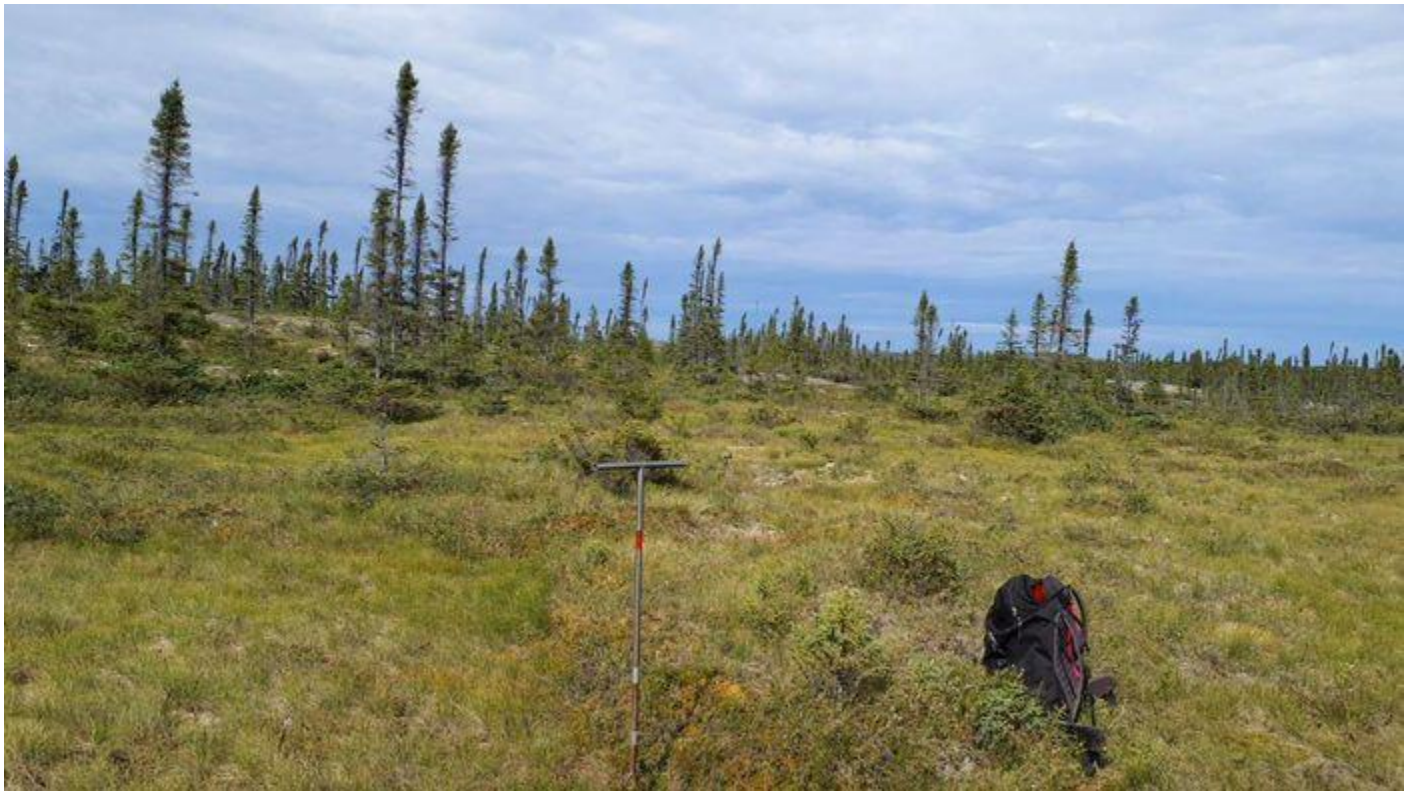

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Coordinates (lat., lon., alt.) :	55.2308, -77.5743, 101.3678	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A21.1		**Station number (office) :**	
Sample number :			**Date :**	August 9th 2022
GPS Points :	**Lat :**	55.2585	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5826		
	Alt :	110.9116		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	40 / 40		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	20
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	2	Other class	Plant litter				
Inferior horizon no 1	6	Silt	Dark brown				
Inferior horizon no 2	11	Sand	Beige				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	169%
No-woody (%) :	66%
Dominance test	
Number of dominant OBL or FACW species (A) :	6
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	71%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
▼Shrub				
Picea mariana	15%	8%	O	FACH
Salix planifolia	15%	8%	O	OBL*
Salix argyrocarpa	15%	8%	O	
Myrica gale	35%	19%	O	OBL
Dasiphora fruticosa	15%	8%	O	FACH
Lonicera villosa	15%	8%	O	NI
Rhododendron groenlandicum	3%	2%	N	OBL
Juniperus communis var. depressa	0.5%	0%	N	NI
Vaccinium uliginosum	3%	2%	N	NI
Andromeda polifolia var. polifolia	0.5%	0%	N	
Empetrum nigrum subsp. nigrum	15%	8%	O	NI
Linnaea borealis subsp. longiflora	0.5%	0%	N	NI
Betula glandulosa	35%	19%	O	FACH
Chamaedaphne calyculata	15%	8%	N	OBL
Vaccinium vitis-idaea	0.5%	0%	N	NI
▼No-woody				
Calamagrostis canadensis	3%	5%	N	FACH
Cornus canadensis	15%	23%	O	NI
Solidago macrophylla	3%	5%	N	NI
Lysimachia borealis	3%	5%	N	NI
Rubus arcticus subsp. acaulis	15%	23%	O	
Viola labradorica	15%	23%	O	
Coptis trifolia	3%	5%	N	NI
Carex saxatilis	3%	5%	N	FACH
Rubus chamaemorus	3%	5%	N	FACH
Carex aquatilis var. aquatilis	3%	5%	N	OBL
Eurybia radula	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp		
Field notes :		

PHOTOGRAPHY

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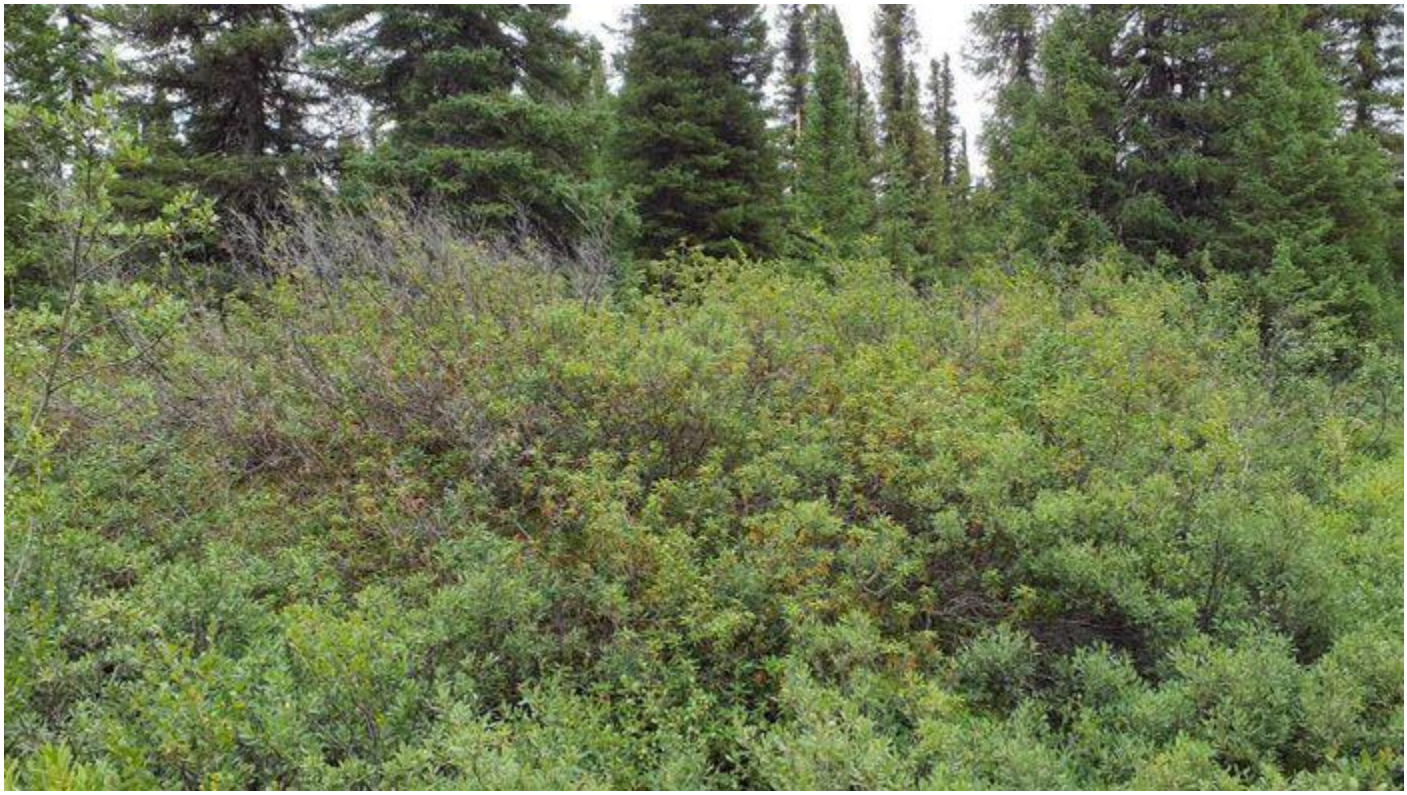

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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2585, -77.5826, 110.9116	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2585, -77.5826, 110.9116	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A22.1		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.2787	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5877		
	Alt :	7.4971		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	5
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	40	Loamy sand	Grey sand with iron oxydation (orange)		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	68%
No-woody (%) :	155%
Dominance test	
Number of dominant OBL or FACW species (A) :	6
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	118%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Salix planifolia	65%	96%	O	OBL*
Betula glandulosa	3%	4%	N	FACH
Salix argyrocarpa	0.5%	1%	N	
▼No-woody				
Calamagrostis canadensis	15%	10%	O	FACH
Carex aquatilis var. aquatilis	3%	2%	N	OBL
Comarum Palustrine	35%	23%	O	OBL
Rubus arcticus subsp. acaulis	15%	10%	O	
Agrostis mertensii	3%	2%	N	
Chamaenerion angustifolium subsp. angustifolium	15%	10%	O	NI
Symphyotrichum puniceum var. puniceum	3%	2%	N	FACH
Equisetum sylvaticum	15%	10%	O	FACH
Equisetum arvense	15%	10%	O	NI
Viola macloskeyi	15%	10%	O	OBL
Rubus chamaemorus	15%	10%	O	FACH
Galium triflorum	3%	2%	N	NI
Luzula parviflora subsp. melanocarpa	3%	2%	N	
Lysimachia borealis	0.5%	0%	N	NI
Epilobium ciliatum subsp. glandulosum	0.5%	0%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		

General remarks :
Shrub swamp.

Field notes :
Musk ox droppings

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2787, -77.5877, 7.4971	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2787, -77.5877, 7.4971	**Orientation :**	Est

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	55.2787, -77.5877, 7.4971	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2787, -77.5877, 7.4971	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2787, -77.5877, 7.4971	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2787, -77.5877, 7.4971	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A22.2		**Station number (office) :**	
Sample number :			**Date :**	1August 5th 2022
GPS Points :	**Lat :**	55.2799	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5879		
	Alt :	-0.468		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☑ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Autre - Naturelle
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Organic matter - fibric		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	121%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	115%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Picea mariana	0.5%	%	N	FACH
Salix pedicellaris	0.5%	%	N	OBL
▼No-woody				
Carex aquatilis var. aquatilis	65%	54%	O	OBL
Eriophorum russeolum subsp. russeolum	35%	29%	O	OBL*
Platanthera dilatata var. dilatata	3%	2%	N	FACH
Comarum Palustrine	15%	12%	N	OBL
Agrostis scabra	3%	2%	N	
Rubus arcticus subsp. acaulis	0.5%	0%	N	

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fen, old landslide		
Field notes :		
Musk ox droppings		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2799, -77.5879, -0.468	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2799, -77.5879, -0.468	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	55.2799, -77.5879, -0.468	**Orientation :**	Est

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Title :			
Coordinates (lat., lon., alt.) :	55.2799, -77.5879, -0.468	**Orientation :**	Ouest

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Coordinates (lat., lon., alt.) :	55.2799, -77.5879, -0.468	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2799, -77.5879, -0.468	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A22.3		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.2798	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5894		
	Alt :	12.9055		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	10	Sand	Dark grey, fine sand		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	50	Sand	Orange		Not applicable	Not applicable	Faible

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	38%
Shrub (%) :	65%
No-woody (%) :	3%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	1
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea glauca	3%	8%	N	NI
Picea mariana	35%	92%	O	FACH
▼Shrub				
Picea mariana	15%	23%	O	FACH
Betula glandulosa	35%	54%	O	FACH
Vaccinium vitis-idaea	15%	23%	O	NI
Juniperus communis var. depressa	0.5%	1%	N	NI
Vaccinium uliginosum	0.5%	1%	N	NI
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
Rhododendron groenlandicum	0.5%	1%	N	OBL
Vaccinium angustifolium	0.5%	1%	N	NI
▼No-woody				
Sibbaldia tridentata	0.5%	17%	N	
Diphasiastrum complanatum	3%	100%	N	NI
Avenella flexuosa	0.5%	17%	N	
Lycopodium annotinum	0.5%	17%	N	NI
Cornus canadensis	0.5%	17%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-lichen forest		
Field notes :		
Musk ox droppings		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2798, -77.5894, 12.9055	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2798, -77.5894, 12.9055	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2798, -77.5894, 12.9055	**Orientation :**	Est

PHOTOGRAPHY

ID :			
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Coordinates (lat., lon., alt.) :	55.2798, -77.5894, 12.9055	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2798, -77.5894, 12.9055	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2798, -77.5894, 12.9055	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A22.4		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.279	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5943		
	Alt :	16.2779		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Humus Fibric		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	41%
No-woody (%) :	138%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	107%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Picea mariana	3%	7%	N	FACH
Chamaedaphne calyculata	3%	7%	N	OBL
Rhododendron groenlandicum	0.5%	1%	N	OBL
Betula glandulosa	0.5%	1%	N	FACH
Kalmia polifolia	0.5%	1%	N	OBL
Andromeda polifolia var. polifolia	35%	85%	O	
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
▼No-woody				
Trichophorum cespitosum	85%	62%	O	OBL
Carex rariflora	35%	25%	O	
Carex aquatilis var. aquatilis	15%	11%	N	OBL
Drosera rotundifolia	3%	2%	N	OBL
Carex stylosa	0.5%	0%	N	

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fen near a pond		
Field notes :		

PHOTOGRAPHY

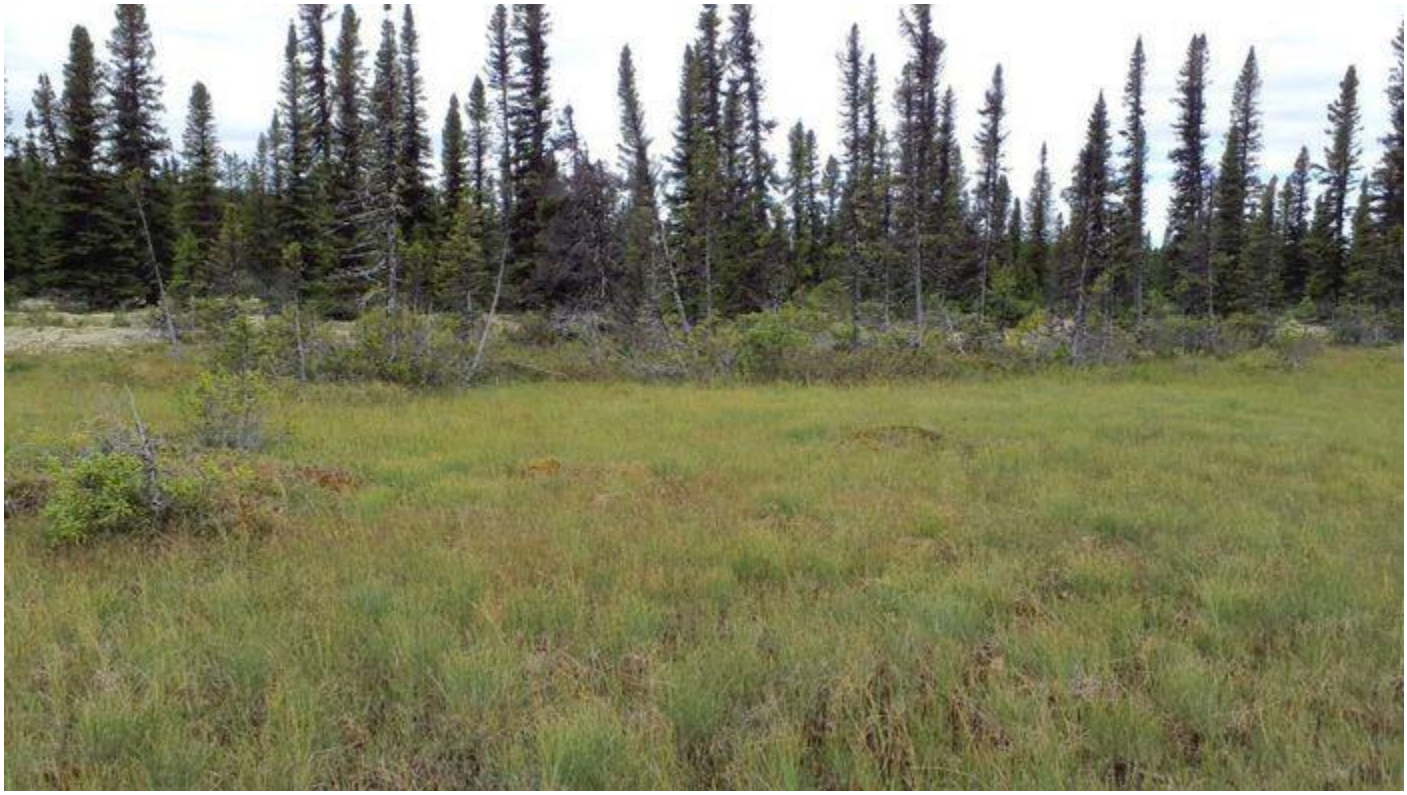
ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.279, -77.5943, 16.2779	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.279, -77.5943, 16.2779	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.279, -77.5943, 16.2779	**Orientation :**	Sud



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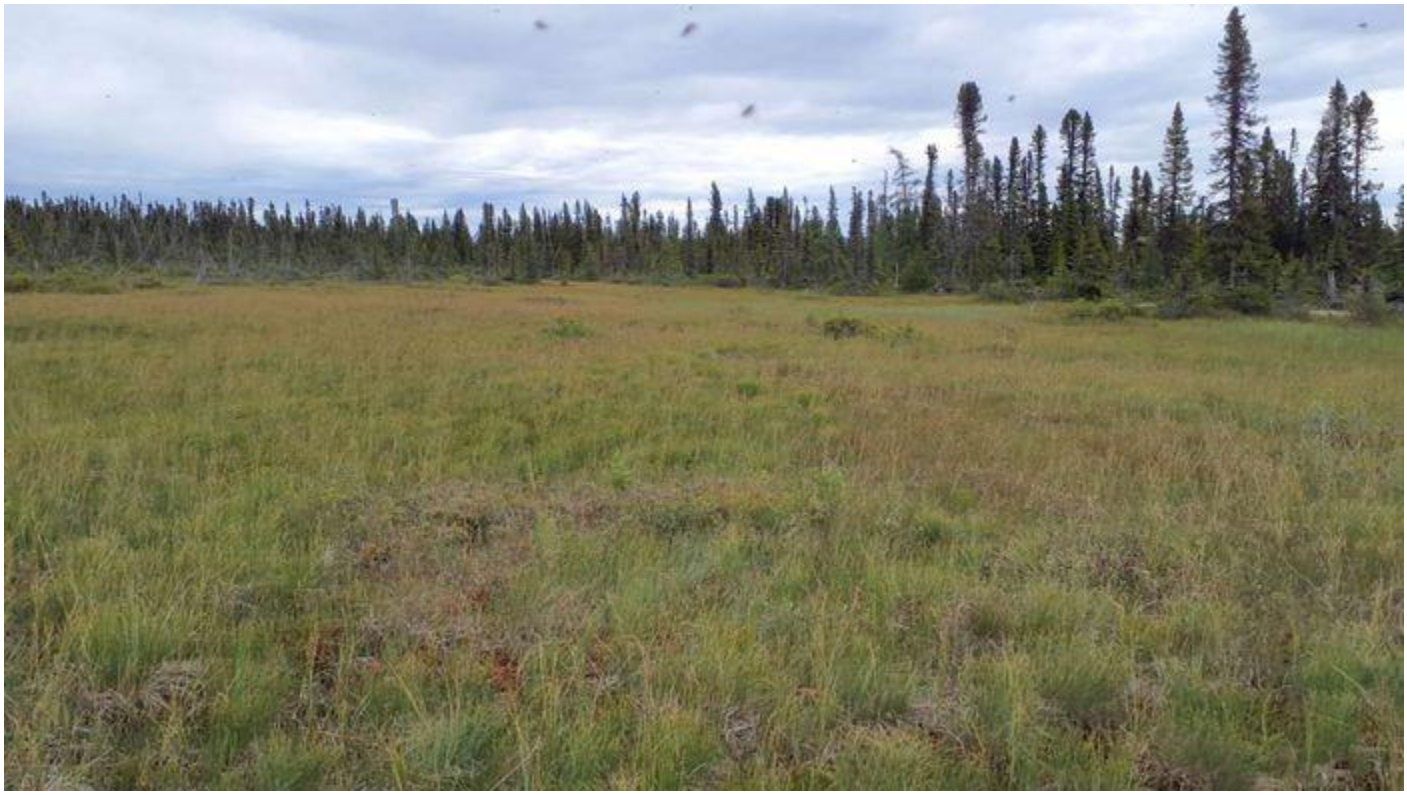
ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.279, -77.5943, 16.2779	**Orientation :**	Est



PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.279, -77.5943, 16.2779	**Orientation :**	Ouest

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A22.5		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.2765	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5902		
	Alt :	22.0011		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	10	Sand	Grey		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	25	Sand	Brown orange		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	3%
Shrub (%) :	21%
No-woody (%) :	21%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	1
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
Picea mariana	3%	100%	N	FACH
▼Shrub				
Betula glandulosa	15%	71%	O	FACH
Empetrum nigrum subsp. nigrum	3%	14%	N	NI
Vaccinium vitis-idaea	3%	14%	N	NI
Picea mariana	0.5%	2%	N	FACH
▼No-woody				
Sibbaldia tridentata	0.5%	2%	N	
Carex bigelowii subsp. bigelowii	3%	14%	N	FACH
Avenella flexuosa	3%	14%	N	
Diphasiastrum complanatum	15%	71%	O	NI
Armeria maritima subsp. sibirica	0.5%	2%	N	
Lysimachia borealis	0.5%	2%	N	NI
Carex arctogena	0.5%	2%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		

General remarks :

Spruce-lichen forest

Field notes :

Musk ox droppings

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2765, -77.5902, 22.0011	**Orientation :**	Nord

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	55.2765, -77.5902, 22.0011	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	55.2765, -77.5902, 22.0011	**Orientation :**	Est

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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.2765, -77.5902, 22.0011	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A23.1		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3146	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6299		
	Alt :	78.386		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	25 / 40		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Mesic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	120	Other class	Organic matter - mesic				
Inferior horizon no 1	5	Sand	Brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	110%
No-woody (%) :	175%
Dominance test	
Number of dominant OBL or FACW species (A) :	5
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	136%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
Larix laricina	0.5%	3%	N	FACH
▼Shrub				
Picea mariana	35%	32%	O	FACH
Vaccinium uliginosum	15%	14%	O	NI
Empetrum nigrum subsp. nigrum	15%	14%	O	NI
Myrica gale	15%	14%	O	OBL
Kalmia polifolia	3%	3%	N	OBL
Juniperus communis var. depressa	3%	3%	N	NI
Vaccinium oxycoccos	3%	3%	N	OBL
Betula glandulosa	3%	3%	N	FACH
Andromeda polifolia var. polifolia	15%	14%	O	
Linnaea borealis subsp. longiflora	3%	3%	N	NI
Lonicera villosa	0.5%	0%	N	NI
▼No-woody				
Trichophorum cespitosum	65%	37%	O	OBL
Carex aquatilis var. aquatilis	35%	20%	O	OBL
Rubus chamaemorus	15%	9%	N	FACH
Equisetum sylvaticum	3%	2%	N	FACH
Geocaulon lividum	15%	9%	N	NI
Eurybia radula	3%	2%	N	OBL
Solidago uliginosa	3%	2%	N	OBL
Lysimachia borealis	0.5%	0%	N	NI
Carex stylosa	3%	2%	N	
Coptis trifolia	3%	2%	N	NI
Drosera rotundifolia	3%	2%	N	OBL
Carex rariflora	15%	9%	N	
Avenella flexuosa	0.5%	0%	N	
Cornus canadensis	3%	2%	N	NI
Carex pauciflora	3%	2%	N	OBL
Juncus filiformis	3%	2%	N	FACH
Vahlodea atropurpurea	0.5%	0%	N	
Petasites frigidus var. palmatus	0.5%	0%	N	FACH
Carex vaginata	3%	2%	N	OBL
Calamagrostis canadensis	0.5%	0%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Forested peatland		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
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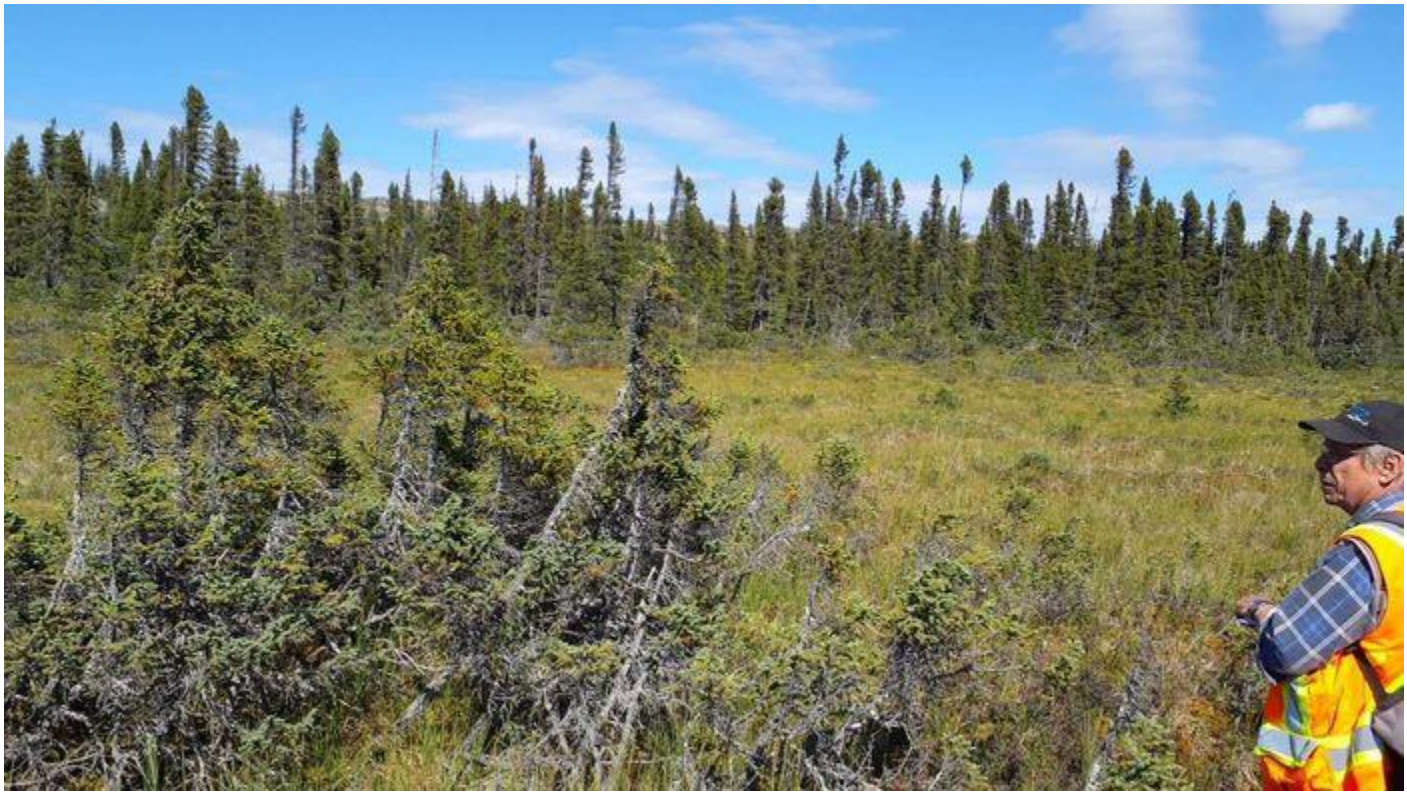

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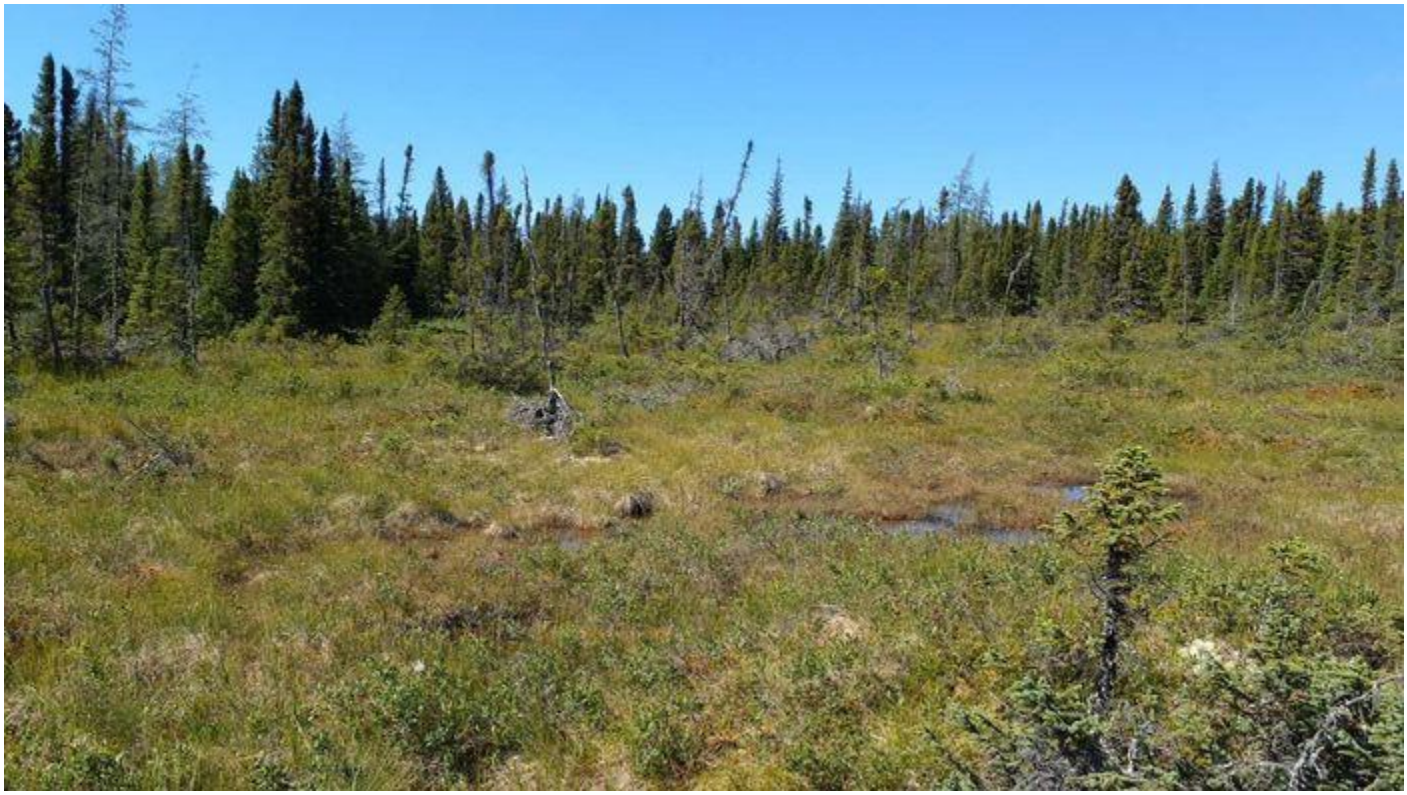
Title :			
Coordinates (lat., lon., alt.) :	55.3146, -77.6299, 78.386	**Orientation :**	Ouest



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ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3146, -77.6299, 78.386	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A23.2		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3155	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6303		
	Alt :	88.178		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	1	Other class	Plant litter				
Inferior horizon no 1	40	Sand	Grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	35%
Shrub (%) :	36%
No-woody (%) :	15%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	35%	100%	O	FACH
▼Shrub				
Betula glandulosa	15%	42%	O	FACH
Juniperus communis var. depressa	3%	8%	N	NI
Empetrum nigrum subsp. nigrum	15%	42%	O	NI
Vaccinium caespitosum	3%	8%	N	NI
Vaccinium vitis-idaea	0.5%	1%	N	NI
▼No-woody				
Geocaulon lividum	0.5%	3%	N	NI
Cornus canadensis	15%	100%	O	NI
Chamaenerion angustifolium subsp. angustifolium	0.5%	3%	N	NI
Lycopodium annotinum	0.5%	3%	N	NI
Avenella flexuosa	0.5%	3%	N	
Carex bigelowii subsp. bigelowii	0.5%	3%	N	FACH
Spinulum annotinum subsp. alpestre	0.5%	3%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-moss forest		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3155, -77.6303, 88.178	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
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Title :			
Coordinates (lat., lon., alt.) :	55.3155, -77.6303, 88.178	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A24.1		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3161	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7005		
	Alt :	15.4414		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	Not evaluated
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	1	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	15	Silt	Black	Orange	Moderately abundant (2 to 20%)	Average (5 to 15mm)	Distinct

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	6%
Shrub (%) :	113%
No-woody (%) :	42%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	72%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	3%	50%	N	FACH
Larix laricina	3%	50%	N	FACH
▼Shrub				
Alnus alnobetula subsp. crispa	15%	13%	N	NI
Dasiphora fruticosa	15%	13%	N	FACH
Myrica gale	65%	58%	O	OBL
Juniperus communis var. depressa	3%	3%	N	NI
Salix arctophila	3%	3%	N	
Linnaea borealis subsp. longiflora	3%	3%	N	NI
Picea mariana	0.5%	0%	N	FACH
Salix vestita	3%	3%	N	
Larix laricina	0.5%	0%	N	FACH
Betula glandulosa	3%	3%	N	FACH
Viburnum edule	0.5%	0%	N	FACH
Vaccinium uliginosum	3%	3%	N	NI
Rhododendron groenlandicum	0.5%	0%	N	OBL
▼No-woody				
Trichophorum cespitosum	3%	7%	N	OBL
Solidago uliginosa	3%	7%	N	OBL
Lycopodium annotinum	15%	36%	O	NI
Mitella nuda	3%	7%	N	FACH
Viola macloskeyi	0.5%	1%	N	OBL
Solidago macrophylla	15%	36%	O	NI
Calamagrostis canadensis	0.5%	1%	N	FACH
Elymus trachycaulus subsp. trachycaulus	0.5%	1%	N	
Carex bigelowii subsp. bigelowii	3%	7%	N	FACH
Avenella flexuosa	0.5%	1%	N	
Agrostis mertensii	0.5%	1%	N	
Cornus canadensis	0.5%	1%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp Riparian		
Field notes :		

PHOTOGRAPHY

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Coordinates (lat., lon., alt.) :	55.3161, -77.7005, 15.4414	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3161, -77.7005, 15.4414	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A24.2		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3159	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7007		
	Alt :	13.4155		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☑ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	5	Other class	Plant litter		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	60%
No-woody (%) :	6%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	4%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Empetrum nigrum subsp. nigrum	15%	25%	O	NI
Betula glandulosa	15%	25%	O	FACH
Vaccinium uliginosum	15%	25%	O	NI
Salix uva-ursi	0.5%	1%	N	
Rhododendron groenlandicum	0.5%	1%	N	OBL
Rhododendron tomentosum	15%	25%	O	
Kalmia procumbens	0.5%	1%	N	
Vaccinium vitis-idaea	0.5%	1%	N	NI
Arctous alpina	0.5%	1%	N	
▼No-woody				
Sibbaldia tridentata	0.5%	8%	N	
Carex bigelowii subsp. bigelowii	0.5%	8%	N	FACH
Carex saxatilis	0.5%	8%	N	FACH
Trichophorum cespitosum	3%	50%	N	OBL
Festuca brachyphylla subsp. brachyphylla	0.5%	8%	N	
Mononeuria groenlandica	0.5%	8%	N	
Calamagrostis canadensis	0.5%	8%	N	FACH
Rubus chamaemorus	3%	50%	N	FACH
Carex capillaris subsp. capillaris	0.5%	8%	N	FACH*
Eriophorum vaginatum subsp. spissum	0.5%	8%	N	OBL
Cornus canadensis	0.5%	8%	N	NI
Agrostis mertensii	0.5%	8%	N	
Carex arctogena	0.5%	8%	N	
Saxifraga tricuspidata	0.5%	8%	N	
Carex rariflora	0.5%	8%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	Rocky outcrop
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Rocky outcrop near pond		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3159, -77.7007, 13.4155	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3159, -77.7007, 13.4155	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3159, -77.7007, 13.4155	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3159, -77.7007, 13.4155	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3159, -77.7007, 13.4155	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A25.1		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3135	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7369		
	Alt :	-34.6551		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes		**% of depressions / % mounds :**	15 / 50	

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	Yes	**Rock – Depth :**	5
Significant stoniness :	Yes	**Stoniness – Depth :**	5
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	5	Other class	Decomposed black humus		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	65%
Shrub (%) :	139%
No-woody (%) :	21%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	7
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea glauca	65%	100%	O	NI
▼Shrub				
Betula glandulosa	15%	11%	O	FACH
Juniperus communis var. depressa	15%	11%	O	NI
Salix glauca var. cordifolia	3%	2%	N	
Alnus alnobetula subsp. crispa	35%	25%	O	NI
Empetrum nigrum subsp. nigrum	35%	25%	O	NI
Linnaea borealis subsp. longiflora	15%	11%	O	NI
Vaccinium uliginosum	15%	11%	O	NI
Vaccinium vitis-idaea	3%	2%	N	NI
Shepherdia canadensis	3%	2%	N	NI
Ribes triste	0.5%	0%	N	OBL
▼No-woody				
Platanthera obtusata subsp. obtusata	3%	14%	N	FACH
Pyrola grandiflora	3%	14%	N	
Solidago macrophylla	15%	71%	O	NI
Lysimachia borealis	0.5%	2%	N	NI
Campanula gieseckeana	0.5%	2%	N	
Viola renifolia	0.5%	2%	N	
Carex bigelowii subsp. bigelowii	0.5%	2%	N	FACH
Festuca rubra subsp. arctica	0.5%	2%	N	
Poa alpina subsp. alpina	0.5%	2%	N	
Moneses uniflora	0.5%	2%	N	NI

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
White spruce forest		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7369, -34.6551	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7369, -34.6551	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7369, -34.6551	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7369, -34.6551	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7369, -34.6551	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A25.2		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3135	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7375		
	Alt :	-40.2457		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Sentier de véhicules motorisés
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	Yes	**Rock – Depth :**	0
Significant stoniness :	Yes	**Stoniness – Depth :**	0
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	138%
No-woody (%) :	57%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Picea glauca	3%	2%	N	NI
Salix glauca var. cordifolia	85%	62%	O	
Shepherdia canadensis	35%	25%	O	NI
Empetrum nigrum subsp. nigrum	15%	11%	N	NI
Alnus alnobetula subsp. crispa	0.5%	0%	N	NI
▼No-woody				
Euphrasia hudsoniana	0.5%	1%	N	
Pyrola grandiflora	15%	26%	O	
Solidago multiradiata	15%	26%	O	
Solidago macrophylla	0.5%	1%	N	NI
Ligusticum scoticum subsp. scoticum	3%	5%	N	NI
Lathyrus japonicus	15%	26%	O	NI
Trisetum spicatum	0.5%	1%	N	
Achillea borealis var. borealis	3%	5%	N	
Campanula gieseckeana	3%	5%	N	
Potentilla litoralis	0.5%	1%	N	
Festuca rubra	3%	5%	N	
Poa alpina subsp. alpina	0.5%	1%	N	
Draba glabella	0.5%	1%	N	
Leymus mollis subsp. mollis	0.5%	1%	N	NI
Saxifraga paniculata subsp. laestadii	0.5%	1%	N	
Plantago maritima	0.5%	1%	N	FACH
Festuca brachyphylla subsp. brachyphylla	0.5%	1%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	Shrubland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrubland		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7375, -40.2457	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7375, -40.2457	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7375, -40.2457	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7375, -40.2457	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3135, -77.7375, -40.2457	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A25.3		**Station number (office) :**	
Sample number :			**Date :**	August 8th 2022
GPS Points :	**Lat :**	55.3134	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7377		
	Alt :	-45.9391		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☑ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Lake	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Sand	Beige		Not applicable	Not applicable	Faible

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	165%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
▼No-woody				
Leymus mollis subsp. mollis	65%	39%	O	NI
Honckenya peploides subsp. diffusa	35%	21%	O	
Lathyrus japonicus	35%	21%	O	NI
Stellaria longipes subsp. longipes	3%	2%	N	
Festuca rubra	15%	9%	N	
Rhinanthus minor subsp. groenlandicus	3%	2%	N	
Ligusticum scoticum subsp. scoticum	3%	2%	N	NI
Achillea borealis var. borealis	3%	2%	N	
Taraxacum ceratophorum	0.5%	0%	N	
Arctopoa eminens	3%	2%	N	
Potentilla anserina subsp. groenlandica	0.5%	0%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	Meadow/grassland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Coastal meadow		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3134, -77.7377, -45.9391	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3134, -77.7377, -45.9391	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3134, -77.7377, -45.9391	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3134, -77.7377, -45.9391	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3134, -77.7377, -45.9391	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**		
Station number (field) :	A25.4		**Station number (office) :**		
Sample number :			**Date :**	August 8th 2022	
GPS Points :	**Lat :**	55.3004	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye	
	Lon :	-77.7463			
	Alt :				
Status of the observation :	Observed - Validate				

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☑ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Lake	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	Yes	**Rock – Depth :**	0
Significant stoniness :	Yes	**Stoniness – Depth :**	0
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	1 - Rapid	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	3%
No-woody (%) :	6%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Salix glauca var. cordifolia	3%	100%	N	
Empetrum nigrum subsp. nigrum	0.5%	17%	N	NI
Alnus alnobetula subsp. crispa	0.5%	17%	N	NI
Picea glauca	0.5%	17%	N	NI
Salix arctophila	0.5%	17%	N	
▼No-woody				
Deschampsia cespitosa subsp. cespitosa	0.5%	8%	N	
Saxifraga cespitosa	0.5%	8%	N	
Plantago maritima	0.5%	8%	N	FACH
Stellaria longipes subsp. longipes	0.5%	8%	N	
Taraxacum ceratophorum	0.5%	8%	N	
Poa glauca subsp. glauca	0.5%	8%	N	
Arctanthemum arcticum subsp. polare	0.5%	8%	N	
Festuca rubra subsp. arctica	3%	50%	N	
Saxifraga tricuspidata	0.5%	8%	N	
Trisetum spicatum	0.5%	8%	N	
Agrostis mertensii	0.5%	8%	N	
Carex saxatilis	3%	50%	N	FACH
Euphrasia hudsoniana	0.5%	8%	N	
Lathyrus japonicus	0.5%	8%	N	NI
Sagina nodosa subsp. borealis	0.5%	8%	N	FACH
Castilleja raupii	0.5%	8%	N	
Viscaria alpina	0.5%	8%	N	
Festuca brachyphylla subsp. brachyphylla	0.5%	8%	N	
Campanula gieseckeana	0.5%	8%	N	
Solidago multiradiata	0.5%	8%	N	
Juncus alpinoarticulatus subsp. americanus	0.5%	8%	N	OBL
Arctopoa eminens	0.5%	8%	N	
Orthilia secunda	0.5%	8%	N	NI
Sibbaldia tridentata	0.5%	8%	N	
Carex norvegica	0.5%	8%	N	
Carex rariflora	0.5%	8%	N	
Achillea borealis var. borealis	0.5%	8%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	Tree swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Rocky outcrop		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.3004, -77.7463,	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**		
Station number (field) :	A3.1		**Station number (office) :**		
Sample number :			**Date :**	August 6th 2022	
GPS Points :	**Lat :**	53.93	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye	
	Lon :	-77.3981			
	Alt :	141.7458			
Status of the observation :	Observed - Validate				

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	2	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	40	Sand	Brown		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	10	Other class	Clay till. Light grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	35%
Shrub (%) :	113%
No-woody (%) :	51%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	4
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Pinus banksiana	35%	100%	O	NI
▼Shrub				
Salix humilis var. humilis	15%	13%	N	NI*
Salix bebbiana	3%	3%	N	FACH
Vaccinium angustifolium	65%	58%	O	NI
Betula glandulosa	3%	3%	N	FACH
Larix laricina	0.5%	0%	N	FACH
Picea mariana	3%	3%	N	FACH
Alnus alnobetula subsp. crispa	3%	3%	N	NI
Rhododendron groenlandicum	15%	13%	N	OBL
Epigaea repens	3%	3%	N	NI
Vaccinium uliginosum	3%	3%	N	NI
Linnaea borealis	0.5%	0%	N	NI
Pinus banksiana	0.5%	0%	N	NI
Kalmia angustifolia var. angustifolia	0.5%	0%	N	NI
▼No-woody				
Cornus canadensis	15%	29%	O	NI
Petasites frigidus var. palmatus	3%	6%	N	FACH
Maianthemum canadense subsp. canadense	15%	29%	O	NI
Chamaenerion angustifolium subsp. angustifolium	3%	6%	N	NI
Schizachne purpurascens	3%	6%	N	
Piptatheropsis canadensis	3%	6%	N	
Diphasiastrum sitchense	3%	6%	N	
Calamagrostis canadensis	0.5%	1%	N	FACH
Solidago hispida	3%	6%	N	NI
Piptatheropsis pungens	3%	6%	N	
Avenella flexuosa	0.5%	1%	N	
Sibbaldia tridentata	0.5%	1%	N	

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce forest, fire from 1989		
Field notes :		
Wasp nest, bear and caribou droppings		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.93, -77.3981, 141.7458	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A5.1		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.0653	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4106		
	Alt :	143.9456		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	25 / 15		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	1	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	Yes
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Humus mesique		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	39%
No-woody (%) :	157%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	194%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Chamaedaphne calyculata	15%	38%	O	OBL
Andromeda polifolia var. latifolia	15%	38%	O	OBL
Kalmia polifolia	3%	8%	N	OBL
Vaccinium oxycoccos	3%	8%	N	OBL
Picea mariana	0.5%	1%	N	FACH
Rhododendron groenlandicum	0.5%	1%	N	OBL
Larix laricina	3%	8%	N	FACH
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
▼No-woody				
Rhynchospora alba	35%	22%	O	OBL
Juncus stygius subsp. americanus	3%	2%	N	OBL
Trichophorum cespitosum	65%	41%	O	OBL
Carex limosa	3%	2%	N	OBL
Carex exilis	15%	10%	N	OBL
Carex oligosperma	15%	10%	N	OBL
Sarracenia purpurea subsp. purpurea	3%	2%	N	OBL
Menyanthes trifoliata	3%	2%	N	OBL
Drosera rotundifolia	15%	10%	N	OBL
Carex pauciflora	0.5%	0%	N	OBL
Rubus chamaemorus	0.5%	0%	N	FACH
Maianthemum trifolium	0.5%	0%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0653, -77.4106, 143.9456	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0653, -77.4106, 143.9456	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0653, -77.4106, 143.9456	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0653, -77.4106, 143.9456	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0653, -77.4106, 143.9456	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A6.1		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.1568	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3733		
	Alt :	123.9359		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	25	Silt	Dark brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	0%
No-woody (%) :	59%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	61%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
▼No-woody				
Nuphar variegata	35%	59%	O	OBL
Sparganium fluctuans	15%	25%	O	OBL
Sparganium angustifolium	3%	5%	N	OBL
Carex rostrata	3%	5%	N	OBL
Carex aquatilis var. aquatilis	3%	5%	N	OBL
Utricularia intermedia	0.5%	1%	N	OBL
Potamogeton epihydrus	0.5%	1%	N	OBL
Hippuris vulgaris	0.5%	1%	N	OBL
Utricularia vulgaris subsp. macrorhiza	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shallow waters
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shallow waters		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3733, 123.9359	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3733, 123.9359	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3733, 123.9359	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3733, 123.9359	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3733, 123.9359	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A6.2		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.1568	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3735		
	Alt :	131.1957		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	50 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	80	**Organic horizon – Type :**	Mesic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	80	Other class	Organic matter - mesic				
Inferior horizon no 1	20	Silt	Dark brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	56%
No-woody (%) :	35%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	92%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Picea mariana	0.5%	1%	N	FACH
Chamaedaphne calyculata	35%	63%	O	OBL
Myrica gale	15%	27%	O	OBL
Kalmia polifolia	3%	5%	N	OBL
Vaccinium oxycoccos	3%	5%	N	OBL
Alnus incana subsp. rugosa	0.5%	1%	N	FACH
Salix pedicellaris	0.5%	1%	N	OBL
▼No-woody				
Drosera rotundifolia	0.5%	1%	N	OBL
Carex oligosperma	35%	100%	O	OBL
Carex aquatilis var. aquatilis	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3735, 131.1957	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3735, 131.1957	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3735, 131.1957	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3735, 131.1957	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3735, 131.1957	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.1568, -77.3735, 131.1957	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A9.1		**Station number (office) :**	
Sample number :			**Date :**	4 août 2022
GPS Points :	**Lat :**	54.5204	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5134		
	Alt :	83.4227		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	10 / 30		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	25	**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	25	Other class	Brown, humus Humic		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	50	Sand	Brown Dark grey		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	50%
Shrub (%) :	110%
No-woody (%) :	48%
Dominance test	
Number of dominant OBL or FACW species (A) :	6
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	63%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Larix laricina	35%	70%	O	FACH
Picea mariana	15%	30%	O	FACH
▼Shrub				
Alnus incana subsp. rugosa	65%	59%	O	FACH
Rhododendron groenlandicum	15%	14%	N	OBL
Myrica gale	15%	14%	N	OBL
Salix planifolia	15%	14%	N	OBL*
Betula glandulosa	0.5%	0%	N	FACH
▼No-woody				
Calamagrostis canadensis	15%	31%	O	FACH
Carex canescens	3%	6%	N	OBL
Equisetum sylvaticum	15%	31%	O	FACH
Carex aquatilis var. aquatilis	15%	31%	O	OBL
Maianthemum trifolium	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Tree swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Tree swamp		
Field notes :		

PHOTOGRAPHY

ID :			
Title :	Sand		
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	Sud

PHOTOGRAPHY

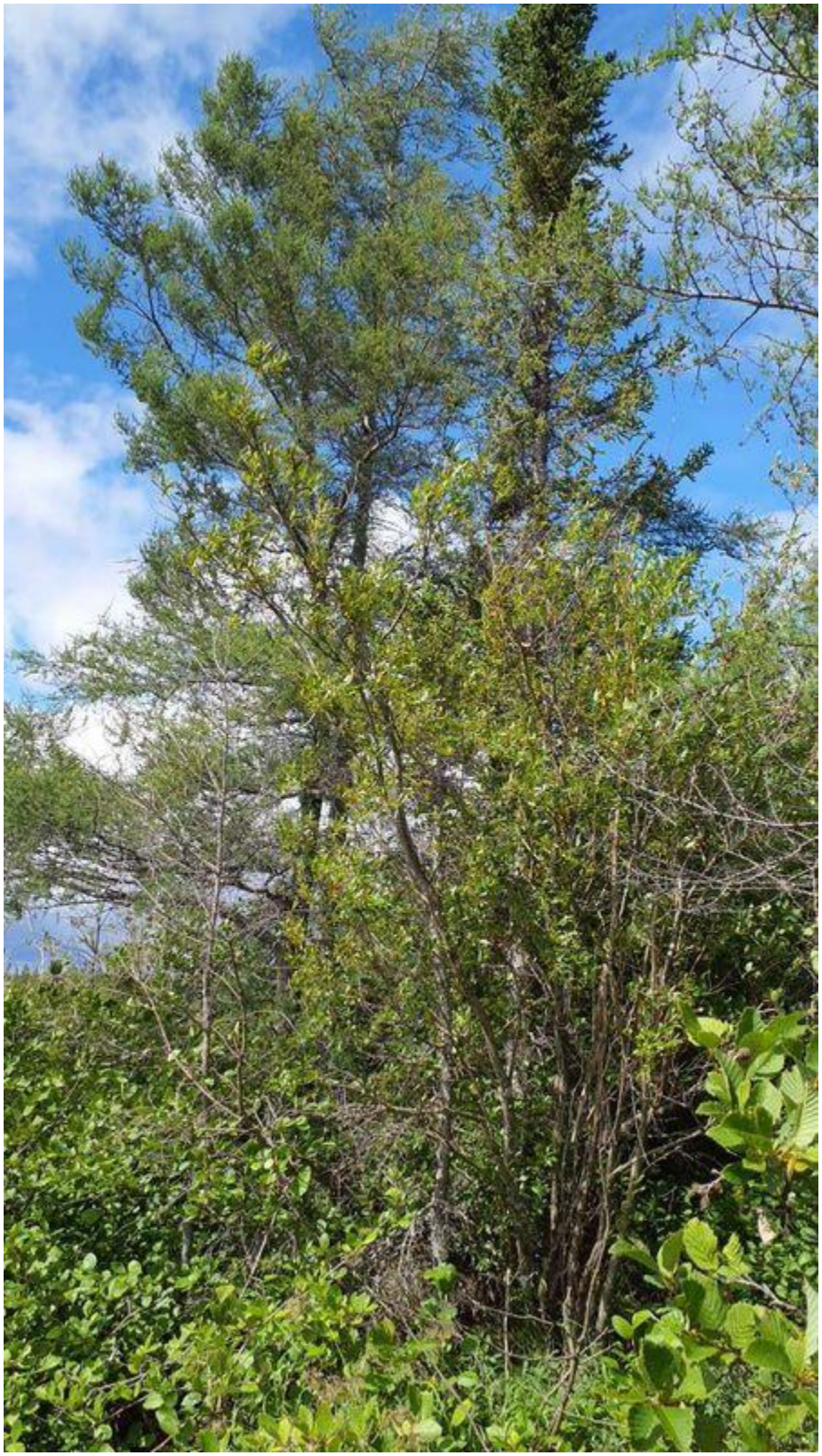
ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	



PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5204, -77.5134, 83.4227	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A9.2		**Station number (office) :**	
Sample number :			**Date :**	4 août 2022
GPS Points :	**Lat :**	54.5207	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5131		
	Alt :	89.297		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	5 / 40		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	3	**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	10	Sand	Grey		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	20	Sand	Light brown		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	50	Sand	Dark brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	50%
Shrub (%) :	179%
No-woody (%) :	0%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	1
Total absolute cover of OBL species (%) :	85%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	35%	70%	O	FACH
Larix laricina	15%	30%	O	FACH
▼Shrub				
Picea mariana	3%	2%	N	FACH
Larix laricina	3%	2%	N	FACH
Rhododendron groenlandicum	85%	47%	O	OBL
Vaccinium angustifolium	85%	47%	O	NI
Vaccinium vitis-idaea	3%	2%	N	NI
▼No-woody				
Avenella flexuosa	0.5%	%	N	
Carex deflexa var. deflexa	0.5%	%	N	
Equisetum sylvaticum	0.5%	%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :	Bruli sur Sand	
Initial state of the water environment :		
General remarks :		
Spruce forest, partial fire from 1985		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5207, -77.5131, 89.297	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A9.3		**Station number (office) :**	Pinède à pin griz
Sample number :			**Date :**	4 août 2022
GPS Points :	**Lat :**	54.5217	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5141		
	Alt :	87.0414		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	0	**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	4	Sand	Light grey		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	40	Sand	Orange		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	35%
Shrub (%) :	65%
No-woody (%) :	0%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Pinus banksiana	35%	100%	O	NI
▼Shrub				
Rhododendron groenlandicum	15%	23%	O	OBL
Vaccinium angustifolium	15%	23%	O	NI
Vaccinium vitis-idaea	35%	54%	O	NI
Picea mariana	0.5%	1%	N	FACH
Betula glandulosa	0.5%	1%	N	FACH
▼No-woody				
Chamaenerion angustifolium subsp. angustifolium	0.5%	%	N	NI
Piptatheropsis pungens	0.5%	%	N	
Sibbaldia tridentata	0.5%	%	N	
Diphasiastrum sitchense	0.5%	%	N	
Avenella flexuosa	0.5%	%	N	
Maianthemum canadense subsp. canadense	0.5%	%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
30 - 50 year		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	Sud

PHOTOGRAPHY

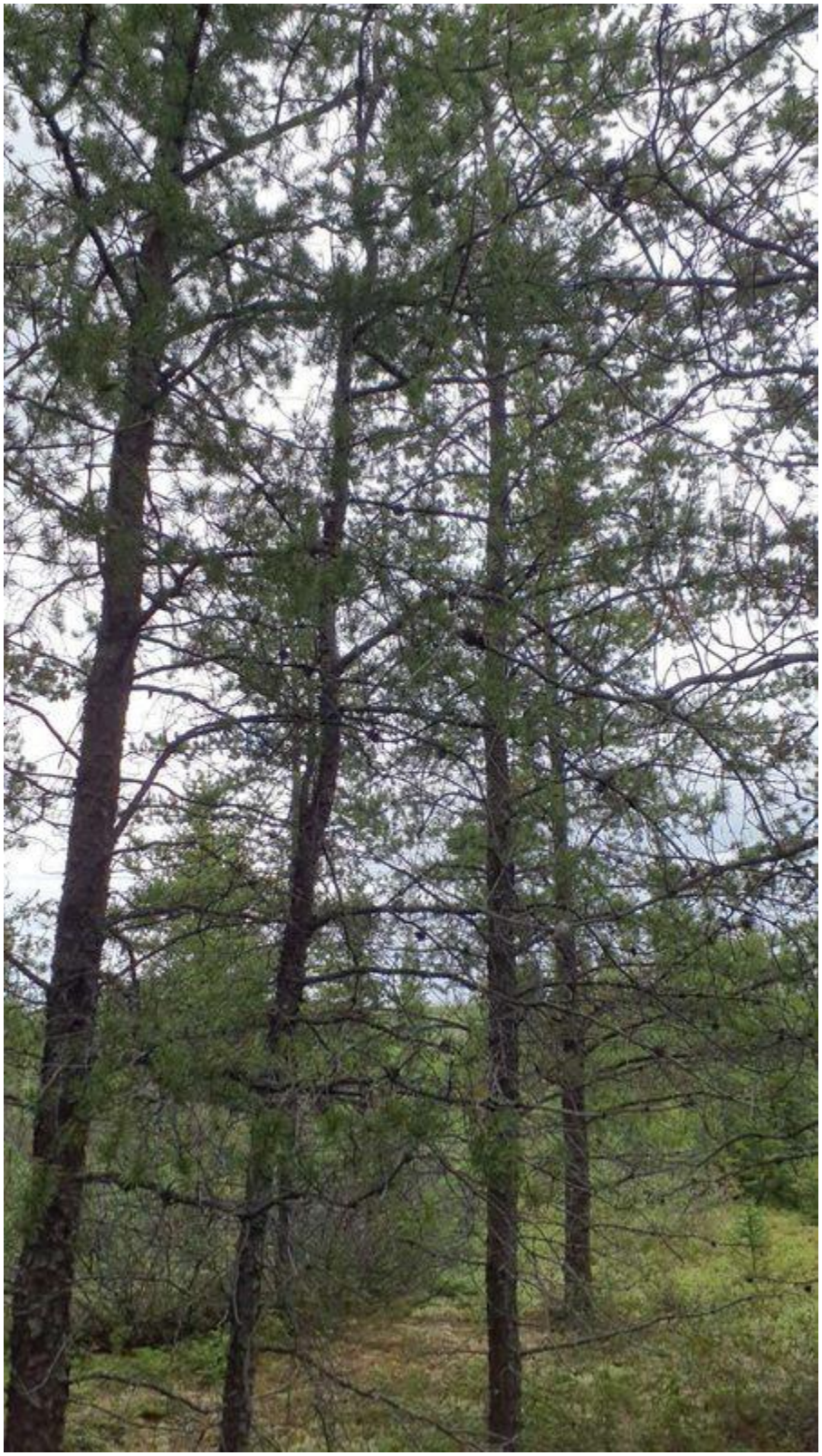
ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	



PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5217, -77.5141, 87.0414	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A9.4		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.5236	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.516		
	Alt :	84.2076		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☑ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	3	**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	Yes	**Stoniness – Depth :**	25
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	3	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	3	Sand	Light grey		Not applicable	Not applicable	Not applicable
Inferior horizon no 2	25	Sand	Brown Dark orange		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	66%
No-woody (%) :	0%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
▼Shrub				
Betula glandulosa	15%	23%	O	FACH
Rhododendron groenlandicum	15%	23%	O	OBL
Picea mariana	3%	5%	N	FACH
Salix bebbiana	0.5%	1%	N	FACH
Vaccinium vitis-idaea	15%	23%	O	NI
Vaccinium uliginosum	3%	5%	N	NI
Vaccinium angustifolium	15%	23%	O	NI
▼No-woody				
Cornus canadensis	0.5%	%	N	NI
Diphasiastrum sitchense	0.5%	%	N	
Avenella flexuosa	0.5%	%	N	
Piptatherum pungens	0.5%	%	N	

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Open spruce forest, fire from 1998		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5236, -77.516, 84.2076	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5236, -77.516, 84.2076	**Orientation :**	Nord

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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5236, -77.516, 84.2076	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.5236, -77.516, 84.2076	**Orientation :**	Est

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.5236, -77.516, 84.2076	**Orientation :**	Ouest

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Title :	Chabli		
Coordinates (lat., lon., alt.) :	54.5236, -77.516, 84.2076	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	A9.5		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.524	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.5157		
	Alt :	89.3634		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	60 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	70	**Organic horizon – Type :**	Humic
Observed rock :	Yes	**Rock – Depth :**	70
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	10
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	25	Other class	Humus Fibric		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	70	Accumulation of soil organic matter (SOM) (Ah)	Brown / black		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	35%
Shrub (%) :	148%
No-woody (%) :	38%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	104%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	35%	100%	O	FACH
Larix laricina	0.5%	1%	N	FACH
▼Shrub				
Picea mariana	15%	10%	N	FACH
Rhododendron groenlandicum	35%	24%	O	OBL
Chamaedaphne calyculata	65%	44%	O	OBL
Vaccinium uliginosum	15%	10%	N	NI
Empetrum nigrum subsp. nigrum	15%	10%	N	NI
Vaccinium oxycoccos	3%	2%	N	OBL
Kalmia polifolia	0.5%	0%	N	OBL
▼No-woody				
Rubus chamaemorus	35%	92%	O	FACH
Maianthemum trifolium	0.5%	1%	N	OBL
Carex trisperma	0.5%	1%	N	OBL
Equisetum sylvaticum	3%	8%	N	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Forested peatland		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.524, -77.5157, 89.3634	**Orientation :**	Nord

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Coordinates (lat., lon., alt.) :	54.524, -77.5157, 89.3634	**Orientation :**	Sud

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Coordinates (lat., lon., alt.) :	54.524, -77.5157, 89.3634	**Orientation :**	Est

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Coordinates (lat., lon., alt.) :	54.524, -77.5157, 89.3634	**Orientation :**	Ouest

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Coordinates (lat., lon., alt.) :	54.524, -77.5157, 89.3634	**Orientation :**	

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Title :			
Coordinates (lat., lon., alt.) :	54.524, -77.5157, 89.3634	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B1.1		**Station number (office) :**	
Sample number :			**Date :**	3 août 2022
GPS Points :	**Lat :**	53.816	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4373		
	Alt :	144.7744		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	50 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	60	**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	60
Drainage class :	4 - Imparfait	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	60		Light brown	Humus Fibric			
Inferior horizon no 1	100	Accumulation of soil organic matter (SOM) (Ah)	Dark brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	91%
No-woody (%) :	15%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	42%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
Larix laricina	0.5%	3%	N	FACH
▼Shrub				
Picea mariana	35%	38%	O	FACH
Rhododendron groenlandicum	35%	38%	O	OBL
Chamaedaphne calyculata	3%	3%	N	OBL
Empetrum nigrum subsp. nigrum	15%	16%	N	NI
Kalmia polifolia	3%	3%	N	OBL
Vaccinium oxycoccos	0.5%	1%	N	OBL
▼No-woody				
Rubus chamaemorus	15%	100%	O	FACH
Maianthemum trifolium	0.5%	3%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-moss forest, drainage is modified by the road		
Field notes :		

PHOTOGRAPHY

ID :			
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Coordinates (lat., lon., alt.) :	53.816, -77.4373, 144.7744	**Orientation :**	Est

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Title :			
Coordinates (lat., lon., alt.) :	53.816, -77.4373, 144.7744	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.816, -77.4373, 144.7744	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.816, -77.4373, 144.7744	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.816, -77.4373, 144.7744	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B1.2		**Station number (office) :**	
Sample number :			**Date :**	3 août 2022
GPS Points :	**Lat :**	53.8277	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4295		
	Alt :	125.8144		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	15
Drainage class :	5 - Poor	**Lateral drainage :**	Yes
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Light brown	Humic bien decomposé	Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	68%
No-woody (%) :	56%
Dominance test	
Number of dominant OBL or FACW species (A) :	5
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	108%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Larix laricina	0.5%	%	N	FACH
▼Shrub				
Chamaedaphne calyculata	35%	51%	O	OBL
Salix pedicellaris	15%	22%	O	OBL
Alnus incana subsp. rugosa	15%	22%	O	FACH
Larix laricina	3%	4%	N	FACH
▼No-woody				
Comarum Palustrine	15%	27%	O	OBL
Carex aquatilis var. aquatilis	35%	63%	O	OBL
Carex magellanica subsp. irrigua	3%	5%	N	OBL
Eriophorum russeolum subsp. russeolum	0.5%	1%	N	OBL*
Hippuris vulgaris	0.5%	1%	N	OBL
Sparganium hyperboreum	0.5%	1%	N	OBL
Carex canescens	3%	5%	N	OBL
Equisetum fluviatile	0.5%	1%	N	OBL
Maianthemum trifolium	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Riparian fen		
Field notes :		

PHOTOGRAPHY

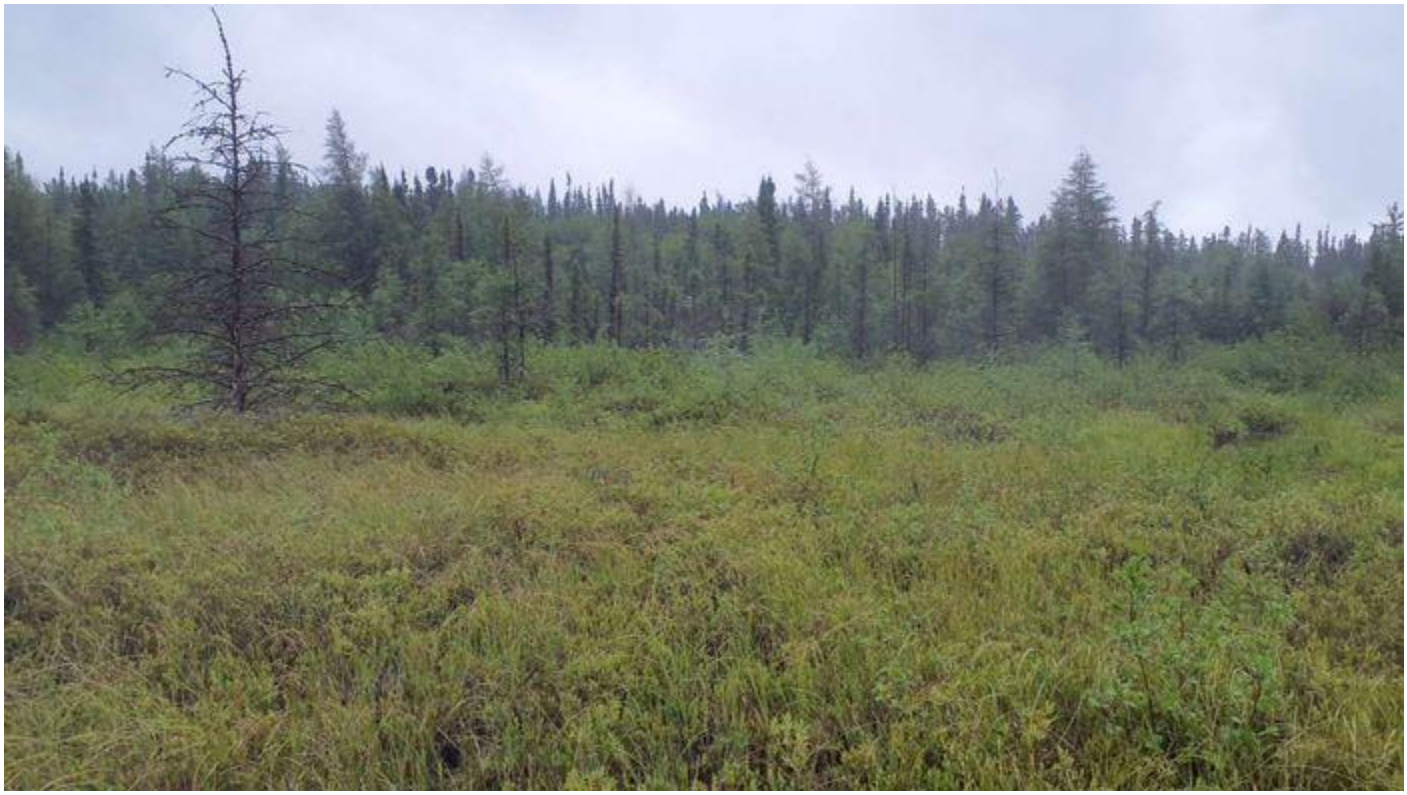
ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8277, -77.4295, 125.8144	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8277, -77.4295, 125.8144	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8277, -77.4295, 125.8144	**Orientation :**	Sud



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Coordinates (lat., lon., alt.) :	53.8277, -77.4295, 125.8144	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.8277, -77.4295, 125.8144	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B11.1		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.3427	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3496		
	Alt :	115.854		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	50 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	3	Other class	Mo				
Inferior horizon no 1	20	Silt	Dark brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	68%
No-woody (%) :	100%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	151%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Alnus incana subsp. rugosa	3%	4%	N	FACH
Myrica gale	35%	51%	O	OBL
Salix pedicellaris	15%	22%	O	OBL
Chamaedaphne calyculata	0.5%	1%	N	OBL
Salix argyrocarpa	15%	22%	O	
▼No-woody				
Carex aquatilis var. aquatilis	85%	85%	O	OBL
Comarum Palustrine	15%	15%	N	OBL
Equisetum fluviatile	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.3496, 115.854	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.3496, 115.854	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.3496, 115.854	**Orientation :**	Est

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Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.3496, 115.854	**Orientation :**	Ouest

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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.3496, 115.854	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B11.2		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.3427	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.351		
	Alt :	127.7025		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☑ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	10	**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	4 - Imparfait	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	10	Other class	Litter moss				
Inferior horizon no 1	5	Clay	Grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	70%
Shrub (%) :	42%
No-woody (%) :	21%
Dominance test	
Number of dominant OBL or FACW species (A) :	5
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	35%	50%	O	FACH
Larix laricina	35%	50%	O	FACH
▼Shrub				
Picea mariana	15%	36%	O	FACH
Rhododendron groenlandicum	15%	36%	O	OBL
Salix pyrifolia	3%	7%	N	FACH
Amelanchier bartramiana	0.5%	1%	N	
Betula glandulosa	0.5%	1%	N	FACH
Vaccinium angustifolium	3%	7%	N	NI
Vaccinium vitis-idaea	3%	7%	N	NI
Vaccinium caespitosum	0.5%	1%	N	NI
Vaccinium oxycoccos	0.5%	1%	N	OBL
Alnus alnobetula subsp. crispa	3%	7%	N	NI
▼No-woody				
Equisetum sylvaticum	15%	71%	O	FACH
Petasites frigidus var. palmatus	3%	14%	N	FACH
Cornus canadensis	3%	14%	N	NI
Chamaenerion angustifolium subsp. angustifolium	0.5%	2%	N	NI
Rubus chamaemorus	0.5%	2%	N	FACH
Lycopodium annotinum	0.5%	2%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-moss forest. Near an old beaver dam		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.351, 127.7025	**Orientation :**	Nord

PHOTOGRAPHY

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Coordinates (lat., lon., alt.) :	54.3427, -77.351, 127.7025	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.351, 127.7025	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.351, 127.7025	**Orientation :**	Ouest

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.351, 127.7025	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3427, -77.351, 127.7025	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B12.1		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.4211	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.395		
	Alt :	118.6885		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	50 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Mesic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Organic matter - mesic				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	86%
No-woody (%) :	35%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	83%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
▼Shrub				
Picea mariana	3%	3%	N	FACH
Rhododendron groenlandicum	65%	76%	O	OBL
Chamaedaphne calyculata	15%	17%	N	OBL
Kalmia polifolia	3%	3%	N	OBL
Vaccinium vitis-idaea	0.5%	1%	N	NI
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
Vaccinium oxycoccos	0.5%	1%	N	OBL
▼No-woody				
Rubus chamaemorus	35%	100%	O	FACH

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Forested bog		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.4211, -77.395, 118.6885	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.4211, -77.395, 118.6885	**Orientation :**	Sud

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.4211, -77.395, 118.6885	**Orientation :**	Est

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Coordinates (lat., lon., alt.) :	54.4211, -77.395, 118.6885	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.4211, -77.395, 118.6885	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.4211, -77.395, 118.6885	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B13.1		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.4652	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.412		
	Alt :	108.7452		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	30 / 30		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	42%
No-woody (%) :	241%
Dominance test	
Number of dominant OBL or FACW species (A) :	10
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	243%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Picea mariana	3%	7%	N	FACH
Larix laricina	3%	7%	N	FACH
Myrica gale	15%	36%	O	OBL
Dasiphora fruticosa	0.5%	1%	N	FACH
Andromeda polifolia var. polifolia	15%	36%	O	
Kalmia polifolia	3%	7%	N	OBL
Chamaedaphne calyculata	0.5%	1%	N	OBL
Lonicera villosa	0.5%	1%	N	NI
Vaccinium oxycoccos	3%	7%	N	OBL
Betula glandulosa	0.5%	1%	N	FACH
Empetrum nigrum subsp. nigrum	0.5%	1%	N	NI
▼No-woody				
Trichophorum cespitosum	65%	27%	O	OBL
Menyanthes trifoliata	35%	15%	O	OBL
Rhynchospora alba	15%	6%	O	OBL
Eurybia radula	3%	1%	N	OBL
Oclemena nemoralis	15%	6%	O	OBL
Agrostis scabra	3%	1%	N	
Piptatheropsis canadensis	3%	1%	N	
Equisetum fluviatile	3%	1%	N	OBL
Drosera rotundifolia	3%	1%	N	OBL
Drosera anglica	0.5%	0%	N	OBL
Utricularia cornuta	15%	6%	O	OBL
Utricularia vulgaris subsp. macrorhiza	3%	1%	N	OBL
Utricularia minor	0.5%	0%	N	OBL
Utricularia intermedia	15%	6%	O	OBL
Solidago uliginosa	3%	1%	N	OBL
Maianthemum trifolium	15%	6%	O	OBL
Agrostis mertensii	0.5%	0%	N	
Carex limosa	3%	1%	N	OBL
Carex exilis	3%	1%	N	OBL
Carex pauciflora	3%	1%	N	OBL
Rubus chamaemorus	15%	6%	O	FACH
Juncus stygius subsp. americanus	3%	1%	N	OBL
Carex rostrata	0.5%	0%	N	OBL
Sparganium hyperboreum	0.5%	0%	N	OBL

Epilobium Palustrine	0.5%	0%	N	OBL
Malaxis unifolia	0.5%	0%	N	
Ranunculus aquatilis var. diffusus	0.5%	0%	N	OBL
Scheuchzeria palustris	15%	6%	O	OBL
Muhlenbergia uniflora	0.5%	0%	N	OBL
Calamagrostis canadensis	0.5%	0%	N	FACH
Coptis trifolia	3%	1%	N	NI
Eriophorum vaginatum subsp. spissum	0.5%	0%	N	OBL
Eriophorum tenellum	0.5%	0%	N	OBL
Platanthera dilatata var. dilatata	0.5%	0%	N	FACH

SYNTHESIS

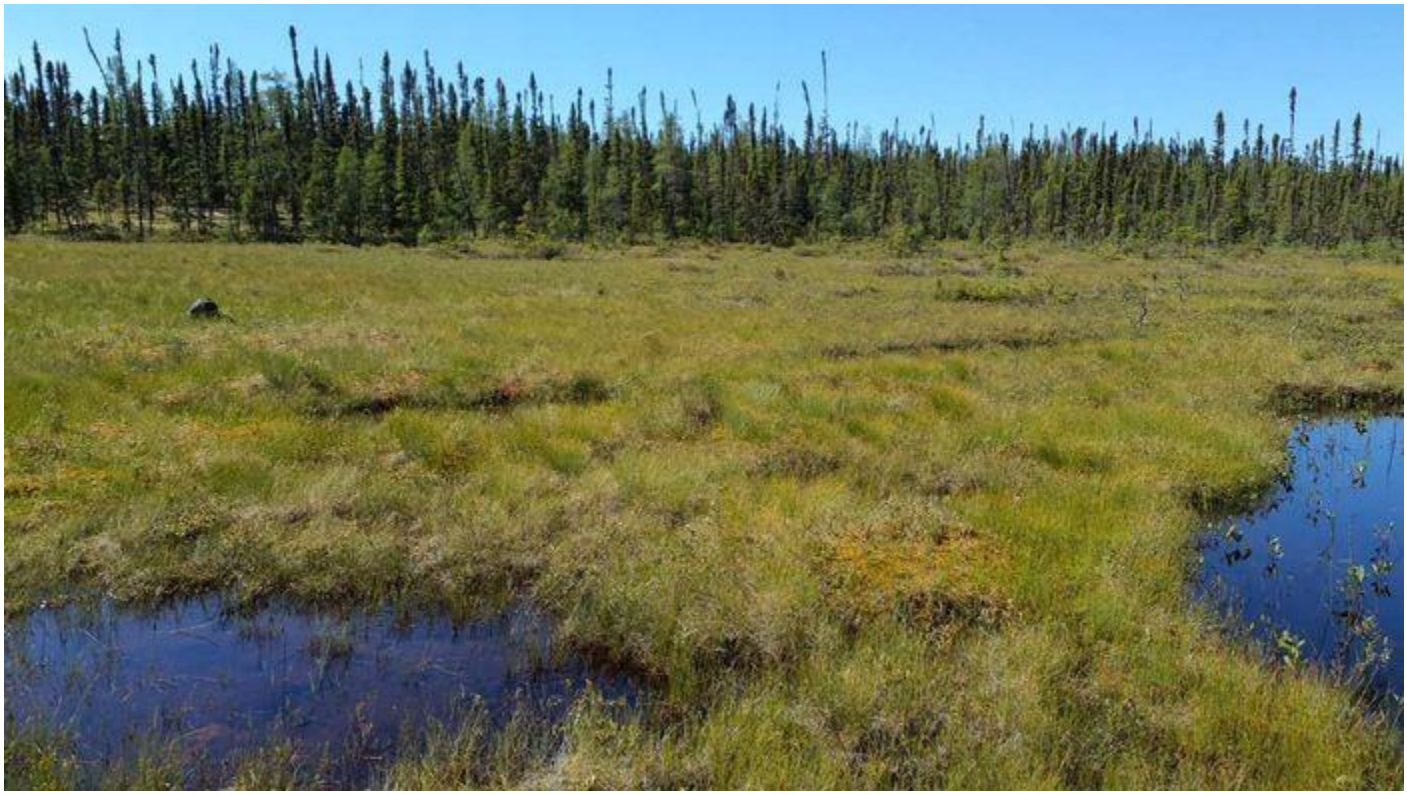
Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Ribbed fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.4652, -77.412, 108.7452	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.4652, -77.412, 108.7452	**Orientation :**	Sud



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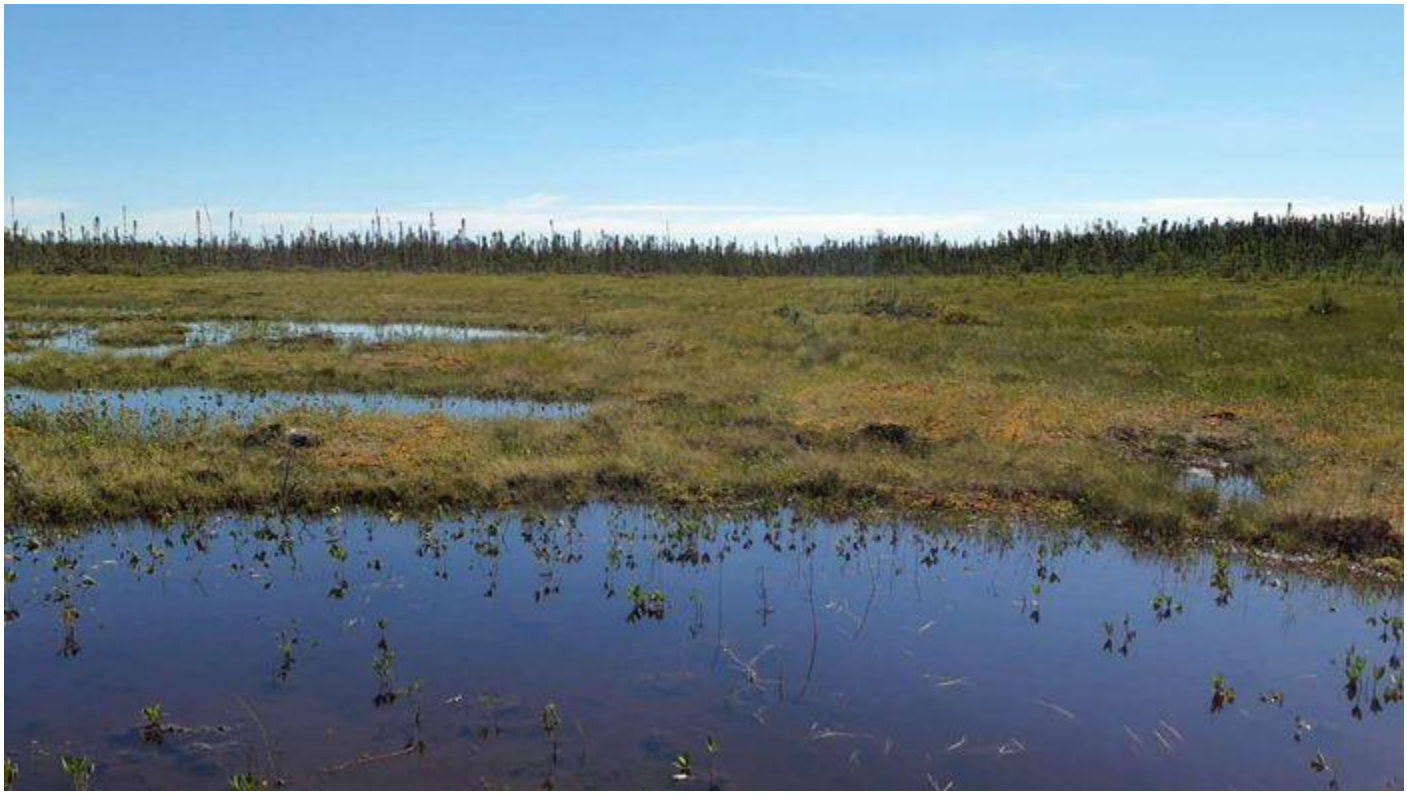

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Coordinates (lat., lon., alt.) :	54.4652, -77.412, 108.7452	**Orientation :**	Ouest

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.4652, -77.412, 108.7452	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B16.1		**Station number (office) :**	
Sample number :			**Date :**	August 12th 2022
GPS Points :	**Lat :**	54.5338	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4808		
	Alt :	110.7456		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	Yes	**Stoniness – Depth :**	10
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	2	Other class	Plant litter				
Inferior horizon no 1	10	Sand	Dark brown				
Inferior horizon no 2	7	Sand	Orange Brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	9%
Shrub (%) :	156%
No-woody (%) :	27%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	3%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Populus tremuloides	3%	33%	N	NI
Picea mariana	3%	33%	N	FACH
Larix laricina	3%	33%	N	FACH
▼Shrub				
Populus tremuloides	35%	22%	O	NI
Vaccinium angustifolium	65%	42%	O	NI
Prunus pensylvanica	15%	9%	N	NI
Rubus idaeus subsp. strigosus	0.5%	0%	N	NI
Picea mariana	15%	9%	N	FACH
Juniperus communis var. depressa	3%	2%	N	NI
Viburnum edule	0.5%	0%	N	FACH
Betula glandulosa	15%	9%	N	FACH
Salix pyrifolia	0.5%	0%	N	FACH
Salix ballii	3%	2%	N	
Ribes glandulosum	0.5%	0%	N	FACH
Salix bebbiana	3%	2%	N	FACH
Rhododendron groenlandicum	3%	2%	N	OBL
▼No-woody				
Petasites frigidus var. palmatus	0.5%	2%	N	FACH
Cornus canadensis	15%	56%	O	NI
Piptatheropsis pungens	3%	11%	N	
Chamaenerion angustifolium subsp. angustifolium	0.5%	2%	N	NI
Calamagrostis canadensis	0.5%	2%	N	FACH
Hieracium sp.	0.5%	2%	N	NI
Piptatheropsis canadensis	3%	11%	N	
Lysimachia borealis	0.5%	2%	N	NI
Agrostis mertensii	0.5%	2%	N	
Sibbaldia tridentata	3%	11%	N	
Diphasiastrum sitchense	3%	11%	N	
Capnoides sempervirens	0.5%	2%	N	
Potentilla norvegica	0.5%	2%	N	NI
Carex deflexa var. deflexa	0.5%	2%	N	
Poa glauca subsp. glauca	0.5%	2%	N	
Solidago hispida	0.5%	2%	N	NI
Equisetum sylvaticum	0.5%	2%	N	FACH
Geocaulon lividum	0.5%	2%	N	NI

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Regeneration after fire, medium slope		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.5338, -77.4808, 110.7456	**Orientation :**	Nord

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Title :			
Coordinates (lat., lon., alt.) :	54.5338, -77.4808, 110.7456	**Orientation :**	Sud

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Title :			
Coordinates (lat., lon., alt.) :	54.5338, -77.4808, 110.7456	**Orientation :**	Ouest

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Title :			
Coordinates (lat., lon., alt.) :	54.5338, -77.4808, 110.7456	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B22.1		**Station number (office) :**	
Sample number :			**Date :**	August 9th 2022
GPS Points :	**Lat :**	54.9326	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7053		
	Alt :	110.1054		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	2	Other class	Plant litter				
Inferior horizon no 1	40	Sandy loam	Brown				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	103%
No-woody (%) :	138%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	20%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Betula glandulosa	3%	3%	N	FACH
Salix argyrocarpa	85%	83%	O	
Lonicera villosa	15%	15%	N	NI
Ribes hirtellum	0.5%	0%	N	NI
Salix glauca var. cordifolia	0.5%	0%	N	
Salix ballii	0.5%	0%	N	
Myrica gale	0.5%	0%	N	OBL
▼No-woody				
Packera aurea	15%	11%	O	FACH
Petasites frigidus var. palmatus	15%	11%	O	FACH
Chamaenerion angustifolium subsp. angustifolium	15%	11%	O	NI
Avenella flexuosa	35%	25%	O	
Viola macloskeyi	15%	11%	O	OBL
Achillea borealis var. borealis	3%	2%	N	
Fragaria virginiana subsp. glauca	3%	2%	N	
Bromus ciliatus	3%	2%	N	FACH
Rubus arcticus subsp. acaulis	15%	11%	O	
Viola labradorica	0.5%	0%	N	
Schizachne purpurascens	3%	2%	N	
Caltha palustris	0.5%	0%	N	OBL
Carex disperma	3%	2%	N	OBL
Symphyotrichum puniceum var. puniceum	0.5%	0%	N	FACH
Calamagrostis canadensis	0.5%	0%	N	FACH
Coptis trifolia	3%	2%	N	NI
Comarum palustre	0.5%	0%	N	OBL
Galium trifidum subsp. trifidum	0.5%	0%	N	
Carex brunnescens subsp. brunnescens	0.5%	0%	N	FACH*
Bistorta vivipara	0.5%	0%	N	
Juncus filiformis	0.5%	0%	N	FACH
Agrostis mertensii	0.5%	0%	N	
Sibbaldia tridentata	0.5%	0%	N	
Vahlodea atropurpurea	0.5%	0%	N	
Solidago uliginosa	0.5%	0%	N	OBL
Carex aquatilis var. aquatilis	3%	2%	N	OBL
Elymus trachycaulus subsp. trachycaulus	0.5%	0%	N	

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp		
Field notes :		

PHOTOGRAPHY

ID :			
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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.9326, -77.7053, 110.1054	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B22.2		**Station number (office) :**	
Sample number :			**Date :**	August 9th 2022
GPS Points :	**Lat :**	54.9321	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.7039		
	Alt :	114.6509		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Fibric
Observed rock :	Yes	**Rock – Depth :**	20
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	
Drainage class :	5 - Poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼Description of the soil profile (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	10	Other class	Organic matter - fibric				
Inferior horizon no 1	10	Clay	Grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	80%
Shrub (%) :	30%
No-woody (%) :	36%
Dominance test	
Number of dominant OBL or FACW species (A) :	5
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	2%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	65%	81%	O	FACH
Larix laricina	15%	19%	N	FACH
▼Shrub				
Picea mariana	3%	10%	O	FACH
Betula glandulosa	15%	50%	O	FACH
Linnaea borealis subsp. longiflora	3%	10%	O	NI
Vaccinium caespitosum	3%	10%	O	NI
Salix planifolia	0.5%	2%	N	OBL*
Larix laricina	0.5%	2%	N	FACH
Rhododendron groenlandicum	0.5%	2%	N	OBL
Empetrum nigrum subsp. nigrum	3%	10%	O	NI
Juniperus communis var. depressa	0.5%	2%	N	NI
Gaultheria hispidula	0.5%	2%	N	NI
Vaccinium vitis-idaea	3%	10%	O	NI
Lonicera villosa	0.5%	2%	N	NI
▼No-woody				
Equisetum sylvaticum	15%	42%	O	FACH
Petasites frigidus var. palmatus	15%	42%	O	FACH
Rubus chamaemorus	3%	8%	N	FACH
Cornus canadensis	3%	8%	N	NI
Coptis trifolia	0.5%	1%	N	NI
Avenella flexuosa	0.5%	1%	N	
Vahlodea atropurpurea	0.5%	1%	N	
Achillea borealis var. borealis	0.5%	1%	N	
Carex vaginata	0.5%	1%	N	OBL
Chamaenerion angustifolium subsp. angustifolium	0.5%	1%	N	NI
Sibbaldia tridentata	0.5%	1%	N	
Solidago uliginosa	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Spruce-moss forest		
Field notes :		

PHOTOGRAPHY

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Title :			
Coordinates (lat., lon., alt.) :	54.9321, -77.7039, 114.6509	**Orientation :**	Nord

PHOTOGRAPHY

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ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.9321, -77.7039, 114.6509	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B23.1		**Station number (office) :**	
Sample number :			**Date :**	August 9th 2022
GPS Points :	**Lat :**	55.1342	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.6701		
	Alt :	114.9863		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	10 / 10		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	100	Other class	Organic matter - fibric				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	104%
No-woody (%) :	165%
Dominance test	
Number of dominant OBL or FACW species (A) :	6
Number of dominant NW species (B) :	1
Total absolute cover of OBL species (%) :	185%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

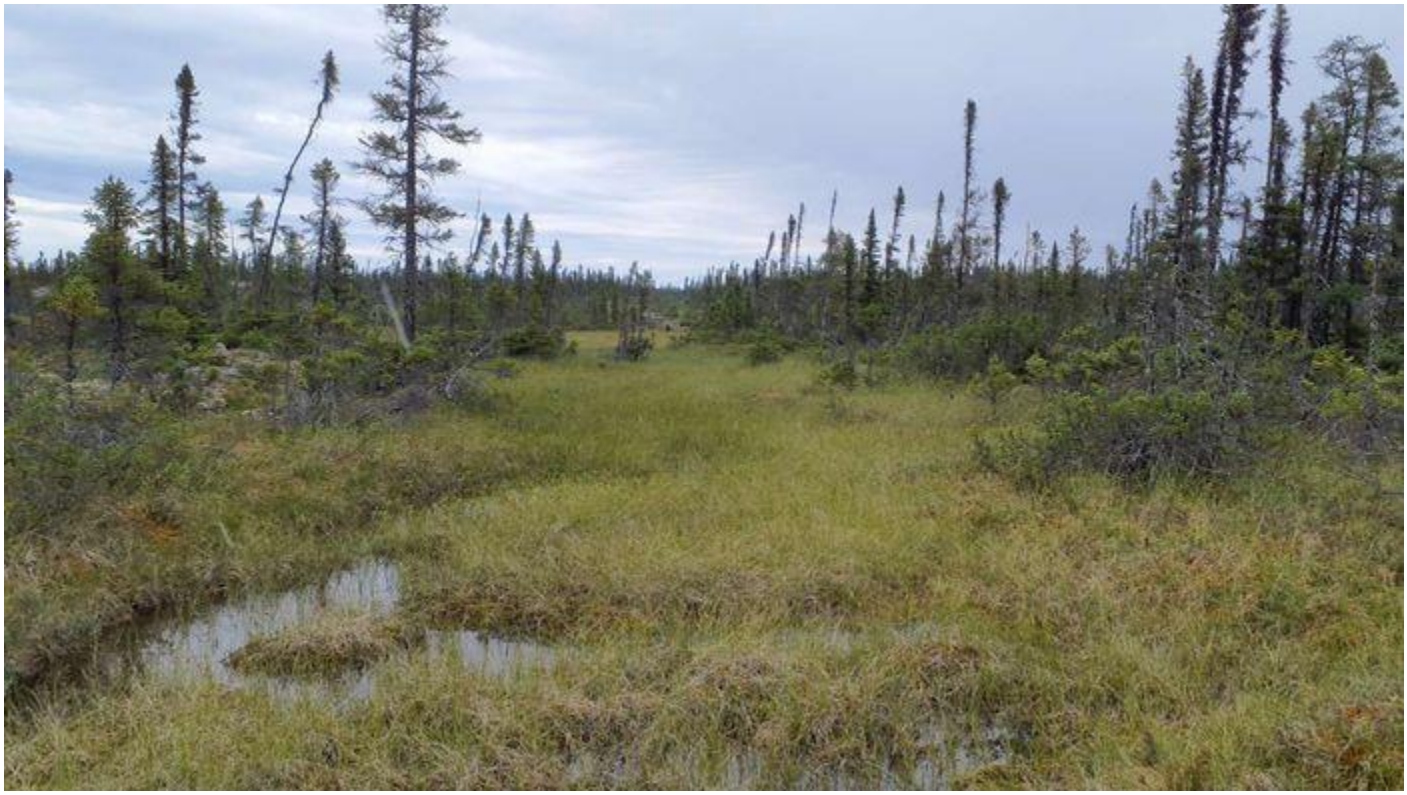
SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Picea mariana	15%	14%	O	FACH
Chamaedaphne calyculata	3%	3%	N	OBL
Myrica gale	35%	34%	O	OBL
Andromeda polifolia var. polifolia	15%	14%	O	
Kalmia polifolia	15%	14%	O	OBL
Betula glandulosa	0.5%	0%	N	FACH
Juniperus communis var. depressa	3%	3%	N	NI
Lonicera villosa	15%	14%	O	NI
Vaccinium oxycoccos	3%	3%	N	OBL
Larix laricina	0.5%	0%	N	FACH
▼No-woody				
Eurybia radula	15%	9%	N	OBL
Carex oligosperma	35%	21%	O	OBL
Carex rariflora	15%	9%	N	
Trichophorum cespitosum	35%	21%	O	OBL
Rubus chamaemorus	15%	9%	N	FACH
Menyanthes trifoliata	35%	21%	O	OBL
Lycopodium annotinum	0.5%	0%	N	NI
Solidago uliginosa	0.5%	0%	N	OBL
Drosera rotundifolia	3%	2%	N	OBL
Coptis trifolia	3%	2%	N	NI
Lysimachia borealis	3%	2%	N	NI
Oclemena nemoralis	0.5%	0%	N	OBL
Muhlenbergia uniflora	0.5%	0%	N	OBL
Agrostis mertensii	3%	2%	N	
Selaginella selaginoides	0.5%	0%	N	FACH
Carex pauciflora	0.5%	0%	N	OBL
Platanthera dilatata var. dilatata	0.5%	0%	N	FACH
Carex exilis	3%	2%	N	OBL
Trichophorum alpinum	0.5%	0%	N	OBL
Deschampsia cespitosa	0.5%	0%	N	FACH
Cornus canadensis	0.5%	0%	N	NI
Epilobium Palustrine	0.5%	0%	N	OBL
Carex aquatilis var. aquatilis	0.5%	0%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	55.1342, -77.6701, 114.9863	**Orientation :**	Nord



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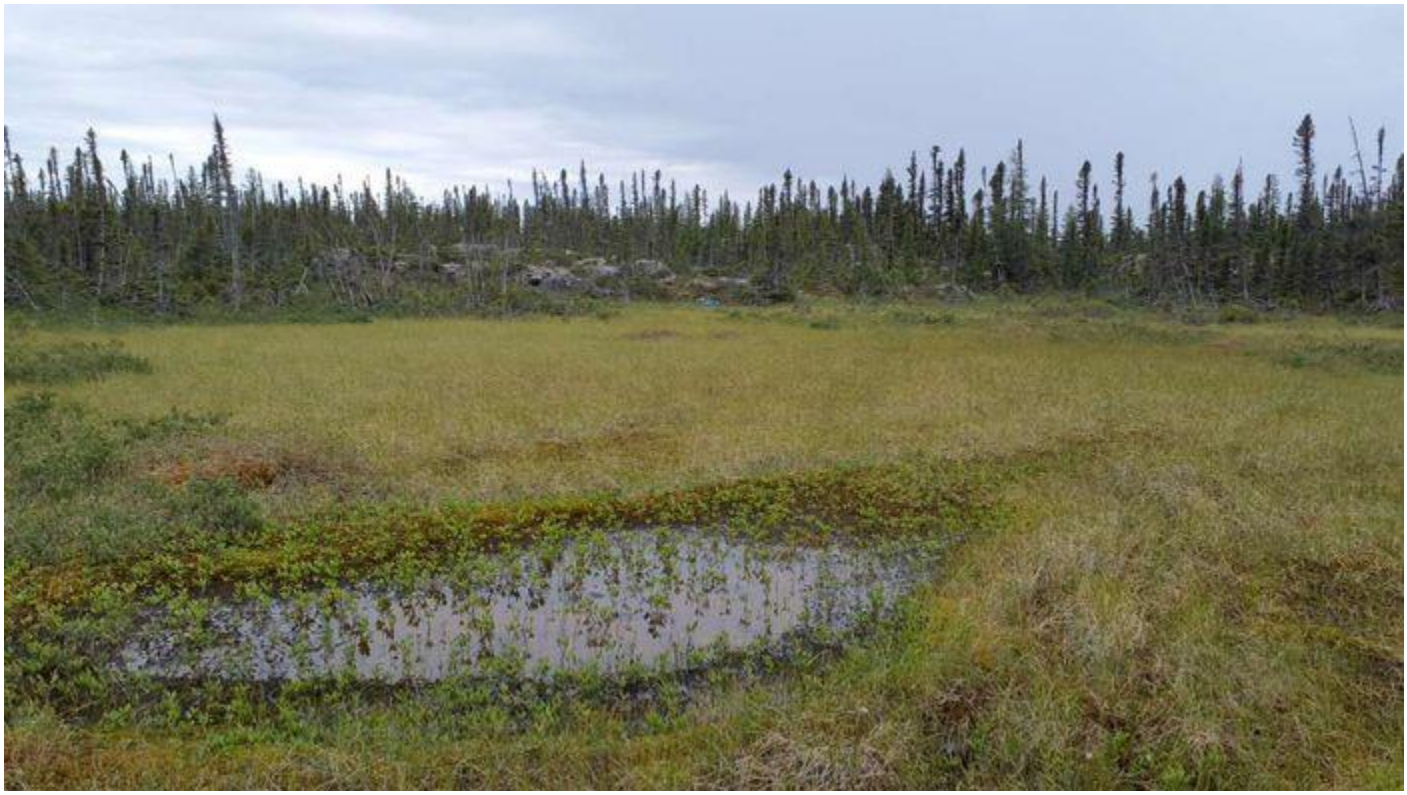

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Title :			
Coordinates (lat., lon., alt.) :	55.1342, -77.6701, 114.9863	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B4.1		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	53.9883	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4221		
	Alt :	154.7193		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	5 / 20		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Fibric
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	5
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	56%
No-woody (%) :	50%
Dominance test	
Number of dominant OBL or FACW species (A) :	4
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	107%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Larix laricina	0.5%	1%	N	FACH
Chamaedaphne calyculata	35%	63%	O	OBL
Myrica gale	15%	27%	O	OBL
Vaccinium oxycoccos	3%	5%	N	OBL
Kalmia polifolia	3%	5%	N	OBL
▼No-woody				
Carex oligosperma	35%	70%	O	OBL
Carex aquatilis var. aquatilis	15%	30%	O	OBL
Carex limosa	0.5%	1%	N	OBL
Maianthemum trifolium	0.5%	1%	N	OBL
Drosera rotundifolia	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Fen		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9883, -77.4221, 154.7193	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9883, -77.4221, 154.7193	**Orientation :**	

PHOTOGRAPHY

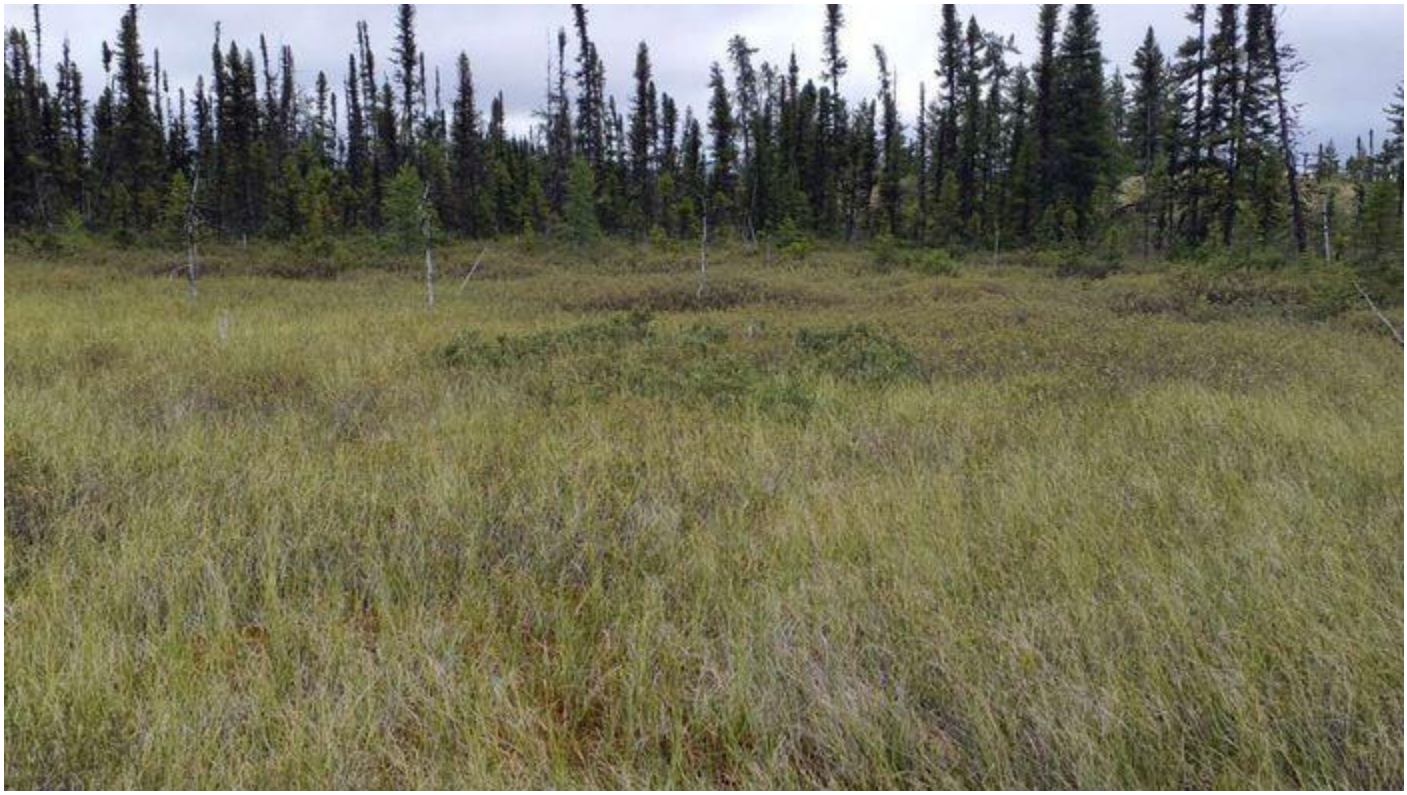
ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9883, -77.4221, 154.7193	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9883, -77.4221, 154.7193	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9883, -77.4221, 154.7193	**Orientation :**	Est



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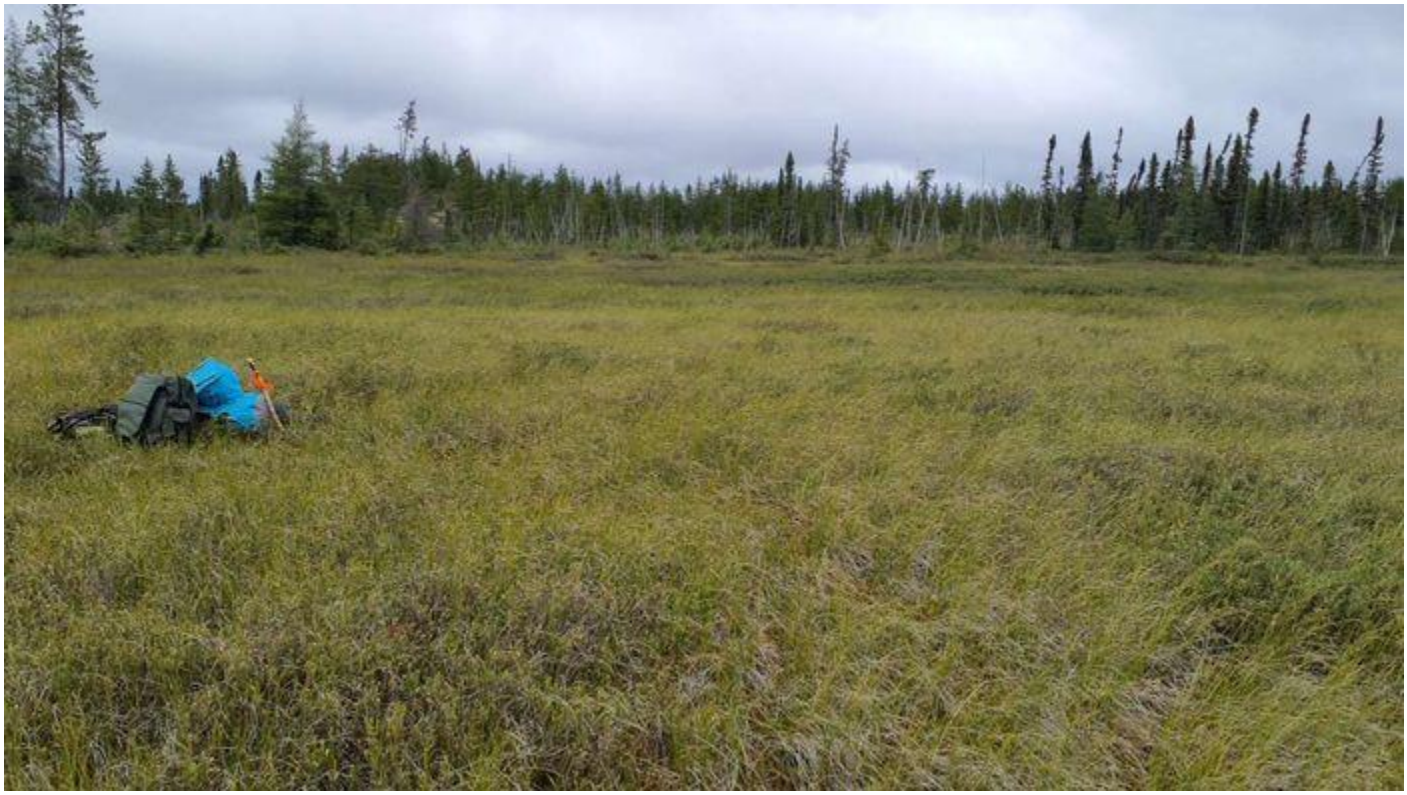
Title :			
Coordinates (lat., lon., alt.) :	53.9883, -77.4221, 154.7193	**Orientation :**	Ouest



Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B4.2		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	53.988	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4213		
	Alt :	161.7517		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Mesic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	50
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

▼Description of the soil profile (mineral horizons)

4B

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	89%
No-woody (%) :	35%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	84%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	15%	100%	O	FACH
Larix laricina	0.5%	3%	N	FACH
▼Shrub				
Picea mariana	3%	3%	N	FACH
Rhododendron groenlandicum	65%	73%	O	OBL
Chamaedaphne calyculata	15%	17%	N	OBL
Vaccinium oxycoccos	3%	3%	N	OBL
Kalmia polifolia	0.5%	1%	N	OBL
Vaccinium uliginosum	3%	3%	N	NI
▼No-woody				
Rubus chamaemorus	35%	100%	O	FACH
Maianthemum trifolium	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Forested bog		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	Sud

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Title :			
Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	Est

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Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	Ouest

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Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	

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Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.988, -77.4213, 161.7517	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B4.3		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	53.9879	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4219		
	Alt :	152.5021		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☑ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	Yes	**Rock – Depth :**	5
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	1	Other class	Plant litter				
Inferior horizon no 1	5	Sand	Grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	18%
Shrub (%) :	72%
No-woody (%) :	18%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	4
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Pinus banksiana	15%	83%	O	NI
Larix laricina	3%	17%	N	FACH
▼Shrub				
Larix laricina	0.5%	1%	N	FACH
Picea mariana	3%	4%	N	FACH
Pinus banksiana	3%	4%	N	NI
Kalmia angustifolia var. angustifolia	15%	21%	O	NI
Betula glandulosa	15%	21%	O	FACH
Chamaedaphne calyculata	15%	21%	O	OBL
Linnaea borealis subsp. longiflora	3%	4%	N	NI
Vaccinium angustifolium	15%	21%	O	NI
Vaccinium uliginosum	3%	4%	N	NI
Epigaea repens	0.5%	1%	N	NI
Vaccinium caespitosum	0.5%	1%	N	NI
▼No-woody				
Diphasiastrum sitchense	3%	17%	N	
Cornus canadensis	15%	83%	O	NI
Sibbaldia tridentata	0.5%	3%	N	
Piptatheropsis pungens	0.5%	3%	N	
Solidago hispida	0.5%	3%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Open jack pine forest on De Geer moraine		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9879, -77.4219, 152.5021	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9879, -77.4219, 152.5021	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9879, -77.4219, 152.5021	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9879, -77.4219, 152.5021	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	53.9879, -77.4219, 152.5021	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B5.1		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	54.0345	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3979		
	Alt :	142.8247		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	Permanent watercourse	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	15
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	2	Other class	Plant litter				
Inferior horizon no 1	20	Silt	Brown green				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	130%
No-woody (%) :	50%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	75%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
Picea mariana	0.5%	%	N	FACH
▼Shrub				
Picea mariana	15%	12%	N	FACH
Dasiphora fruticosa	0.5%	0%	N	FACH
Myrica gale	35%	27%	O	OBL
Chamaedaphne calyculata	35%	27%	O	OBL
Salix pedicellaris	0.5%	0%	N	OBL
Betula glandulosa	15%	12%	N	FACH
Alnus incana subsp. rugosa	15%	12%	N	FACH
Salix pyrifolia	15%	12%	N	FACH
Lonicera villosa	0.5%	0%	N	NI
Rhododendron groenlandicum	0.5%	0%	N	OBL
Rubus idaeus subsp. strigosus	0.5%	0%	N	NI
Alnus alnobetula subsp. crispa	0.5%	0%	N	NI
Salix planifolia	0.5%	0%	N	OBL*
Vaccinium uliginosum	0.5%	0%	N	NI
▼No-woody				
Symphyotrichum puniceum var. puniceum	0.5%	1%	N	FACH
Carex echinata subsp. echinata	35%	70%	O	
Carex aquatilis var. aquatilis	3%	6%	N	OBL
Calamagrostis canadensis	3%	6%	N	FACH
Equisetum sylvaticum	3%	6%	N	FACH
Lysimachia borealis	0.5%	1%	N	NI
Viola labradorica	3%	6%	N	
Rubus arcticus subsp. acaulis	3%	6%	N	
Comarum Palustrine	0.5%	1%	N	OBL
Rubus chamaemorus	0.5%	1%	N	FACH
Cornus canadensis	0.5%	1%	N	NI
Viola macloskeyi	0.5%	1%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Shrub swamp
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Shrub swamp		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0345, -77.3979, 142.8247	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0345, -77.3979, 142.8247	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0345, -77.3979, 142.8247	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0345, -77.3979, 142.8247	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0345, -77.3979, 142.8247	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B5.2		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	54.0341	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3971		
	Alt :	159.8719		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☑ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☑ Convex	☐ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	2	Other class	Plant litter				
Inferior horizon no 1	4	Sand	Brown Grey				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	101%
No-woody (%) :	12%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	5
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
Pinus banksiana	15%	100%	O	NI
▼Shrub				
Picea mariana	0.5%	0%	N	FACH
Rhododendron groenlandicum	15%	15%	O	OBL
Vaccinium angustifolium	35%	35%	O	NI
Betula glandulosa	15%	15%	O	FACH
Salix humilis var. humilis	15%	15%	O	NI*
Pinus banksiana	0.5%	0%	N	NI
Vaccinium uliginosum	15%	15%	O	NI
Amelanchier bartramiana	0.5%	0%	N	
Prunus pensylvanica	3%	3%	N	NI
Juniperus communis var. depressa	0.5%	0%	N	NI
Alnus alnobetula subsp. crispa	3%	3%	N	NI
Empetrum nigrum subsp. nigrum	0.5%	0%	N	NI
▼No-woody				
Diphasiastrum sitchense	3%	25%	O	
Sibbaldia tridentata	3%	25%	O	
Piptatheropsis canadensis	0.5%	4%	N	
Carex deflexa var. deflexa	0.5%	4%	N	
Lysimachia borealis	0.5%	4%	N	NI
Cornus canadensis	3%	25%	O	NI
Dendrolycopodium dendroideum	0.5%	4%	N	
Piptatheropsis pungens	0.5%	4%	N	
Melampyrum lineare	3%	25%	O	NI
Chamaenerion angustifolium subsp. angustifolium	0.5%	4%	N	NI
Avenella flexuosa	0.5%	4%	N	
Solidago macrophylla	0.5%	4%	N	NI
Solidago hispida	0.5%	4%	N	NI
Maianthemum canadense subsp. canadense	0.5%	4%	N	NI
Diphasiastrum complanatum	0.5%	4%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Pine forest		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
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PHOTOGRAPHY

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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.0341, -77.3971, 159.8719	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B7.1		**Station number (office) :**	
Sample number :			**Date :**	August 11th 2022
GPS Points :	**Lat :**	54.1823	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3833		
	Alt :	140.9741		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☑ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	3 - Moderate	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	1	Other class	Plant litter				
Inferior horizon no 1	4	Sand	Grey				
Inferior horizon no 2	13	Sand	Orange				

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	39%
No-woody (%) :	18%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	2
Total absolute cover of OBL species (%) :	15%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	0.5%	%	N	FACH
▼Shrub				
Picea mariana	3%	8%	N	FACH
Vaccinium angustifolium	15%	38%	O	NI
Salix humilis var. humilis	3%	8%	N	NI*
Rhododendron groenlandicum	15%	38%	O	OBL
Vaccinium vitis-idaea	3%	8%	N	NI
Salix bebbiana	0.5%	1%	N	FACH
Chamaedaphne calyculata	0.5%	1%	N	OBL
▼No-woody				
Diphasiastrum sitchense	3%	17%	N	
Cornus canadensis	15%	83%	O	NI
Solidago hispida	0.5%	3%	N	NI
Chamaenerion angustifolium subsp. angustifolium	0.5%	3%	N	NI
Piptatheropsis pungens	0.5%	3%	N	
Avenella flexuosa	0.5%	3%	N	
Lycopodium clavatum	0.5%	3%	N	NI
Diphasiastrum complanatum	0.5%	3%	N	NI

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Regeneration after fire (approx. 25 years). Archeological site.		
Field notes :		

PHOTOGRAPHY

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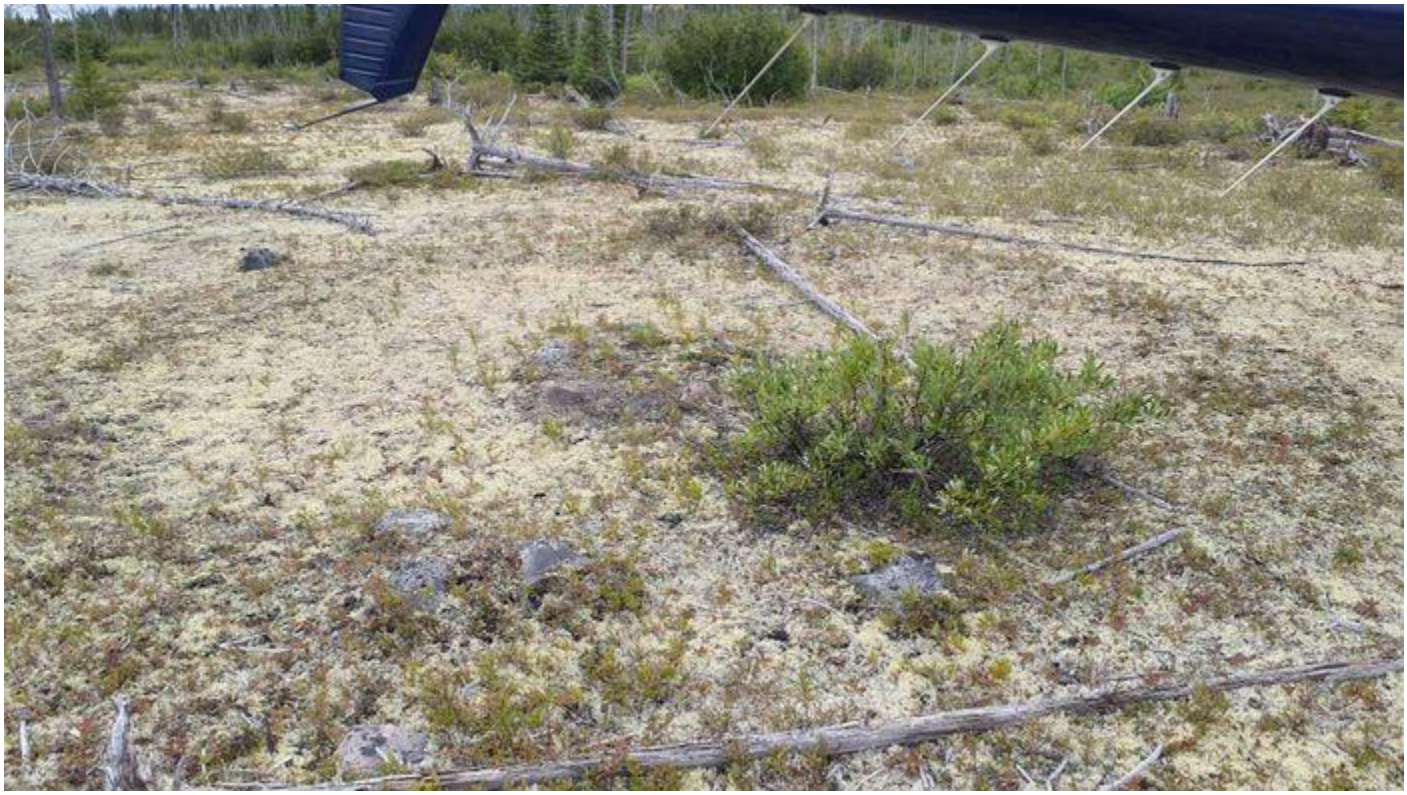

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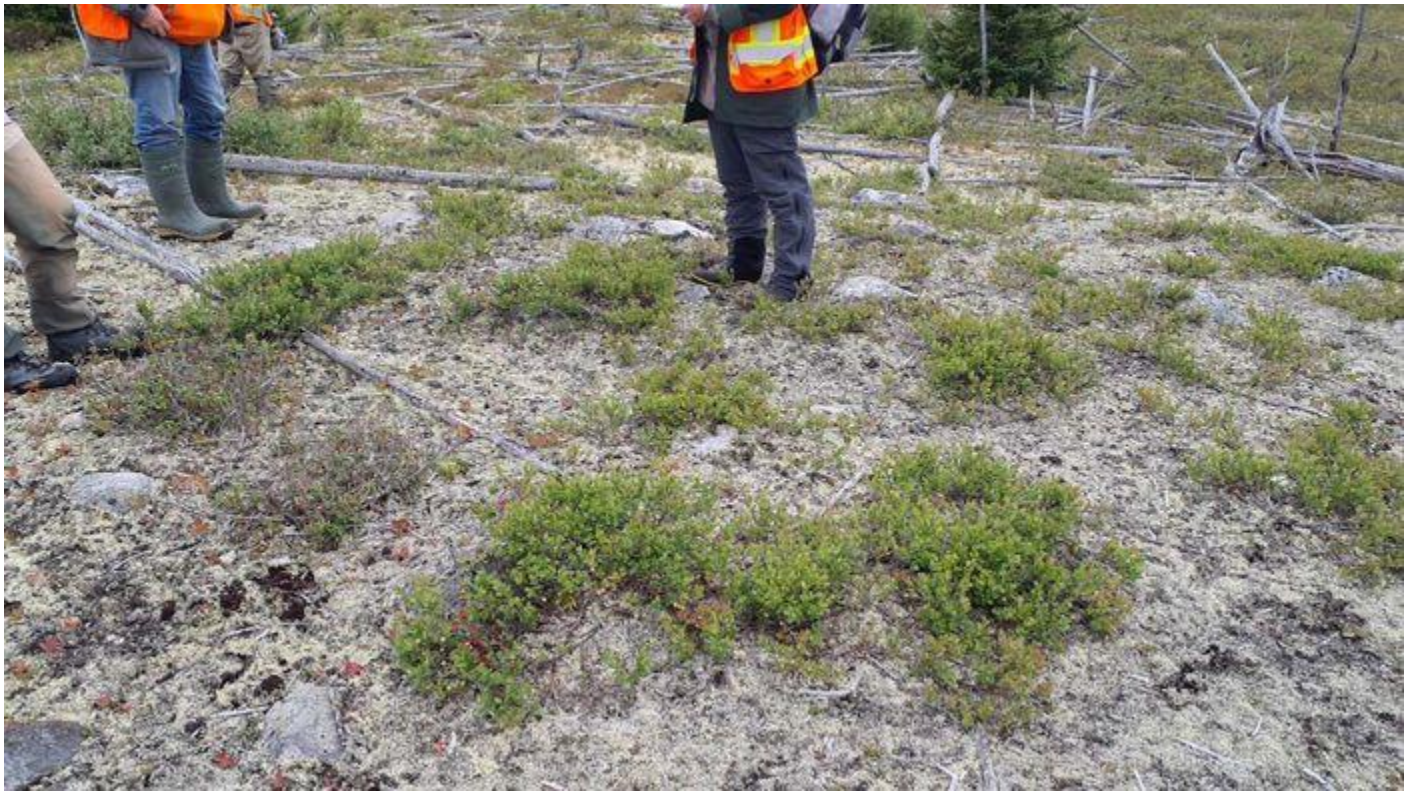

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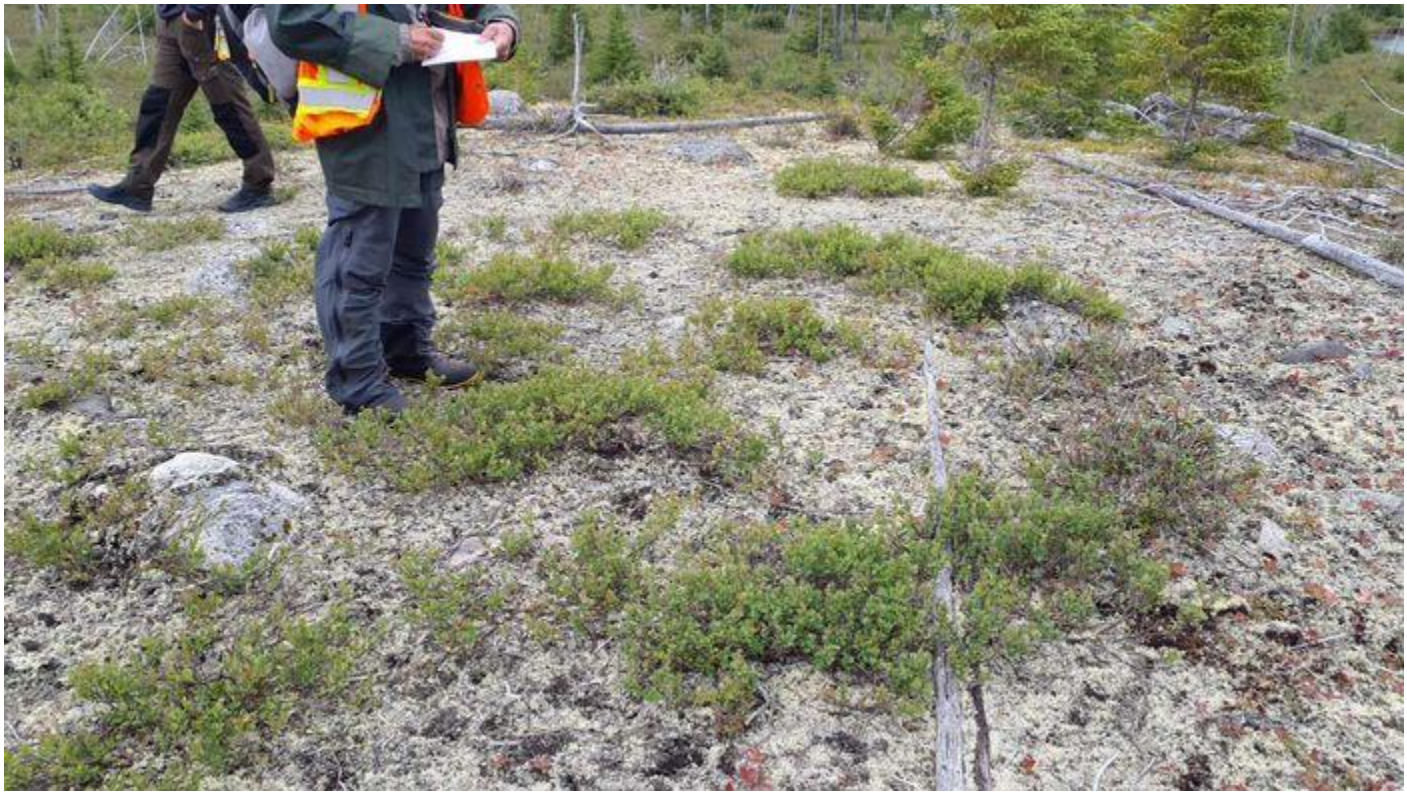

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Coordinates (lat., lon., alt.) :	54.1823, -77.3833, 140.9741	**Orientation :**	

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PHOTOGRAPHY

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Coordinates (lat., lon., alt.) :	54.1823, -77.3833, 140.9741	**Orientation :**	

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PHOTOGRAPHY

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PHOTOGRAPHY

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Title :	Trou 2 et 3		
Coordinates (lat., lon., alt.) :	54.1823, -77.3833, 140.9741	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B8.1		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.2277	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3613		
	Alt :	138.9938		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☑ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	30 / 10		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Lake	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

▼Description of the soil profile (mineral horizons)

4B

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	33%
No-woody (%) :	27%
Dominance test	
Number of dominant OBL or FACW species (A) :	3
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	60%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Chamaedaphne calyculata	15%	45%	O	OBL
Myrica gale	15%	45%	O	OBL
Vaccinium oxycoccos	3%	9%	N	OBL
▼No-woody				
Scheuchzeria palustris	15%	56%	O	OBL
Nuphar variegata	3%	11%	N	OBL
Drosera rotundifolia	3%	11%	N	OBL
Eriophorum vaginatum subsp. spissum	0.5%	2%	N	OBL
Carex limosa	3%	11%	N	OBL
Trichophorum cespitosum	3%	11%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	No	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Lagg. Located between the pond and de peatland. Fire from 1989.		
Field notes :		

PHOTOGRAPHY

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Title :			
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PHOTOGRAPHY

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PHOTOGRAPHY

ID :			
Title :			
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Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	B8.2		**Station number (office) :**	
Sample number :			**Date :**	August 7th 2022
GPS Points :	**Lat :**	54.2277	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.3616		
	Alt :	139.7056		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	40 / 40		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Lake	**Nature of the hydrologic connection :**	Indirect

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Humic
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	104%
No-woody (%) :	18%
Dominance test	
Number of dominant OBL or FACW species (A) :	2
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	87%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Picea mariana	0.5%	%	N	FACH
▼Shrub				
Picea mariana	3%	3%	N	FACH
Chamaedaphne calyculata	65%	63%	O	OBL
Rhododendron groenlandicum	15%	14%	N	OBL
Vaccinium oxycoccos	0.5%	0%	N	OBL
Vaccinium uliginosum	3%	3%	N	NI
Kalmia polifolia	3%	3%	N	OBL
Empetrum nigrum subsp. nigrum	15%	14%	N	NI
Vaccinium angustifolium	0.5%	0%	N	NI
▼No-woody				
Rubus chamaemorus	15%	83%	O	FACH
Carex pauciflora	3%	17%	N	OBL
Trichophorum cespitosum	0.5%	3%	N	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Burned forested bog.		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.2277, -77.3616, 139.7056	**Orientation :**	Nord

PHOTOGRAPHY

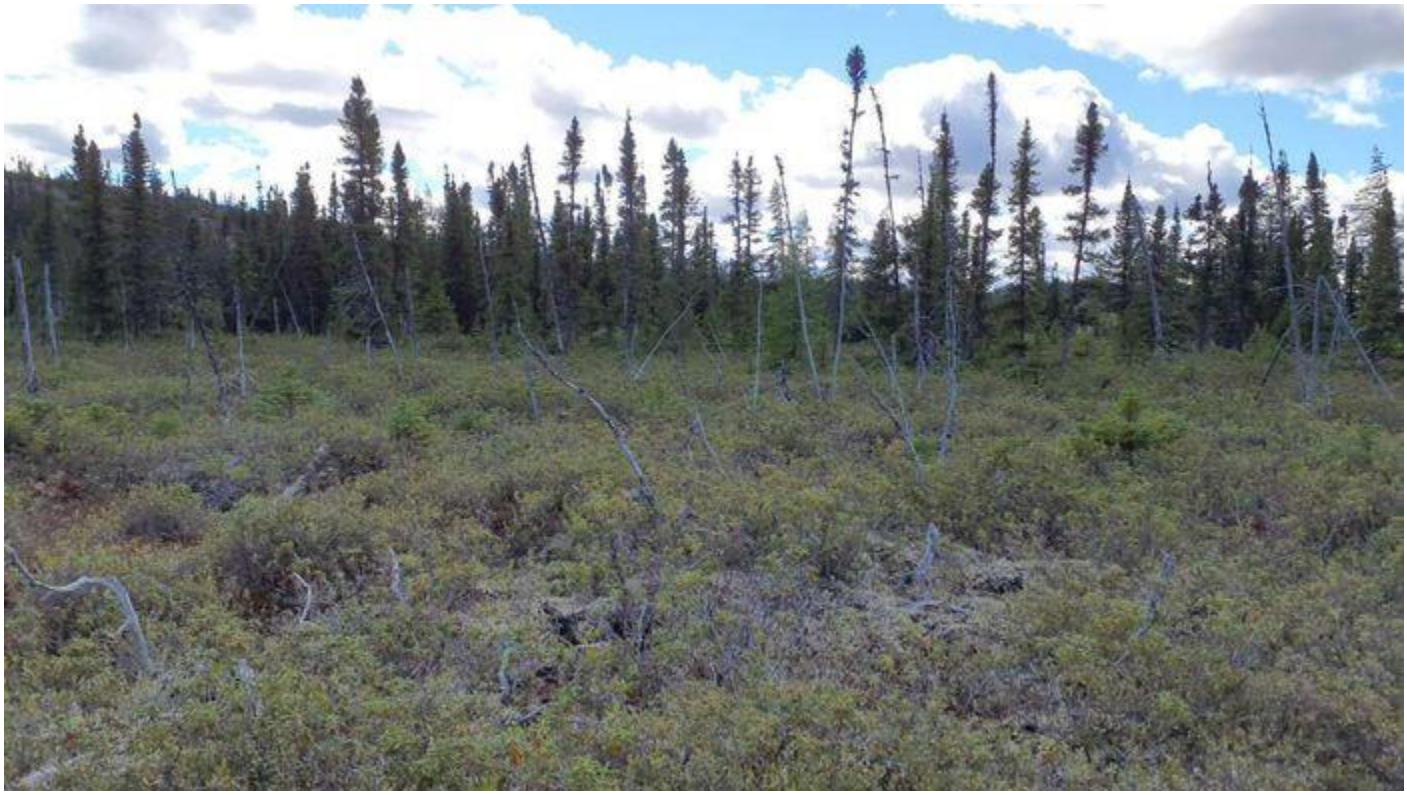
ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.2277, -77.3616, 139.7056	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.2277, -77.3616, 139.7056	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.2277, -77.3616, 139.7056	**Orientation :**	Ouest



PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.2277, -77.3616, 139.7056	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	BB9.1		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.3042	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4349		
	Alt :	174.2337		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	Feu
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :		**Organic horizon – Type :**	Not evaluated
Observed rock :	Yes	**Rock – Depth :**	0
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	2 - Good	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast
Superior horizon	1	Other class	Plant litter		Not applicable	Not applicable	Not applicable
Inferior horizon no 1	6	Sand	Dark brown		Not applicable	Not applicable	Not applicable

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	15%
Shrub (%) :	121%
No-woody (%) :	54%
Dominance test	
Number of dominant OBL or FACW species (A) :	1
Number of dominant NW species (B) :	3
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
Populus tremuloides	15%	100%	O	NI
Picea mariana	0.5%	3%	N	FACH
Pinus banksiana	0.5%	3%	N	NI
▼Shrub				
Alnus alnobetula subsp. crispa	35%	29%	O	NI
Populus tremuloides	15%	12%	N	NI
Prunus pensylvanica	15%	12%	N	NI
Viburnum edule	15%	12%	N	FACH
Vaccinium uliginosum	35%	29%	O	NI
Rubus idaeus subsp. strigosus	0.5%	0%	N	NI
Picea mariana	3%	2%	N	FACH
Ribes glandulosum	0.5%	0%	N	FACH
Amelanchier bartramiana	0.5%	0%	N	
Salix humilis var. humilis	3%	2%	N	NI*
▼No-woody				
Lysimachia borealis	0.5%	1%	N	NI
Calamagrostis canadensis	15%	28%	O	FACH
Chamaenerion angustifolium subsp. angustifolium	3%	6%	N	NI
Sibbaldia tridentata	15%	28%	O	
Solidago macrophylla	3%	6%	N	NI
Schizachne purpurascens	15%	28%	O	
Piptatheropsis pungens	3%	6%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Aspen on rock, fire from 1989.		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3042, -77.4349, 174.2337	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3042, -77.4349, 174.2337	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3042, -77.4349, 174.2337	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3042, -77.4349, 174.2337	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3042, -77.4349, 174.2337	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	BB9.2		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.3037	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4355		
	Alt :	166.6479		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☑ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☐ Mid-slope
Land form :	☐ Concave	☐ Convex	☑ Regular	☐ Irregular	
Presence of depressions :	Yes	**% of depressions / % mounds :**	10 / 50		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**	
Is the soil disturbed ?	No		
Is the hydrology disturbed ?	No	**Pressure :**	
Is it an anthropogenic environment ?	No		
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No	
Presence of species likely to be designated as threatened or vulnerable: No			
Disturbances comments :			
Pressure comments :			

Section 3 – HYDROLOGY

3A

Surface free water :	☑ Yes	☐ No	☐ Not evaluated
Hydrologic connection :	Lake	**Nature of the hydrologic connection :**	Direct

3B

Primary indicators :	**Secondary indicators :**
☑ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	100	**Organic horizon – Type :**	Folique
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	Yes	**Water table – Depth :**	0
Drainage class :	6 - Very poor	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	74%
No-woody (%) :	33%
Dominance test	
Number of dominant OBL or FACW species (A) :	10
Number of dominant NW species (B) :	0
Total absolute cover of OBL species (%) :	102%
Is the vegetation dominated by hydrophytes (A>B)?	Yes

SPECIES by stratum	**% absolute**	**% relative**	**Dominant species (Y/N)**	**Status**
▼Arborescent				
▼Shrub				
Chamaedaphne calyculata	35%	47%	O	OBL
Myrica gale	15%	20%	O	OBL
Picea mariana	3%	4%	N	FACH
Larix laricina	0.5%	1%	N	FACH
Rhododendron groenlandicum	15%	20%	O	OBL
Vaccinium oxycoccos	3%	4%	N	OBL
Kalmia polifolia	3%	4%	N	OBL
▼No-woody				
Carex oligosperma	3%	9%	O	OBL
Carex limosa	15%	45%	O	OBL
Rhynchospora alba	3%	9%	O	OBL
Trichophorum cespitosum	3%	9%	O	OBL
Menyanthes trifoliata	3%	9%	O	OBL
Maianthemum trifolium	0.5%	2%	N	OBL
Rubus chamaemorus	3%	9%	O	FACH
Drosera rotundifolia	0.5%	2%	N	OBL
Carex exilis	0.5%	2%	N	OBL
Nuphar variegata	3%	9%	O	OBL

SYNTHESIS

Typical wetland vegetation ?	Yes	**Type of environement :**
Positive hydrological indicator test ?	Yes	Humid-Peatland
Presence of hydromorphic soils ?	Yes	
Is this station a wetland ?	**Yes**	**Environment subtype :**
Is this station a complex case ?	No	Peatland
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Bog Riparian		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3037, -77.4355, 166.6479	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
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PHOTOGRAPHY

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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3037, -77.4355, 166.6479	**Orientation :**	Ouest

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3037, -77.4355, 166.6479	**Orientation :**	

Report identification of wetland boundaries

Section 1 – IDENTIFICATION

Project number (field) :	211-08415-00		**Field campaign :**	
Station number (field) :	BB9.3		**Station number (office) :**	
Sample number :			**Date :**	August 5th 2022
GPS Points :	**Lat :**	54.3039	**Name of evaluator(s) :**	Mathieu.Ferland@wsp.com Jean Deshaye
	Lon :	-77.4358		
	Alt :	169.3778		
Status of the observation :	Observed - Validate			

Section 2 – GENERAL DESTRICPTION OF THE SITE

2A

Context :	☐ Estuarine	☐ Marine	☐ Riparian	☐ Palustrine	☐ Lacustrine
Situation :	☐ Bottom of slope	☐ Hill	☐ Valley	☐ Top of the slope	☑ Mid-slope
Land form :	☐ Concave	☐ Convex	☐ Regular	☑ Irregular	
Presence of depressions :	No	**% of depressions / % mounds :**	/		

2B

Is the vegetation disturbed ?	No	**Type of disturbance :**
Is the soil disturbed ?	No	
Is the hydrology disturbed ?	No	**Pressure :**
Is it an anthropogenic environment ?	No	
It the environment affected by a beaver dam ?	No	**Presence of invasive alien species (IAS) :** No
Presence of species likely to be designated as threatened or vulnerable: No		
Disturbances comments :		
Pressure comments :		

Section 3 – HYDROLOGY

3A

Surface free water :	☐ Yes	☑ No	☐ Not evaluated
Hydrologic connection :	None	**Nature of the hydrologic connection :**	None

3B

Primary indicators :	**Secondary indicators :**
☐ Saturated with water in the first 30 cm	☐ Roots of trees and shrubs above ground
☐ Water demarcation lines (dock, rocks, trees...)	☐ Moss lines on the tree stump
☐ Debris brought by water - Deposition of sediments	☐ Enlarged stumps
☐ Sulfur smell (rotten egg)	☐ Enlarged lenticels
☐ Blackish litter	☐ Shallow root system
☐ Rhizosphere effect (oxidation around the roots)	☐ Adventitious root
☐ Eroded bark	

Section 4 – SOIL

4A

Organic horizon (cm) :	0	**Organic horizon – Type :**	Not evaluated
Observed rock :	No	**Rock – Depth :**	
Significant stoniness :	No	**Stoniness – Depth :**	
Redoxic soil (gleyed matrix and marked speckles) **:**	No	**Redoxic soil – Depth :**	
Reductive soil (completely gleyed) **:**	No	**Reductive soil – Depth :**	
Water table observed :	No	**Water table – Depth :**	
Drainage class :	1 - Rapid	**Lateral drainage :**	No
Complex cases :	☐ Red soils ☐ Sandy texture ☐ Ortstein ☐ Fragipan		

4B

▼**Description of the soil profile** (mineral horizons)

Horizon	Thickness (cm)	Texture	Matrix color	Speckle color	Speckle abundance	Speckle size	Speckle contrast

Section 5 – VEGETATION

Stratum description	
Tree stratum :	Corresponds to all woody species over 4 meters high.
Shrub stratum :	Corresponds to all woody species less than 4 meters high.
Field stratum :	All vegetation not included in the other stratum (herbaceous, muscinal, etc.)
Total absolute cover	
Arborescent (%) :	0%
Shrub (%) :	12%
No-woody (%) :	21%
Dominance test	
Number of dominant OBL or FACW species (A) :	0
Number of dominant NW species (B) :	4
Total absolute cover of OBL species (%) :	0%
Is the vegetation dominated by hydrophytes (A>B)?	No

SPECIES by stratum	% absolute	% relative	Dominant species (Y/N)	Status
▼Arborescent				
▼Shrub				
Prunus pensylvanica	3%	25%	O	NI
Picea mariana	0.5%	4%	N	FACH
Vaccinium angustifolium	3%	25%	O	NI
Vaccinium uliginosum	3%	25%	O	NI
Betula glandulosa	0.5%	4%	N	FACH
Larix laricina	0.5%	4%	N	FACH
Salix humilis var. humilis	3%	25%	O	NI*
Juniperus communis var. depressa	0.5%	4%	N	NI
▼No-woody				
Sibbaldia tridentata	15%	71%	O	
Piptatheropsis canadensis	3%	14%	N	
Piptatheropsis pungens	0.5%	2%	N	
Avenella flexuosa	3%	14%	N	
Agrostis scabra	0.5%	2%	N	
Carex deflexa var. deflexa	0.5%	2%	N	
Carex umbellata	0.5%	2%	N	
Solidago macrophylla	0.5%	2%	N	NI
Danthonia spicata	0.5%	2%	N	
Poa glauca subsp. glauca	0.5%	2%	N	
Woodsia ilvensis	0.5%	2%	N	
Mononeuria groenlandica	0.5%	2%	N	

SYNTHESIS

Typical wetland vegetation ?	No	**Type of environement :**
Positive hydrological indicator test ?	No	Terrestrial
Presence of hydromorphic soils ?	No	
Is this station a wetland ?	**No**	**Environment subtype :**
Is this station a complex case ?	No	Rocky outcrop
Initial state of the wetland :		
Initial state of the water environment :		
General remarks :		
Rocky outcrop		
Field notes :		

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3039, -77.4358, 169.3778	**Orientation :**	Sud

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3039, -77.4358, 169.3778	**Orientation :**	Est

PHOTOGRAPHY

ID :			
Title :			
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PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3039, -77.4358, 169.3778	**Orientation :**	Nord

PHOTOGRAPHY

ID :			
Title :			
Coordinates (lat., lon., alt.) :	54.3039, -77.4358, 169.3778	**Orientation :**	

APPENDIX

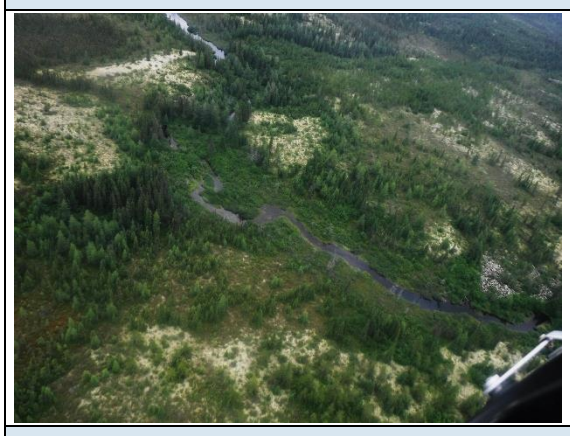
G

AQUATIC HABITAT INVENTORY SHEETS

1 CHARACTERIZATION OF STREAMS

STATION A1

GENERAL INFORMATION



Characterization Date: August 6, 2022

Average observed width: 5 m

Average depth: 1 m

Flow velocity: Slow

Shape: Meander

Flow type: Permanent

Underground segment: None

Special note:

Station moved to about 250 m on the river, as it was impossible to land by helicopter at the initial location. No impassable obstacles observed from the helicopter.

STATION CHARACTERIZATION

Flow facies: Lentic channel

Substrate[1]: 100 OM with some boulders in the bank

Substrate condition: Sealed

Bank Slope: Low

Slope Height: *Left:* 0.30 m *Right:*0.30 m

Aquatic grass bed: 5%

Rock Shelter: None

Woody Shelter: None

Overhanging bank: 15%

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Average

Adult feeding: Average

Rest area: Average

WATER PHYSICOCHEMISTRY

Temperature: 17.1°C

pH: 6.21

Dissolved oxygen: 8.89 mg/L

Dissolved oxygen: 90.9%

Conductivity: 19.1 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☒ Yes ☐ No

Station Name: A1V

Fishing effort: 5:40 PM to 7:45 AM (~14h)

Results:

2 white suckers without parasites

- CACO of 8.5 cm
- CACO of 20.0 cm

Electrofishing: ☐ Yes ☒ No

Station Name:

Fishing effort:

Results:

Angling: ☒ Yes ☐ No

Station Name: A1L

Fishing effort: 15 minutes with 2 fishermen

Results:

- 1 northern pike (ESLU)

ENVIRONMENTAL DNA

Station Name: A1A

Type of filter used: 1 filter of 5 µm

Volume filtered: 2.97 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Northern pike (*Esox lucius* – *ESLU)*
- *Esox*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- Trout-perch (*Percopsis Trout-perchmaycus* – PEOM)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - Initial position of station A1

Aerial view - Between initial and realized position of A1

Aerial view - Between initial and realized position of A1

Location of hoop net

White sucker approximately 8.5 cm

White sucker approximately 20 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (<2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A2

GENERAL INFORMATION

Characterization Date: August 11, 2022

Average observed width: 12 m

Average depth: >1 m

Flow velocity: Slow

Shape: Sinuous

Flow type: Permanent

Underground segment: None

Special note:

Station located further upstream on the stream than the original location. Wide winding channel in the swamp connected to a small pond. Further downstream, it seems to have some rapids/weir areas with higher current velocity, however impossible to land with the helicopter.

STATION CHARACTERIZATION

Flow facies: Lentic channel

Substrate[1]: OM, L

Substrate condition: Presence of aquatic plants

Bank Slope: Low

Slope Height: *Left:* 0.15 m
*Right:*0.15 m

Aquatic grass bed: 20%

Rock Shelter: None

Woody Shelter: None

Overhanging bank: None

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Low

Adult feeding: Low

Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 15.1°C

pH: 6.49

Dissolved oxygen: 9.09 mg/L

Dissolved oxygen: 91.8%

Conductivity: 15.8 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A2L
Fishing effort: 15 minutes with 1 fisherman
Results:

- 1 Northern pike (ESLU) of approximately 255 mm caught approximately 45 m upstream of the eDNA station

ENVIRONMENTAL DNA

Station Name: A2A

Type of filter used: 1 filter of 5 µm

Volume filtered: 2.66 L

Species detected:

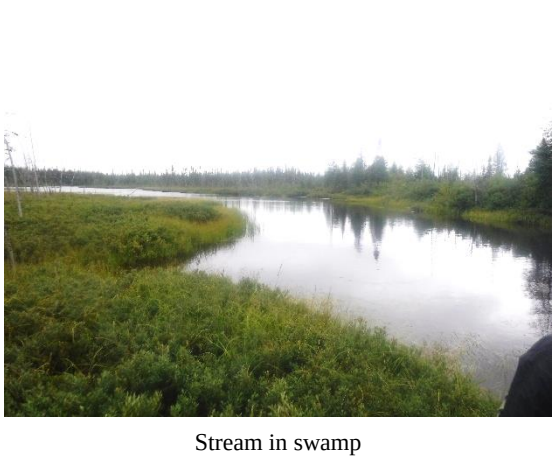
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- *Rhinichthys*
- Northern pike (*Esox lucius* – *ESLU)*
- Yellow perch (Perca flavescens – PEFL)
- Walleye (*Sander vitreus* – SAVI)
- Trout-perch (*Percopsis Trout-perchmaycus* – PEOM)
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - Initial position of station A2

Aerial view - Station A2 completed

Location of the helicopter and vegetation inventory



Stream in swamp

Aquatic plants

Captured Northern pike of approximately 26 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A3

GENERAL INFORMATION

Characterization Date: August 6, 2022
Average observed width: 35 m
Average depth: >1 m
Flow velocity: Moderate
Shape: Divided
Flow type: Permanent
Underground segment: None
Special note:

Basin at the exit of a rapid. Presence of sand shoals with trees lying in the water which provide natural woody shelters. Small forested island in the center of the basin of about 10 m^2.

STATION CHARACTERIZATION

Flow facies: Basin and rapid
Substrate[1]: 80 S and 20 OM (basin) G, C and B (rapid)
Substrate condition: Presence of sediments
Bank Slope: Average
Slope Height: *Left:* 0.60 m *Right:*1.00 m

Aquatic grass bed: None
Rock Shelter: None
Woody Shelter: 15%
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Low
Adult feeding: High
Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 15.9 °C
pH: 6.29
Dissolved oxygen: 9.94 mg/L
Dissolved oxygen: 100.4%
Conductivity: 15.5 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A3L
Fishing effort: 10 minutes with 2 fishermen
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A3A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 1.03 L
Species detected:

- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Spottail shiner (*Notropis hudsonius* – NOHU)
- *Rhinichthys*
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- Walleye (*Sander vitreus* – SAVI)
- Trout-perch (*Percopsis Trout-perchmaycus* – PEOM)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Downstream of the rapids / Start of the basin

Basin and sand shoal

Forested island in the center of the basin

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A5

GENERAL INFORMATION

Characterization Date: August 5, 2022

Average observed width: 10 m

Average depth: In pools >1 m and in rapids ~0.20 m

Flow velocity: Slow (pools) to fast (rapid)

Shape: Sinuous

Flow type: Permanent

Underground segment: None

Special note:

Succession of rapids with a basin in the center that flows towards a lake further downstream.

STATION CHARACTERIZATION

Flow facies: Rapid and basin

Substrate[1]: G, B and Bx

Substrate condition: Covered with silt and presence of aquatic plants

Bank Slope: Low

Slope Height: *Left:* 0.50 m
*Right:*0.50 m

Aquatic grass bed: 5%

Rock Shelter: 15%

Woody Shelter: 5%

Overhanging bank: None

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☒ Yes ☐ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Average

Adult feeding: High

Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 16.5 °C

pH: 6.30

Dissolved oxygen: 10.07 mg /L

Dissolved oxygen: 103.2%

Conductivity: 17.1 µS/cm

OTHER RELEVANT INFORMATION

Presence of an island of water lilies near the end of the first rapids.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: A5A

Type of filter used: 1 filter of 1,2 µm

Volume filtered: 1.13 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- Walleye (*Sander vitreus* – SAVI)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

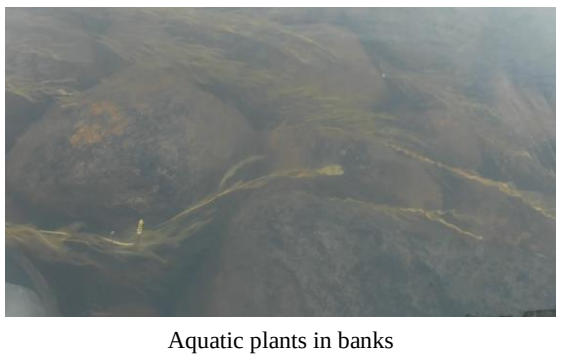
First rapids

Basin between the rapids

Second rapids

Basin grain size and vegetation

Water lily island



Aquatic plants in banks

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder(> 1024mm) and Rm: Parent rock

STATION A6

GENERAL INFORMATION

Characterization Date:	August 12, 2022
Average observed width:	10 m
Average depth:	0.30 m
Flow velocity:	Zero to slow
Shape:	Sinuous
Flow type:	Permanent
Underground segment:	None

Special note:

Station located further downstream from the initial position. No impassable obstacle observed by helicopter during the overflight. Station downstream of the outflow of a large lake at the level of a shallow zone whose substrate is composed of silt and organic matter, very soft. Abundant aquatic vegetation forming a swamp.

STATION CHARACTERIZATION

Flow facies:	Lentic flat	**Aquatic grass bed:**	30%	**Presence of pools:**	☒ Yes ☐ No
Substrate[1]:	90 L/OM and 10 B	**Rock Shelter:**	5%	**Potential spawning grounds:**	☐ Yes ☒ No
Substrate condition:	Presence of aquatic plants and algae	**Woody Shelter:**	None	**Habitat Potential (Brook Trout):**	
Bank Slope:	Low	**Overhanging bank:**	None	*Nursery:*	Average
Slope Height:	*Left: n.d.* *Right:n.d.*	**Obstacle to migration:**	☐ Yes ☒ No	*Adult feeding:*	Average
				Rest area:	Average

WATER PHYSICOCHEMISTRY

Temperature:	13.0 °C
pH:	5.82
Dissolved oxygen:	9.80 mg/L
Dissolved oxygen:	96.1%
Conductivity:	17.4 µS/cm

OTHER RELEVANT INFORMATION

Pool Clarification:
Presence of two narrows from the lake flowing into the channel forming a small pool with relatively clear water.

Clarification of habitat potential:
Preferred fish habitat rated as medium. This would be more of a transition zone between two different environments for aquatic wildlife.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: A6A
Type of filter used: 1 filter of 1.2 µm
Volume filtered: 0.97 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - Overview of the station

General view - Station and vegetation

Shallow area

Shallow area and pool

Aquatic vegetation and organic substrate

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A9

GENERAL INFORMATION

Characterization Date: August 4, 2022
Average observed width: 70 m
Average depth: Undetermined (>1 m)
Flow velocity: Moderate
Shape: Straight
Flow type: Permanent
Underground segment: None
Special note:

Large river between two large lakes. Presence of rapids about 100m downstream from the station with a coarser grain size (G, B, Bx). 5% vegetation cover at the banks.

STATION CHARACTERIZATION

Flow facies: Lentic flat
Substrate[1]: 30 S, 30 V, 30 G and 10 B
Substrate condition: Clean
Bank Slope: Average
Slope Height: *Left:* 1.50 m *Right:*2.00 m

Aquatic grass bed: None
Rock Shelter: 10%
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Average
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 15.8 °C
pH: 6.22
Dissolved oxygen: 9.88 mg/L
Dissolved oxygen: 100.1%
Conductivity: 16.9 µS/cm

OTHER RELEVANT INFORMATION

Wildlife observations:
Numerous caribou tracks and feces.
An antler was also found near the helicopter landing area.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☒ Yes ☐ No
Station Name: A9V
Fishing effort: 1h25 PM to 8:16 AM (~18.75h)
Results:
4 different fish species
- 1 stickleback fry (GASP) < 30mm
- More than 50 yellow perch fries (PEFL) between 30 and 40 mm
- More than 100 sucker fries (CASP) between 20 and 40 mm
- 1 lake chub (COPL) of about 40 mm

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A9V/A9A
Fishing effort: 15-20 minutes with 1 fisherman
Results:
- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A9A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 1.09 L

Species detected:
- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- *Burbot* (*Lotta lotta – LOLO)*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Yellow perch (Perca flavescens – PEFL)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Upstream from the station

Center of the station

Downstream from the station - Angling

Location of the hoop net

Yellow perch fry

Lake chub

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder(> 1024mm) and Rm: Parent rock

STATION A10

GENERAL INFORMATION

Characterization Date: August 4, 2022
Average observed width: 5 - 6 m
Average depth: >1 m
Flow velocity: Moderate
Shape: Meander
Flow type: Permanent
Underground segment: None
Special note:

Attempt to install a hoop net in the meander, but the current speed and depth are too high, so no experimental fishing gear was installed. 5% vegetation cover at bank level.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: 85 S and 15 L
Substrate condition: Presence of sediment and loose material
Bank Slope: Steep
Slope Height: *Left:* 1.50 m *Right:*1.20 m

Aquatic grass bed: 10%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Average
Adult feeding: High
Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 13.9 °C
pH: 6.52
Dissolved oxygen: 10.43 mg/ L
Dissolved oxygen: 101.9%
Conductivity: 17.8 µS/cm

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: A10A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 2.00 L

Species detected:

- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- *Burbot* (*Lotta lotta – LOLO)*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- *Salmonidae*
- *Cottus*

OTHER RELEVANT INFORMATION

Wildlife observations:
Presence of beavers (cut wood)

REPRESENTATIVE PHOTOGRAPHS

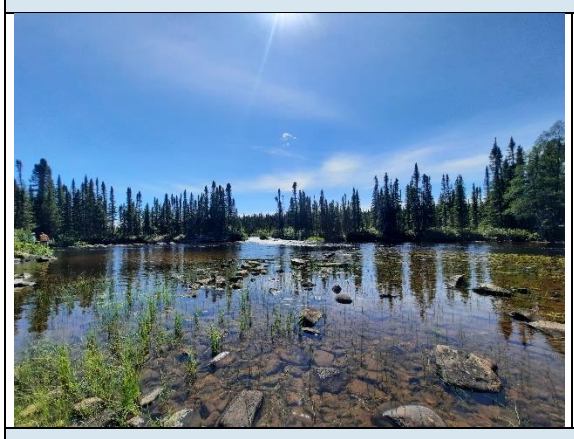
eDNA sampling

Downstream from the station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A11

GENERAL INFORMATION



Characterization Date: August 5, 2022

Average observed width: Undetermined

Average depth: ~ 0.25 m in the rapids area and >1 m in the basin

Flow velocity: Slow to fast

Shape: Divided and sinuous

Flow type: Permanent

Underground segment: None

Special note:

Confluence between two rapids and a basin-type widening. Presence of a shoal made up of pebbles and boulders with an aquatic grass bed.

STATION CHARACTERIZATION

Flow facies: Rapid and basin

Substrate[1]: G and B (rapid)
OM, S, G and B (basin)

Substrate condition: Presence of sediments

Bank Slope: Undetermined

Slope Height: *Left:* n.d.
*Right:*n.d.

Aquatic grass bed: 30%

→ Half fished (electrofishing) then characterized by the vegetation team.

Rock Shelter: 30%

Woody Shelter: None

Overhanging bank: 10%

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☒ Yes ☐ No

Potential spawning grounds: ☒ Yes ☐ No

Habitat Potential (Brook Trout):

Nursery: High

Adult feeding: High

Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 16.0 °C

pH: 6.64

Dissolved oxygen: 10.30 mg/L

Dissolved oxygen: 104.2%

Conductivity: 20.0 µS/cm

OTHER RELEVANT INFORMATION

Wildlife observations:
Observations and captures of brook trout (SAFO) downstream of rapids, directly at the pool. About ten SAFO were captured and then released as they were less than 20 cm. In addition, many SAFO less than 100 mm were observed following the line spoon without being caught.

Due to the large number of captures and sightings of SAFO in this area, there are potential spawning grounds nearby for this species.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☒ Yes ☐ No
Station Name: A11Pe
Fishing effort: 734 seconds
Results:

- 6 white suckers (CACO) of : 66 mm, 71 mm, 80 mm, 83 mm, 100 mm, ~150 mm and ~300 mm

Angling: ☒ Yes ☐ No
Station Name: A11L
Fishing effort: About 30-45 min with 1 fisherman

Results:

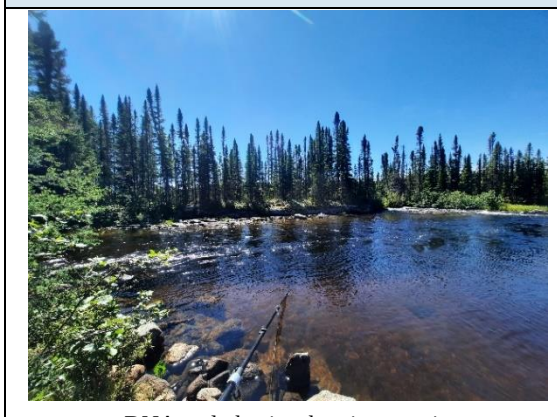
- More than 15 brook trout (SAFO) were caught. A dozen had a total length of less than 200 mm. The others were 260 mm, 280 mm, 300 mm, 300 mm and 390 mm respectively. The 390 mm one had recently consumed a northern pike (ESLU) ~ 100 mm.

ENVIRONMENTAL DNA

Station Name: A11A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 2.00 L
Species detected:

- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- *Burbot* (*Lotta lotta – LOLO)*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Lake trout* (*Salvelinus namaycush* – SANA*)*
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

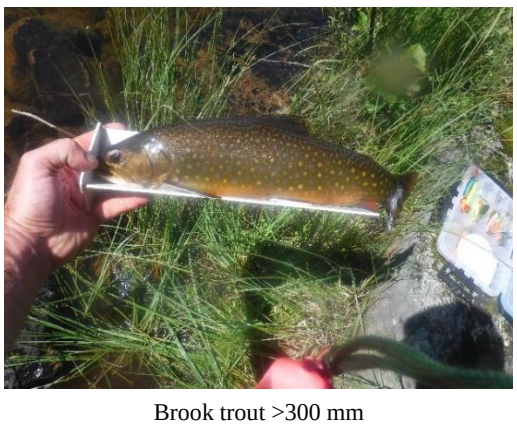


eDNA and physicochemistry station

Shoal and aquatic grass bed

Angling station

White sucker



Brook trout >300 mm

Northern pike ~ 100 mm consumed by a SAFO

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A12 (KAPISTAKUPAW LAKE)

GENERAL INFORMATION

Characterization Date: August 5, 2022
Average observed width: 7 m
Average depth: 0.40 m
Flow velocity: Fast
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

The station was moved to the lake outlet to optimize the results of experimental fishing. At the beginning of the lake outlet, a natural sill of large boulders and parent rock is present. The water flows through a succession of riffle and sill zones to the lake downstream.

STATION CHARACTERIZATION

Flow facies: Rapid and weir
Substrate[1]: G, B, Bx and Rm
Substrate condition: At the lake - covered with OM
Rapid - clean
Bank Slope: Low to average
Slope Height: *Left: n.d.*
Right:n.d.

Aquatic grass bed: None
Rock Shelter: 30%
Woody Shelter: None
Overhanging bank: 30%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Average
Adult feeding: High
Rest area: Average

WATER PHYSICOCHEMISTRY

Temperature: 14.5 °C
pH: 6.27
Dissolved oxygen: 10.30 mg/L
Dissolved oxygen: 101.1%
Conductivity: 16.1 µS/cm

OTHER RELEVANT INFORMATION

Human presence:
Presence of a camp, a small plane landing strip, an ATV trail and a moose hunting area (walking trail, salt boulder, etc.). Jordan Shem, a Cree worker accompanying the technical team, confirmed that this camp is Cree owned.

Wildlife observation:
Bald Eagle observed in flight near the station

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☒ Yes ☐ No
Station Name: A12PED/PEF
Fishing effort: 261 seconds
Results:
- 5 sculpins (COSP) averaging 70 mm in length, varying from 60 to 80 mm
- 1 unidentified fish observed

** Electrofishing precision:*
Fishing only on a portion of the left bank, approximately one third of the width of the river over 25 m.

Angling: ☒ Yes ☐ No
Station Name: A12L
Fishing effort: 15 minutes with 2 fishermen
Results:
- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A12A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 1.26 L
Species detected:
- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - Station

Camp

Lake Outfall - Basin

Lake outfall - Weir and rapids

Electrofishing station

Sculpin

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A13

GENERAL INFORMATION

Characterization Date: August 7, 2022
Average observed width: 12 m
Average depth: >1 m
Flow velocity: Moderate
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

Presence of an impassable waterfall downstream of station A13 which is visible from aerial photographs

STATION CHARACTERIZATION

Flow facies: Lotic channel
Substrate[1]: B, Bx, and Rm
Substrate condition: Covered with silt
Bank Slope: Average to very steep (rocky cape)
Slope Height: *Left:* 1.00 m *Right:*20.00m

Aquatic grass bed: None
Rock Shelter: 10%
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☒ Yes ☐ No
→ Impassable waterfall downstream

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 13.6 °C
pH: 5.59
Dissolved oxygen: 10.45 mg/L
Dissolved oxygen: 100.6%
Conductivity: 13.4 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A13L
Fishing effort: 10-15 minutes with 2 fishermen
Results:

- 1 brook trout (SAFO) of about 200 mm
- 1 unidentified fish of about 150 mm, possibly another brook trout

ENVIRONMENTAL DNA

Station Name: A13A
Type of filter used: 2 filters (1,2 µm and 5 µm)
Volume filtered: 0.69 L and 2,20 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Salmonidae*

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Aerial view of the station

Aerial view of the station

Impassable fall

Downstream from the station

Upstream from the station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder(> 1024mm) et Rm: Parent rock

STATION A14

GENERAL INFORMATION

Characterization Date: August 7, 2022
Average observed width: 10 m
Average depth: 1.00 m
Flow velocity: Moderate to fast
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

Presence of a secondary river branch from a small wetland. Presence of a possible impassable obstacle to approximately 70 m upstream of station A14.

STATION CHARACTERIZATION

Flow facies: Rapid and wetland
Substrate[1]: 70 S and 30 B
Substrate condition: Undetermined
Bank Slope: Low to average
Slope Height: *Left:* 0.10 m *Right:*n.d.

Aquatic grass bed: 5%
Rock Shelter: 5%
Woody Shelter: 5%
Overhanging bank: None
Obstacle to migration: ☒ Yes ☐ No
→ A14 INF (on the map)

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 12.3 °C
pH: 5.41
Dissolved oxygen: 10.67 mg/L
Dissolved oxygen: 98.4%
Conductivity: 18.3 µS/cm

OTHER RELEVANT INFORMATION

Obstacle clarifications:
Obstacle possibly impassable for fish upstream of station A14: the water flows directly over the bedrock, creating a drop over ¾ of the width of the stream, i.e. about 35 m wide. It would thus be only on the right bank, over a few meters, that the fish would be able to go up the stream despite the fast current and the slope.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A14L
Fishing effort: 20 minutes with 2 fishermen
Results:

- 3 brook trout (SAFO) caught (125 mm, 160 mm and 200 mm) and 1 observed

ENVIRONMENTAL DNA

Station Name: A14A
Type of filter used: 1 filter of 5 µm
Volume filtered: 3.00 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Lake trout* (*Salvelinus namaycush* – SANA*)*
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Wetland

Rapids

Impassable obstacle under reserve

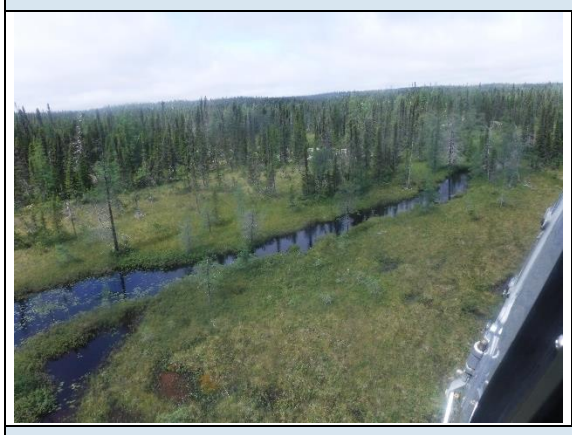
Brook trout of about 160 mm

Captured brook trout of about 125 mm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A15

GENERAL INFORMATION



Characterization Date: August 7, 2022
Average observed width: 3 m
Average depth: 1.00 m
Flow velocity: Zero to slow
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

Lentic channel in a swamp with lots of aquatic vegetation.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: OM
Substrate condition: Presence of sediment and very soft
Bank Slope: Low
Slope Height: *Left:* 0.10 m *Right:*0.10 m

Aquatic grass bed: 25%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Low
Adult feeding: Low
Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 12.8 °C
pH: 5.53
Dissolved oxygen: 10.66 mg/L
Dissolved oxygen: 100.6%
Conductivity: 17.6 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A15L
Fishing effort: 10 to 15 minutes with 1 fisherman
Results:

- 1 unidentified fish of about 150-200 mm observed, but not caught

ENVIRONMENTAL DNA

Station Name: A15A
Type of filter used: 1 filter of 5 µm
Volume filtered: 2.74 L
Species detected:

- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Abundant aquatic vegetation

Upstream from the station

Downstream from the station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder(> 1024mm) et Rm: Parent rock

STATION A16

GENERAL INFORMATION

Characterization Date: August 7, 2022
Average observed width: 20 m
Average depth: >1 m
Flow velocity: Slow
Shape: Sinuous and divided
Flow type: Permanent
Underground segment: None
Special note:

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: 80 OM and 20 S
Substrate condition: Undetermined
Bank Slope: Average
Slope Height: *Left:* 0.20 m *Right:*0.20 m

Aquatic grass bed: 10%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: High
Adult feeding: Average
Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 14.0 °C
pH: 5.59
Dissolved oxygen: 10.30 mg/L
Dissolved oxygen: 100.2%
Conductivity: 19.4 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A16L
Fishing effort: 20 minutes with 2 fishermen
Results:

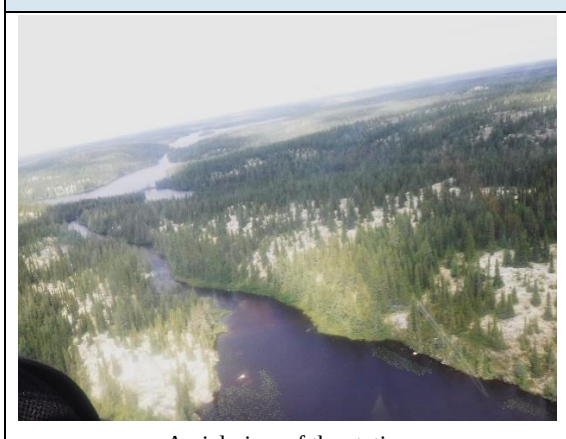
- 4 brook trout (SAFO) caught (190 mm and 27 mm for those measured)

ENVIRONMENTAL DNA

Station Name: A16A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 1.66 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- *Margaricus*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Lake trout* (*Salvelinus namaycush* – SANA*)*
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS



Aerial view of the station

Aerial view of the station

eDNA and physicochemistry station

Angling station

Brook trout about19 cm

Brook trout about 27 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A17

GENERAL INFORMATION

Characterization Date: August 7, 2022
Average observed width: 7 m
Average depth: >1 m
Flow velocity: Zero to slow
Shape: Meander
Flow type: Permanent
Underground segment: None
Special note:

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: OM
Substrate condition: Presence of sediment and very soft
Bank Slope: Low
Slope Height: *Left:* 0.10 m *Right:*0.10 m

Aquatic grass bed: 15%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 12.7 °C
pH: 5.57
Dissolved oxygen: 8.25 mg/L
Dissolved oxygen: 77.8%
Conductivity: 24.8 µS/cm

OTHER RELEVANT INFORMATION

Wildlife observations:
Caribou tracks

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A17L
Fishing effort: 10 minutes with 1 fisherman
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A17A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 1.19 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- *Margaricus*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - Upstream widening

Upstream from the station

Downstream from the station

Caribou tracks

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A19

GENERAL INFORMATION

Characterization Date: August 9, 2022

Average observed width: 10 m

Average depth: >1 m

Flow velocity: Fast

Shape: Sinuous

Flow type: Permanent

Underground segment: None

Special note:

Station realized in a basin area at the end of a rapid with a high current and forming two counter-currents on each side.

STATION CHARACTERIZATION

Flow facies: Basin and rapid

Substrate[1]: G and B (rapid)

Substrate condition: Undetermined

Bank Slope: Average

Slope Height: *Left:* 0.30 m
*Right:*0.50 m

Aquatic grass bed: None

Rock Shelter: None

Woody Shelter: None

Overhanging bank: 10%

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Low

Adult feeding: Average

Rest area: Average

WATER PHYSICOCHEMISTRY

Temperature: 13.7 °C

pH: 6.56

Dissolved oxygen: 10.44 mg/L

Dissolved oxygen: 100.3%

Conductivity: 25.3 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A19L
Fishing effort: 15 minutes with 1 fisherman
Results:

- 3 brook trout (SAFO) caught
- Observation of SAFO following the lure

ENVIRONMENTAL DNA

Station Name: A19A

Type of filter used: 1 filter of 1,2 µm

Volume filtered: 1.74 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- *Margaricus*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - General

Aerial view - Upstream from the station

Rapids

Basin area

Angling station

Brook trout about 24.5 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A20

GENERAL INFORMATION

Characterization Date: August 9, 2022
Average observed width: 2 m
Average depth: >1 m
Flow velocity: Moderate to fast
Shape: Sinuous and meander
Flow type: Permanent
Underground segment: None
Special note:

The eDNA station is located in a small widening of the stream. The stream appears to be quite narrow, sinuous and flows through the heaths.

STATION CHARACTERIZATION

Flow facies: Rapid and basin
Substrate[1]: Undetermined
Substrate condition: Undetermined
Bank Slope: Average
Slope Height: *Left:* 0.50 m *Right:*0.50 m

Aquatic grass bed: 20%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: 15%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 16.9 °C
pH: 6.92
Dissolved oxygen: 10.94 mg/L
Dissolved oxygen: 105.4%
Conductivity: 26.5 µS/cm

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: A20L
Fishing effort: 5-10 minutes with 1 fisherman
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A20A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 2.08 L
Species detected:

- Northern pike (*Esox lucius – ESLU)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Cottus*

OTHER RELEVANT INFORMATION

Wildlife observations:
Wood frog observed

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the stream

Aerial view of the stream

Basin area

Station ADNe, physicochemistry and angling

Dense vegetation (heaths)

Wood Frog

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A21

GENERAL INFORMATION

Characterization Date:	August 9, 2022
Average observed width:	1 m
Average depth:	0.25 m
Flow velocity:	Zero to slow
Shape:	Sinuous
Flow type:	Permanent
Underground segment:	20% with flow through peat and moss. Presence of channels
Special note:	

Very small and shallow sinuous stream that originates in a shallow pond. Lots of heaths overhanging the stream. eDNA taken closer to the pond, as it is easier to access and much quicker to run.

STATION CHARACTERIZATION

Flow facies:	Lentic flat	**Aquatic grass bed:**	40%	**Presence of pools:**	☐ Yes ☒ No
Substrate[1]:	Undetermined	**Rock Shelter:**	None	**Potential spawning grounds:**	☐ Yes ☒ No
Substrate condition:	Undetermined	**Woody Shelter:**	None	**Habitat Potential (Brook Trout):**	
Bank Slope:	Low	**Overhanging bank:**	None	*Nursery:*	Low
Slope Height:	*Left: n.d.* *Right: n.d.*	**Obstacle to migration:**	☐ Yes ☒ No	*Adult feeding:*	Low
				Rest area:	Low

WATER PHYSICOCHEMISTRY

Temperature:	15.3 °C
pH:	6.35
Dissolved oxygen:	10.40 mg/L
Dissolved oxygen:	103.7%
Conductivity:	23.4 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: A21A

Type of filter used: 1 filter of 5 µm

Volume filtered: 2.74 L

Species detected:

- *Brook trout* (*Salvelinus fontinalis*– SAFO)

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

eDNA and physicochemistry station

Flow through heaths

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A22

GENERAL INFORMATION

Characterization Date: August 8, 2022

Average observed width: Undetermined

Average depth: 0,20 m in the ponds

Flow velocity: Zero

Shape: Non applicable

Flow type: Intermittent

Underground segment: 60% with flow through peat and moss.
Presence of ponds

Special note:

Succession of small ponds (very clear water) flowing over a vegetation cover. Watercourse becomes underground in places. It is possible that in low water some ponds become isolated since the connectivity in the environment is not assured.

STATION CHARACTERIZATION

Flow facies: Lentic channel

Substrate[1]: OM and plant cover

Substrate condition: Covered with sediment and very soft

Bank Slope: Zero

Slope Height: *Left:* n.a.
Right: n.a.

Aquatic grass bed: Not applicable

Rock Shelter: Not applicable

Woody Shelter: Not applicable

Overhanging bank: Not applicable

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Zero to low

Adult feeding: Zero to low

Rest area: Zero to low

WATER PHYSICOCHEMISTRY

Temperature: 5.6 °C

pH: 5.29

Dissolved oxygen: 1.80 mg/L

Dissolved oxygen: 14.2%

Conductivity: 19.1 µS/cm

OTHER RELEVANT INFORMATION

Limiting factor:
The amount of dissolved oxygen in the stream is a limiting factor for fish

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☒ Yes ☐ No
Station Name: A22PED to A22PEF
Fishing effort: 150 seconds
Results:

- No fish observed or caught

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: A22A

Type of filter used: 1 filter of 1.2 µm

Volume filtered: 2.18 L

Espèce détectée :

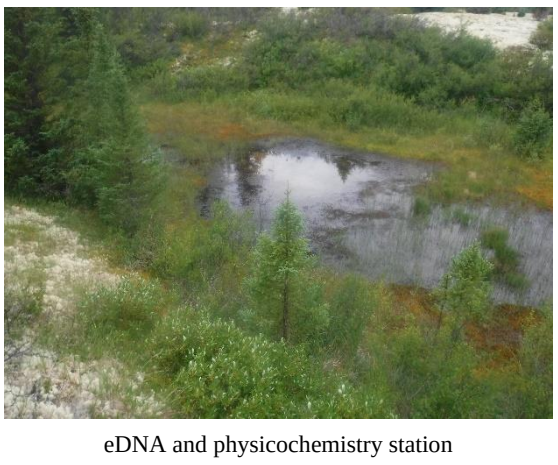
- No fish DNA was detected in the collected sample

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Location of the watercourse

Upstream of the station - Ponds and basins



eDNA and physicochemistry station

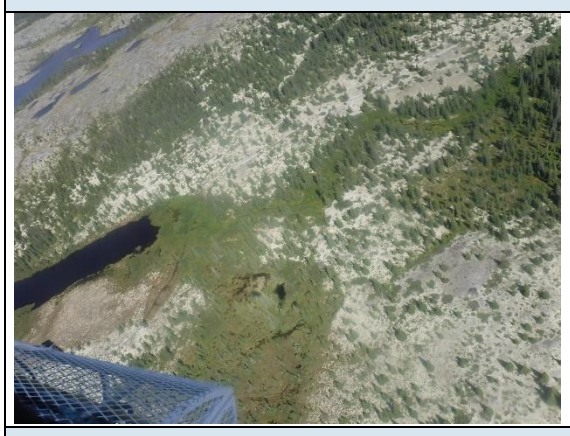
Electrofishing station

Substrate and water depth

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A23

GENERAL INFORMATION



Characterization Date: August 8, 2022
Average observed width: 1 m
Average depth: 0.15 m
Flow velocity: Modertate
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

Shallow lotic channel with some pools (more than 5 pools), very sinuous and very clear water.

STATION CHARACTERIZATION

Flow facies: Lotic channel
Substrate[1]: 70 S, 25 V and 5 C
Substrate condition: Clean. Very compact or very soft depending on the location
Bank Slope: Steep
Slope Height: *Left:* 2.00 m *Right:* 2.00 m

Aquatic grass bed: None
Rock Shelter: None
Woody Shelter: None
Overhanging bank: 90%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☒ Yes ☐ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):

Nursery:	Average
Adult feeding:	Average
Rest area:	Average

WATER PHYSICOCHEMISTRY

Temperature: 11.8 °C
pH: 6.71
Dissolved oxygen: 11.37 mg/L
Dissolved oxygen: 105.2%
Conductivity: 32.6 µS/cm

OTHER RELEVANT INFORMATION

Observations:
ATV trail to midway between the helicopter landing pad and the eDNA and physicochemistry station.

Brook trout clarification:
Fry observed during the eDNA collection. Trout were pale, especially the smaller ones under 40 mm which were borderline transparent.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☒ Yes ☐ No
Station Name: A23PED to A23PEF
Fishing effort: 243 seconds
Results:

- 10 brook trout (SAFO) of 65 mm, 130 mm and 40 mm average length for the 8 small SAFO captured

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: A23A
Type of filter used: 1 filter of 1.2 µm
Volume filtered: 1.57 L
Species detected:

- *Brook trout* (*Salvelinus fontinalis*– SAFO)

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Slope and vegetation nearby

eDNA station, physicochemistry

Upstream from the station

Brook trout about 130 mm

Three brook trout about 40 mm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A24

GENERAL INFORMATION

Characterization Date: August 8, 2022
Average observed width: 2 m
Average depth: 0.20 m
Flow velocity: Fast
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:
Stream connected upstream to a shallow lake and flows to a small pond downstream

STATION CHARACTERIZATION

Flow facies: Rapid
Substrate[1]: 10 C, 30 G, 50 B and 10 Bx
Substrate condition: Clean, presence of algae
Bank Slope: Steep
Slope Height: *Left:* 0.30 m *Right:* 0.30 m

Aquatic grass bed: None
Rock Shelter: 50%
Woody Shelter: None
Overhanging bank: 20% (heaths)
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☒ Yes ☐ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: High
Adult feeding: High
Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 13.5 °C
pH: 7.22
Dissolved oxygen: 10.94 mg/L
Dissolved oxygen: 105.1%
Conductivity: 63.8 µS/cm

OTHER RELEVANT INFORMATION

Pools precision:
Some small pools at the base of the rapids consisting of boulders. Depth of about 30 cm.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☒ Yes ☐ No
Station Name: A24PED to A24PEF
Fishing effort: 289 seconds
Results:

- No fish observed or caught

Angling: ☒ Yes ☐ No
Station Name: A24L - To the lake upstream
Fishing effort: 10 minutes with 2 fishermen
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A24A
Type of filter used: 1 filter of 1,2 µm
Volume filtered: 2.19 L
Espèce détectée :

- No fish DNA was detected in the collected sample

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Beginning of stream - shallow lake upstream

Watercourse division

Coarse substrate

Flows - Rapid

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION A25

GENERAL INFORMATION

Characterization Date: August 8, 2022
Average observed width: 3 m
Average depth: 0.20 m
Flow velocity: Moderate
Shape: Straight
Flow type: Permanent
Underground segment: None
Special note:

Incoming stream on a sandy beach before emptying into Hudson Bay. Presence of a road about 30 m upstream from the stream (ATV crossing). Stream located near human facilities, presence of human waste (cans, packaging...) in the stream.

STATION CHARACTERIZATION

Flow facies: Lentic channel, rapid and weir
Substrate[1]: S and B (lentic channel) V, G and B (rapid and weir)
Substrate condition: Clean
Bank Slope: Low to moderate
Slope Height: *Left:* n.d. *Right:* n.d.

Aquatic grass bed: None
Rock Shelter: 20%
Woody Shelter: 5%
Overhanging bank: 25%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☒ Yes ☐ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Average
Adult feeding: Average
Rest area: Average

WATER PHYSICOCHEMISTRY

Temperature: 10.2 °C
pH: 6.28
Dissolved oxygen: 10.88 mg/l
Dissolved oxygen: 96.8%
Conductivity: 140.5 µS/cm

OTHER RELEVANT INFORMATION

Precision electrofishing :
0% overhanging vegetation at the beginning and over 30% overhanging bank at the end.

Precision angling:
The fishing was done at the outflow of the river, i.e. at the confluence with Hudson Bay

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☒ Yes ☐ No
Station Name: A25PED to A25PEF
Fishing effort: 400 seconds
Results:

- 1 ninespine stickleback (PUPU) of 60 mm

Angling: ☒ Yes ☐ No
Station Name: A25L
Fishing effort: 30 minutes with 2 fishermen
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: A25A
Type of filter used: 1 filter of 1.2 µm
Volume filtered: 3.13 L
Species detected:

- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Capelin (*Mallotus villosus* – MAVI)

REPRESENTATIVE PHOTOGRAPHS

Connection with Hudson Bay

Lentic channel – Fine substrate

Lentic channel – Fine and coarse substrate

Rapid succession and weir with vegetation

Electrofishing station - Rapids and weirs

Ninespine stickleback about 60 mm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B1

GENERAL INFORMATION

Characterization Date: August 3, 2022
Average observed width: Undetermined
Average depth: 0.27 m
Flow velocity: Moderate
Shape: Undetermined
Flow type: Permanent
Underground segment: None
Special note:

The station has been relocated approximately 15 m as the stream crosses into a culvert slightly lower down the access road (spillway road). The stream discharges into a wetland downstream and flows in some locations over moss and through vegetation. The eDNA station was taken downstream of the culvert.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: 60 S, 40 B and some MO
Substrate condition: Presence of sediments
Bank Slope: Undetermined
Slope Height: *Left:* n.d. *Right:* n.d.

Aquatic grass bed: Undetermined
Rock Shelter: <2%
Woody Shelter: <2%
Overhanging bank: 60%
Obstacle to migration: ☒ Yes ☐ No
→ Culvert

Presence of pools: ☒ Yes ☐ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 8.6 °C
pH: 7.10
Dissolved oxygen: 10.72 mg/L
Dissolved oxygen: 92.5%
Conductivity: 24.0 µS/cm

OTHER RELEVANT INFORMATION

Obstacle precision:
It is a 1 m diameter culvert with a water depth of approximately 27 cm and a 27 cm drop. The substrate under the culvert is composed of boulders and sand.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: B1A
Type of filter used: 1 filter of 1.2 µm
Volume filtered: 2.00 L
Species detected:

- No fish DNA was detected in the collected sample

REPRESENTATIVE PHOTOGRAPHS

eDNA and physicochemistry station

Culvert

Substrate and vegetation

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B4

GENERAL INFORMATION

Characterization Date: August 11, 2022

Average observed width: Variable (lake)

Average depth: Variable (in some places >1 m)

Flow velocity: Slow

Shape: Lake and straight downstream watercourse

Flow type: Permanent

Underground segment: None

Special note:

The road alignment would run between two lakes. There is clear connectivity between the two environments via a small stream. The station was therefore located downstream of the lake, near the start of the stream flowing to the second lake.

STATION CHARACTERIZATION

Flow facies: Not applicable

Substrate[1]: OM and B visible

Substrate condition: Undetermined

Bank Slope: Not applicable

Slope Height: *Left:* n.a.
Right: n.a.

Aquatic grass bed: 30%

Rock Shelter: None

Woody Shelter: None in the lake/pond

Overhanging bank: 25%

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Undetermined

Adult feeding: Undetermined

Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 14.6 °C

pH: 5.98

Dissolved oxygen: 7.00 mg/L

Dissolved oxygen: 68.6%

Conductivity: 16.9 µS/cm

OTHER RELEVANT INFORMATION

Wildlife observation:
Common garter snake observed while traveling to the eDNA station.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: B4A

Type of filter used: 1 filter of 5 µm

Volume filtered: 2.16 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Upstream from the station - Lake

Downstream from the station - Start of the watercourse

Vegetation and aquatic plants - Shallow

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B5

GENERAL INFORMATION

Characterization Date: August 11, 2022
Average observed width: Variable
Average depth: Variable
Flow velocity: Slow to moderate
Shape: Not applicable
Flow type: Not applicable
Underground segment: None
Special note:
Station in a large elongated lake.

STATION CHARACTERIZATION

Flow facies: Not applicable
Substrate[1]: Visible OM and S and some boulders on the bank
Substrate condition: Clean
Bank Slope: Not applicable
Slope Height: *Left:* n.a. *Right:* n.a.

Aquatic grass bed: None
Rock Shelter: None
Woody Shelter: None
Overhanging bank: 10%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 15.1 °C
pH: 5.95
Dissolved oxygen: 10.01 mg/L
Dissolved oxygen: 99.3%
Conductivity: 15.3 µS/cm

OTHER RELEVANT INFORMATION

Wildlife observations:
Presence of a common loon on the lake throughout the characterization which reveals a strong potential for the presence of fish in the environment.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: B5A
Type of filter used: 1 filter of 1.2 µm
Volume filtered: 2.03 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- Walleye (*Sander vitreus* – SAVI)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Upstream from the station

Downstream from the station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B7

GENERAL INFORMATION

Characterization Date: August 11, 2022
Average observed width: 11 m
Average depth: >1 m
Flow velocity: Slow
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

Station located at the foot of rapids. The eDNA station is located further downstream from the initial location for easy access by helicopter. The stream is mainly a wide channel with some narrowing that creates rapids.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: 35 OM, 5 L, 40 S and 20 B
Substrate condition: Presence of sediments
Bank Slope: Undetermined
Slope Height: *Left:* n.d. *Right:* n.d.

Aquatic grass bed: 5%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 14.6 °C
pH: 6.04
Dissolved oxygen: 10.22 mg/L
Dissolved oxygen: 100.6%
Conductivity: 18.6 µS/cm

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: B7A
Type of filter used: 1 filter of 5 µm
Volume filtered: 2.74 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- Walleye (*Sander vitreus* – SAVI)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Salmonidae*
- *Cottus*

OTHER RELEVANT INFORMATION

Finding:
A potential archaeological site was discovered at the top of the mountain, near the helicopter landing area. It could be a site where temporary settlements of families from First Nations communities would have resided. In total, four sites were found.

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Aerial view of the watercourse and its depth

Archaeological site

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B8

GENERAL INFORMATION

Characterization Date: August 7, 2022
Average observed width: Variable
Average depth: Variable
Flow velocity: Slow to moderate
Shape: Not applicable
Flow type: Permanent
Underground segment: None
Special note:
The station is located in the lake.

STATION CHARACTERIZATION

Flow facies: Not applicable
Substrate[1]: G and B (in bank)
Substrate condition: Clean
Bank Slope: Not applicable
Slope Height: *Left:* n.a. *Right:* n.a.

Aquatic grass bed: None
Rock Shelter: 10%
Woody Shelter: None
Overhanging bank: 20%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 17.0 °C
pH: 5.83
Dissolved oxygen: 10.05 mg/L
Dissolved oxygen: 104.2%
Conductivity: 17.7 µS/cm

OTHER RELEVANT INFORMATION

Wildlife observations:
Numerous caribou antlers were found in the open wetland to about 50-100 m from the eDNA and physicochemistry station. The environment appears to be used extensively by large wildlife.

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B8L
Fishing effort: 10 minutes with 1 fisherman
Results:

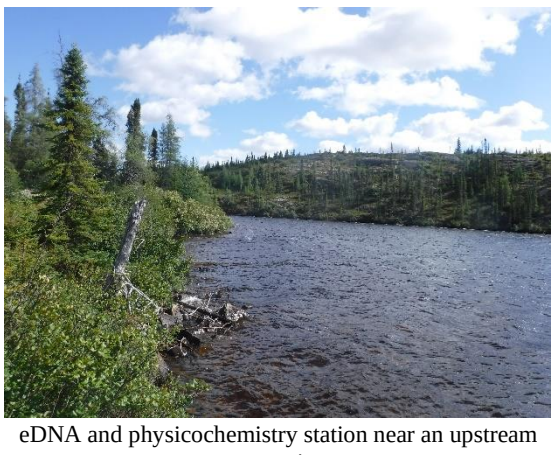
- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: B8A
Type of filter used: 1 filter of 1.2 µm
Volume filtered: 1.72 L
Species detected:

- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- Walleye (*Sander vitreus* – SAVI)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS



eDNA and physicochemistry station near an upstream narrowing

Angling station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION BB9

GENERAL INFORMATION

Characterization Date: August 5, 2022
Average observed width: Variable
Average depth: >1 m
Flow velocity: Not applicable
Shape: Not applicable
Flow type: Permanent
Underground segment: None
Special note:

Station B9 relocated, as it was impossible to land with the helicopter. Station BB9, modified position, was carried out on a pond in a peat bog which is located close to the projected road alignment. Presence of vegetation and aquatic grass bed.

STATION CHARACTERIZATION

Flow facies: Not applicable
Substrate[1]: Undetermined (OM and others)
Substrate condition: Undetermined
Bank Slope: Not applicable
Slope Height: *Left:* n.a. *Right:* n.a.

Aquatic grass bed: 10%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: 20%
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Undetermined
Adult feeding: Undetermined
Rest area: Undetermined

WATER PHYSICOCHEMISTRY

Temperature: 17.1 °C
pH: 6.22
Dissolved oxygen: 9.40 mg/L
Dissolved oxygen: 98.7%
Conductivity: 11.2 µS/cm

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: BB9A
Type of filter used: 1 filter of 5 µm
Volume filtered: 2.18 L
Species detected:
- *Margaricus*

OTHER RELEVANT INFORMATION

Wildlife observation:
A black bear den was observed to midway between the eDNA station and the helicopter landing area. It was located directly on the slope of the mountain in loose substrate.

REPRESENTATIVE PHOTOGRAPHS

General view

General view

Vegetation and pond depth

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B11

GENERAL INFORMATION

Characterization Date: August 12, 2022

Average observed width: 7 m

Average depth: 0.60 m

Flow velocity: Zero to slow

Shape: Meander

Flow type: Permanent

Underground segment: None

Special note:

Station located in a meander of the stream at a long shallow area ~7m wide with a fine substrate. This stream connects two lakes. No visible impassable obstacles.

STATION CHARACTERIZATION

Flow facies: Lentic channel

Substrate[1]: OM, L and S

Substrate condition: Presence of sediment and algae. Very soft.

Bank Slope: Low

Slope Height: *Left:* n.d.
Right: n.d.

Aquatic grass bed: 15%

Rock Shelter: None

Woody Shelter: None

Overhanging bank: None

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: Low

Adult feeding: Low

Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 12.9 °C

pH: 6.12

Dissolved oxygen: 9.64 mg/L

Dissolved oxygen: 91.4 %

Conductivity: 18.8 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B11L
Fishing effort: 15 minutes with 1 fisherman
Results:

- 1 northern pike (ESLU) caught over 30 cm

ENVIRONMENTAL DNA

Station Name: B11A

Type of filter used: 1 filter of 5 µm

Volume filtered: 2.31 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- Yellow perch (Perca flavescens – PEFL)
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view

Lake upstream

Sampled watercourse

Northern pike about 45 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B12

GENERAL INFORMATION

Characterization Date: August 12, 2022
Average observed width: 10 m
Average depth: 0.90 m
Flow velocity: Slow
Shape: Meander
Flow type: Permanent
Underground segment: None
Special note:

Meander/Lentic channel type watercourse on a muddy bottom, very present aquatic vegetation and variable depth. In the swamp, several secondary branches are present. Further downstream, observation of narrowing/acceleration of the current speed with a coarser granulometry of boulders and pebbles.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: OM, L and C
Substrate condition: Presence of aquatic plants and algae. Very soft
Bank Slope: Low
Slope Height: *Left:* 0.10 m *Right:* 0.10 m

Aquatic grass bed: 40 %
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ Non

Presence of pools: ☐ Yes ☒ Non
Potential spawning grounds: ☐ Yes ☒ Non
Habitat Potential (Brook Trout):
Nursery: Low
Adult feeding: Low
Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 12.4 °C
pH: 7.77
Dissolved oxygen: 9.36 mg/L
Dissolved oxygen: 87.0%
Conductivity: 18.8 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B12L
Fishing effort: 15 minutes with 1 fisherman
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: B12A
Type of filter used: 1 filter of 5 µm
Volume filtered: 2.32 L
Species detected:

- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Esox*
- *Burbot* (*Lotta lotta – LOLO)*
- Yellow perch (Perca flavescens – PEFL)
- *Salmonidae*

REPRESENTATIVE PHOTOGRAPHS

Aerial view

Meanders and vegetation

eDNA and physicochemistry station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B13

GENERAL INFORMATION

Characterization Date: August 12, 2022

Average observed width: 15 m

Average depth: 1.00 m

Flow velocity: Fast

Shape: Sinuous

Flow type: Permanent

Underground segment: Presence of subsurface flow in some areas through the vegetation

Special note:

Access by helicopter is very difficult, so station was moved further downstream of the proposed alignment. Mainly composed of large rapids and widening/banking areas. Possibility of waterfalls and impassable obstacles under reserve between the point of eDNA and the crossing point of the initial road. Sample taken in counter-current of rapids.

STATION CHARACTERIZATION

Flow facies: Rapid

Substrate[1]: 60 B, 20 Bx, 20 Rm and glacial deposits

Substrate condition: Clean

Bank Slope: Low

Slope Height: *Left:* 0.50 m
Right: 0.60 m

Aquatic grass bed: None

Rock Shelter: 20%

Woody Shelter: None

Overhanging bank: 5% (heaths)

Obstacle to migration: ☐ Yes ☐ No

→ To be validated, potentially upstream

Presence of pools: ☐ Yes ☒ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: High

Adult feeding: High

Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 14.6 °C

pH: 6.09

Dissolved oxygen: 10.75 mg/L

Dissolved oxygen: 105.9%

Conductivity: 20.3 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B13L - About 250 m downstream from station B13A
Fishing effort: 30 minutes with 2 fishermen
Results:

- 4 brook trout (SAFO) caught at the base of the rapids downstream (one 250 mm)

ENVIRONMENTAL DNA

Station Name: B13A

Type of filter used: 1 filter of 5 µm

Volume filtered: 3.13 L

Species detected:

- Longnose sucker (*Catostomus catostomus* – CACA)
- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- Northern pike (*Esox lucius – ESLU)*
- *Burbot* (*Lotta lotta – LOLO)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station

Succession of rapids

Basin - End of the rapid zone

Rapids

Basin

Brook trout about 25 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B16

GENERAL INFORMATION

Characterization Date: August 12, 2022
Average observed width: 1 m
Average depth: 1.00 m
Flow velocity: Zero to slow
Shape: Meander
Flow type: Permanent
Underground segment: None
Special note:

Narrow stream flowing through heaths between two mountainsides. Several side branches to the stream with a pond upstream.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1]: OM and L
Substrate condition: Presence of sediments
Bank Slope: Low
Slope Height: *Left:* 0.10 m *Right:* 0.10 m

Aquatic grass bed: 15%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: >50% (heaths)
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Low
Adult feeding: Low
Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 13.1 °C
pH: 5.69
Dissolved oxygen: 7.88 mg/L
Dissolved oxygen: 72.7%
Conductivity: 22.5 µS/cm

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B16L
Fishing effort: 10 minutes with 1 fisherman
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: B16A
Type of filter used: 1 filter of 5 µm
Volume filtered: 2.59 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Northern pike (*Esox lucius – ESLU)*

OTHER RELEVANT INFORMATION

Wildlife observation:
Former beaver facility (lodge and presence of downed trees).

REPRESENTATIVE PHOTOGRAPHS

Aerial view of the station through the mountains

Pond/ Shallow lake upstream

Stream widening

eDNA and physicochemistry station

Dense vegetation - Heaths and shrubs

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B22

GENERAL INFORMATION

Characterization Date: August 9, 2022

Average observed width: 70 m

Average depth: >1 m

Flow velocity: Moderate

Shape: Straight

Flow type: Permanent

Underground segment: None

Special note:

Station located further downstream from the initial position for helicopter accessibility. eDNA station carried out in a widening of the stream in rapids. At the time of the flyover, the stream appears to be the spillway of a lake. It is about 10 m wide with a variable flow facies; rapid zone, basin and then current flat.

STATION CHARACTERIZATION

Flow facies: Basin and rapid

Substrate[1]: 95 S and 5 B (basin)
G, B and Bx (rapid)

Substrate condition: Clean

Bank Slope: Low

Slope Height: *Left:* 0.30 m
Right: 0.45 m

Aquatic grass bed: 10%

Rock Shelter: None

Woody Shelter: None

Overhanging bank: 30% (heaths)

Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☒ Yes ☐ No

Potential spawning grounds: ☐ Yes ☒ No

Habitat Potential (Brook Trout):

Nursery: High

Adult feeding: High

Rest area: High

WATER PHYSICOCHEMISTRY

Temperature: 14.9 °C

pH: 6.21

Dissolved oxygen: 10.07 mg/L

Dissolved oxygen: 99.5%

Conductivity: 21.5 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B22L
Fishing effort: 30 minutes with 2 fishermen
Results:

- 20 brook trout (SAFO) between 200 to 300 mm captured about 50 m upstream from the eDNA station, at the base of a rapid, in the pool.

ENVIRONMENTAL DNA

Station Name: B22A

Type of filter used: 1 filter of 1,2 µm

Volume filtered: 0.98 L

Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- Lake chub (*Couesius plumbeus* – COPL)
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Coregonus*
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*
- *Salmonidae*
- *Cottus*

REPRESENTATIVE PHOTOGRAPHS

Downstream from the station

Upstream from the station

Basin

Angling station – Fisherman 1 and 2

Angling station — Cree fisherman

Brook trout about 21 cm

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B23

GENERAL INFORMATION

Characterization Date: August 9, 2022
Average observed width: 6 m
Average depth: >1 m
Flow velocity: Zero
Shape: Sinuous
Flow type: Permanent
Underground segment: None
Special note:

Upstream lake with lots of aquatic vegetation that appears shallow.

STATION CHARACTERIZATION

Flow facies: Basin and lentic channel
Substrate[1] : 78 OM, 20 S, 1 B and 1 Rm
Substrate condition: Undetermined
Bank Slope: Low
Slope Height: *Left:* 0.20 m *Right:* 0.20 m

Aquatic grass bed: 20%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: None
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Low
Adult feeding: Low
Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 15.4 °C
pH: 6.22
Dissolved oxygen: 10.12 mg/L
Dissolved oxygen: 101.3%
Conductivity: 23.7 µS/cm

OTHER RELEVANT INFORMATION

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☒ Yes ☐ No
Station Name: B23L - about 30 m upstream from station B23A
Fishing effort: 10-15 minutes with 1 fisherman
Results:

- No fish observed or caught

ENVIRONMENTAL DNA

Station Name: B23A
Type of filter used: 2 filters (1.2 µm and 5 µm)
Volume filtered: 0.69 L and 2.50 L
Species detected:

- White sucker (*Catostomus commersonii* – CACO)
- *Threespine stickleback* (*Gasterosteus aculeatus – GAAC)*
- Ninespine stickleback (*Pungitius pungitius* – PUPU)
- *Brook trout* (*Salvelinus fontinalis*– SAFO*)*

REPRESENTATIVE PHOTOGRAPHS

Aerial view - Upstream lake

Aerial view - Watercourse

eDNA and physicochemistry station

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

STATION B24

GENERAL INFORMATION

Characterization Date: : August 8, 2022
Average observed width: 2 m
Average depth: >1 m
Flow velocity: Slow
Shape: Meander
Flow type: Permanent
Underground segment: None
Special note:
Channel in a swamp.

STATION CHARACTERIZATION

Flow facies: Lentic channel
Substrate[1] : OM
Substrate condition: Covered with silt
Bank Slope: Undetermined
Slope Height: *Left:* n.d.
Right: n.d.

Aquatic grass bed: 20%
Rock Shelter: None
Woody Shelter: None
Overhanging bank: 10% (heaths)
Obstacle to migration: ☐ Yes ☒ No

Presence of pools: ☐ Yes ☒ No
Potential spawning grounds: ☐ Yes ☒ No
Habitat Potential (Brook Trout):
Nursery: Low
Adult feeding: Low
Rest area: Low

WATER PHYSICOCHEMISTRY

Temperature: 10.6 °C
pH: 5.54
Dissolved oxygen: 8.05 mg/L
Dissolved oxygen: 71.3%
Conductivity: 28.8 µS/cm

EXPERIMENTAL FISHING

Mini hoop net fishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Electrofishing: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

Angling: ☐ Yes ☒ No
Station Name:
Fishing effort:
Results:

ENVIRONMENTAL DNA

Station Name: B24A
Type of filter used: 2 filters (1.2 µm and 5 µm)
Volume filtered: 0.39 L and 2.30 L
Species detected:

- Northern pike (*Esox lucius – ESLU)*
- *Cottus*

OTHER RELEVANT INFORMATION

Observations:
Station B24A appears to be close to a snowmobile trail (signs on trees present as directions).

REPRESENTATIVE PHOTOGRAPHS

eDNA and physicochemistry station

Meander through the vegetation

Widening and vegetation

[1] OM: Organic matter, L: Silt/Clay, S: Sand (< 2mm), V: Gravel (2 to 16mm), C: Pebble (16 to 64mm), G: Cobble (64 to 256mm), B: Boulder (256 to 1024mm), Bx: Large boulder (> 1024mm) and Rm: Parent rock

APPENDIX

H ENVIRONMENTAL DNA ANALYSIS REPORT

FISH METABARCODING **RESULTS**

Order number:	NA-SO00081_SO01187
Report number:	NM-GVQ127
Company:	Nature Metrics North America
Contact:	Bernard Aubé-Maurice
Project:	Grand Alliance
Sample type:	Smith-Root filter
Date of report:	18-Nov-2022
Number of samples:	34 + 4 controls

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been metabarcoded following our eDNA survey - Fish pipeline. **A taxon-by-sample table of your samples is attached to this report (NM-GVQ127.NA-SO00081_SO01187.Fish.xlsx)**. Each row in the table represents one taxon (OTU), shown with the lowest possible taxonomic assignment based on currently available reference data. Each column represents a sample, showing the proportion of sequence reads per detected OTU. Care should be taken in interpreting the numbers in terms of relative species abundance, but a high sequence proportion can be interpreted as lending greater confidence to a detection. This report contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. It is the responsibility of the client to ensure that due consideration is given to the data and that the information is shared in a responsible way.

Here we present an overview of the key results, followed by a more detailed report that starts with the taxonomic composition of the samples followed by a more detailed look at the steps taken to extract, amplify, sequence, and analyse your DNA. A glossary for terms in bold is provided at the end of the report to define key terms used within the report.

OVERVIEW OF YOUR RESULTS

- A total of 21 taxa were detected.
- Average taxon richness was 6.97 and ranged from 1 to 14.
- Most abundant sequences: white sucker (*Catostomus commersonii*).
- Most commonly detected taxa: white sucker (*Catostomus commersonii*), ninespine stickleback (*Pungitius pungitius*) and northern pike (*Esox lucius*).

FULL REPORT

Sample composition

A total of 21 taxa were detected (**Table 1**). 66.7% (14 taxa) were at least 99% similar to a species in the global reference databases, and species names are suggested. The remaining taxa were identified to the lowest possible taxonomic level: 19% to genus (4 taxa), and the remainder to family (3 taxa). The taxa belong to 9 orders, 10 families, and 15 genera.

The average taxon richness was 6.97 and ranged from 1 ('A21A', 'A23A', and 'BB09A') to 14 ('A03A', and 'A11A'). The relative proportion of the sequences found in each of the samples is shown in **Figure 1** and **Table 1** and the diversity is summarised in **Table 2** and **Table 3**.

White sucker (*Catostomus commersonii*), which accounted for 23.9% of the total sequence reads, was among the most abundant in terms of sequences. Among the most commonly detected species were white sucker (*Catostomus commersonii*), ninespine stickleback (*Pungitius pungitius*) and northern pike (*Esox lucius*) which was detected in 24, 22 and 18 samples respectively.

Non-target vertebrate taxa were detected in 8 of the samples. Non-target taxa are shown in Figure 1 and Table 1 but are not included in the summaries of taxon diversity (Table 2 and Table 3). These non-target detections should be treated with some caution as the fish analysis may not fully capture the non-fish vertebrate community present in the samples. Common environmental contaminants such as human and livestock sequences are excluded.

High-quality fish sequence data were obtained for 30 of the 34 eDNA samples.

eDNA metabarcoding of fish was not successful for 'A24A', which failed to amplify despite troubleshooting. Sample 'B04A' produced fewer than expected target reads; results for these samples are therefore considered tentative. The remaining 2 samples, 'A22A' and 'B01A', did not produce any target reads, only common contaminant and non-target sequences were detected.

The field negative control samples failed to amplify, all laboratory controls behaved as expected.

Table 1 (attached separately). Taxon-by-sample table.

Figure 1. The proportion of the sequencing output allocated to the different taxa (rows) within each sample (columns). Each bubble per sample represents the proportion of DNA for each taxon for that sample. The size of the bubble is relative to the number of sequences from all taxa detected in that sample.

Table 2. Taxon richness among the samples.

Sample ID	Class	Order	Family	Genus	Taxa (Species)
A01A	1	7	7	5	8 (5)
A02A	1	5	6	7	8 (6)
A03A	1	7	8	10	14 (10)
A05A	1	6	7	7	10 (7)
A06A	1	6	7	7	8 (7)
A09A	1	7	8	6	10 (7)
A10A	1	7	8	7	11 (8)
A11A	1	7	8	9	14 (10)
A12A	1	5	6	4	8 (5)
A13A	1	3	3	5	6 (4)
A14A	1	4	4	5	9 (5)
A15A	1	2	2	3	3 (3)
A16A	1	4	5	7	11 (6)
A17A	1	3	4	6	6 (5)
A19A	1	4	5	5	6 (4)
A20A	1	4	4	3	4 (3)
A21A	1	1	1	1	1 (1)
A23A	1	1	1	1	1 (1)
A25A	1	2	2	2	2 (2)
B04A	1	2	3	2	3 (2)
B05A	1	6	7	6	8 (6)
B07A	1	6	7	9	11 (8)
B08A	1	6	7	7	10 (8)
B11A	1	6	6	4	7 (4)
B12A	1	5	6	5	8 (6)
B13A	1	6	7	7	11 (7)
B16A	1	2	2	2	2 (2)
B22A	1	4	5	6	9 (5)
B23A	1	3	3	4	4 (4)
B24A	1	2	2	1	2 (1)
BB09A	1	1	1	1	1 (0)

Table 3 (attached separately). The frequency of occurrence of all detected families. Numbers correspond to the number of taxa belonging to those families in those samples.

METHODS

DNA from each filter was extracted using a commercial DNA extraction kit with a protocol modified to increase DNA yields. An extraction blank was also processed for the extraction batch. DNA was purified to remove PCR inhibitors using a commercial purification kit.

Comment: DNA yields were as expected.

Purified DNAs were amplified with PCR for a hypervariable region of the 12S rRNA gene to target fish as part of the eDNA survey - Fish pipeline. Our standard analysis includes 12 replicate PCRs per sample.

All PCRs were performed in the presence of both a negative control and a positive control sample (a mock community with a known composition). Amplification success was determined by gel electrophoresis.

Comment: PCR reactions were successful for 33 of the 34 samples. Electrophoresis bands were strong and of the expected size. Sample 'A24A' failed to amplify despite troubleshooting steps. Overall, 3-12 successful PCRs replicates were obtained for each of the 33 samples submitted for sequencing. No bands were observed on electrophoresis gels for the extraction blank or negative controls.

PCR replicates were pooled and purified, and sequencing adapters were added. Success was determined by gel electrophoresis.

Comment: All samples were successfully indexed, electrophoresis bands were strong and of the expected size. No repeat reactions were necessary.

Amplicons were purified and checked by gel electrophoresis, these were then quantified using a Qubit high sensitivity kit according to the manufacturer's protocol.

Comment: All amplicons were successfully purified.

All purified index PCRs were pooled into a final library with equal concentrations. The final library was sequenced using an Illumina MiSeq V3 kit at 10.5 pM with a 20% PhiX spike in.

Sequence data were processed using a custom bioinformatics pipeline for quality filtering, OTU clustering, and taxonomic assignment.

Comment: Both negative and positive controls were as expected. Very few sequences were discarded prior to dereplication, which is indicative of high-quality data with minimal PCR and sequencing errors. A total of 2,121,002 high-quality sequences, including 2,114,732 target sequences, were included in the final dataset.

Consensus taxonomic assignments were made for each OTU using sequence similarity searches against the NCBI nt (GenBank) reference database. Assignments were made to the lowest possible taxonomic level where there was consistency in the matches. Conflicts were flagged and resolved manually. Minimum similarity thresholds of 99%, 97%, and 95% were used for species-, genus- and higher-level assignments respectively. In cases where there were equally good matches to multiple species, public records from GBIF were used to assess which were most likely to be present in Canada.

Higher-level taxonomic identifications or multiple potential identifications were reported in cases that could not be resolved in this way.

The OTU table was then filtered to remove low abundance OTUs from each sample (<0.025% or <10 reads, whichever is the greater threshold for the sample). Unidentified, non-target, and common contaminant sequences were then removed.

Note that unidentified or misidentified taxa can result from incomplete or incorrect reference databases, and taxa may be missed due to low quality DNA, environmental contaminants, or the dominance of other species in the sample.

Please note that the abundance of taxa cannot be directly inferred from the proportion of total sequence reads. While the proportion of sequence reads is a consequence of abundance, it is also impacted by biomass, activity, surface area, condition, distance from the physical sample, primer bias, and species-specific variation in the genome.

Table 4. Sample information table.

Kit ID	Sample ID	Volume filtered	Date received
NAS-01-03878	A01A	2970ml	22-Sep-22
NAS-01-03899	A02A	2660ml	22-Sep-22
NAS-01-03877	A03A	1030ml	22-Sep-22
NAS-01-03876	A05A	1130ml	22-Sep-22
NAS-01-03904	A06A	970ml	22-Sep-22
NAS-01-03872	A09A	1090ml	22-Sep-22
NAS-01-03871	A10A	2000ml	22-Sep-22
NAS-01-03870	A10A - Blanc terrain	2000ml	22-Sep-22
NAS-01-03874	A11A	2000ml	22-Sep-22
NAS-01-03873	A12A	1260ml	22-Sep-22
NAS-01-03879	A13A	2200ml	22-Sep-22
NAS-01-03882	A14A	3000ml	22-Sep-22
NAS-01-03881	A14A - Blanc terrain	2300ml	22-Sep-22
NAS-01-03880	A15A	2740ml	22-Sep-22
NAS-01-03883	A16A	1660ml	22-Sep-22
NAS-01-03884	A17A	1190ml	22-Sep-22
NAS-01-03896	A19A	1740ml	22-Sep-22
NAS-01-03895	A19A - Blanc terrain	2220ml	22-Sep-22
NAS-01-03893	A20A	2080ml	22-Sep-22
NAS-01-03894	A21A	2740ml	22-Sep-22
NAS-01-03886	A22A	2180ml	22-Sep-22
NAS-01-03890	A23A	1570ml	22-Sep-22
NAS-01-03889	A24A	2190ml	22-Sep-22
NAS-01-03888	A25A	3130ml	22-Sep-22
NAS-01-03869	B01A	2000ml	22-Sep-22
NAS-01-03900	B04A	2160ml	22-Sep-22
NAS-01-03897	B05A	2030ml	22-Sep-22
NAS-01-03898	B07A	2740ml	22-Sep-22
NAS-01-03885	B08A	1720ml	22-Sep-22
NAS-01-03905	B11A	2310ml	22-Sep-22
NAS-01-03902	B12A	2320ml	22-Sep-22
NAS-01-03903	B13A	3130ml	22-Sep-22
NAS-01-03901	B16A	2590ml	22-Sep-22
NAS-01-03892	B22A	980ml	22-Sep-22
NAS-01-03891	B23A	2490ml	22-Sep-22
NAS-01-03887	B24A	2300ml	22-Sep-22
NAS-01-03875	BB09A	2180ml	22-Sep-22
NAS-01-03906	MA - Blanc terrain	2000ml	22-Sep-22

END OF REPORT

Report issued by: **Ben Jones**

Contact: **team@naturemetrics.co.uk**

GLOSSARY

adapter	short, artificially synthesised nucleotide sequence which attaches to the ends of the target DNA or RNA sequences prior to sequencing. They are typically used to aid in attachment of the target sequence to other functional molecules/sequences.
amplicon	A DNA sequence which is the product of PCR amplification.
bioinformatics	An interface between genetics, computational biology, statistics, and programming in which DNA or other biological data is processed, analysed and integrated into research or communications.
bioinformatics pipeline	Refers to a data processing pipeline that takes the raw sequence data from high-throughput sequencing (often 20 million sequences or more) and transforms it into usable ecological data. Key steps for metabarcoding pipelines include quality filtering, trimming, merging paired ends, removal of sequencing errors such as chimeras, clustering of similar sequences into molecular Operational Taxonomic Units, and matching one sequence from each cluster against a reference database. The output is a OTU-by-sample table showing how many sequences from each sample were assigned to each OTU.
BMWP	Short for biological monitoring working party, an index that can be used to measure water quality by scoring the presence of aquatic invertebrate indicator taxa. The index is reliant on taxa that are less tolerant of polluted water bodies (e.g. Ephemeroptera, Plecoptera, Trichoptera).
BOLD	Barcode Of Life Database; a specialised database of eukaryote COI reference sequences.
contaminant sequences	The sensitivity of high-throughput sequencing of eDNA means that contamination is always a concern that needs to be minimised. The sources of contamination are threefold: Natural - Examples of natural contaminants include: frequent visitors to site, faecal discharge from predators, livestock, wastewater, and fishing bait. This type of contamination is typically unavoidable and very difficult to quantify. Sequences of this type are typically flagged and conservatively removed from the sequencing output. Typical contaminant species include cow, pig, dog, cat, sheep, etc. Sampling - Human contamination of sampling equipment can reduce the efficiency of the sequencing. This type of

	contamination can be minimised by stringent contamination protocols, such as PPE. Laboratory - Residual DNA can contaminate other samples processed at the same time in other labs. At NatureMetrics this is mitigated by a designated eDNA laboratory, strict decontamination procedures, negative controls, and good laboratory practices.
dereplication	The identification of unique sequences so that only one copy of each sequence is reported.
eBioAtlas	A global partnership between IUCN and NatureMetrics to map the world's biodiversity using DNA from water samples as a foundation for the Global Biodiversity Framework and to enable IUCN Red List Assessments.
eDNA	Short for 'environmental DNA'. Refers to DNA deposited in the environment through excretion, shedding, mucous secretions, saliva etc. This can be collected in environmental samples (e.g. water, sediment) and used to identify the organisms that it originated from. eDNA in water is broken down by environmental processes over a period of days to weeks. It can travel some distance from the point at which it was released from the organism, particularly in running water. eDNA is sampled in low concentrations and can be degraded (i.e. broken into short fragments), which limits the analysis options.
extraction blank	A DNA extraction with no sample added to assess potential contamination during the DNA extraction process.
gel electrophoresis	The process in which DNA is separated according to size and electrical charge via an electric current, while in a gel. The process is used to confirm the successful amplification of a specifically sized fragment of DNA.
high-throughput sequencing	Technology developed in the 2000s that produces millions of sequences in parallel. Enables thousands of different organisms from a mixture of species to be sequenced at once, so community DNA can be sequenced. Various different technologies exist to do this, but the most commonly used platform is Illumina's MiSeq. Also known as Next-Generation Sequencing (NGS) or parallel sequencing.
inhibitors/inhibition	Naturally-occurring chemicals/compounds that cause DNA amplification to fail, potentially resulting in false negative results. Common inhibitors include tannins, humic acids and other organic compounds. Inhibitors can be overcome by either diluting the DNA (and the inhibitors) or by additional cleaning of the DNA, but

dilution carries the risk of reducing the DNA concentration below the limits of detection. At NatureMetrics, inhibition is removed using a commercial purification kit.

invasive

Invasive species are defined using GRIIS (Global Register of Introduced and Invasive Species) which is a checklist of Introduced and Invasive species for each country. The IUCN describes an Introduced species as a species outside of its natural range and dispersal potential, and an Invasive species as an introduced species which becomes established in a habitat, is an agent of change or threatens native biological diversity.

IUCN Red List

The IUCN (International Union for the Conservation of Nature) is a global union of government and civil organisations that disseminates information to assist conservation. The IUCN Red List of Threatened Species is an inventory of the conservation status of over 100,000 species worldwide. The Red List evaluates data such as population trends, geographic range and the number of mature individuals in order to categorise species based on their extinction risk:

Extinct (EX) - No individual of this species remains alive.

Extinct in the Wild (EW) - Surviving individuals are only found in captivity.

Critically Endangered (CE) - species faces an extremely high risk of extinction in the wild. e.g. Population size estimated at fewer than 50 mature individuals.

Endangered (EN) - species faces a very high risk of extinction in the wild. e.g. Population size estimated at fewer than 250 mature individuals.

Vulnerable (VU) - species faces a high risk of extinction in the wild. e.g. Population size estimated at fewer than 10,000 mature individuals and declining.

Near Threatened (NT) - species is below the threshold for any of the threatened categories (CE, E, V) but is close to this threshold or is expected to pass it in the near future.

Least Concern (LC) - species is not currently close to qualifying for any of the other categories. This includes widespread and abundant species.

Data Deficient (DD) - There is currently insufficient data available to make an assessment of extinction risk. This is not a threat category - when more data becomes available the species may be recategorised as threatened.

Jaccard similarity index

This index is a calculation that compares two samples to see which taxa are shared and which are distinct. The higher the percentage,

	the more similar two samples are in their community composition.
metabarcoding	Refers to identification of species assemblages from community DNA using barcode genes. PCR is carried out with non-specific primers, followed by high-throughput sequencing and bioinformatics processing. Can identify hundreds of species in each sample, and 100+ different samples can be processed in parallel to reduce sequencing cost.
NCBI nt	National Centre for Biotechnology Information nucleotide database; a general reference database.
negative control	Used to determine whether PCR reactions are contaminated.
NMDS	Non-metric multidimensional scaling (NMDS) is a method that allows visualisation of the similarity of each sample to one another. The dissimilarity between each sample is calculated, taking into account shared taxa (Jaccard similarity index), and then configured into a 2D ordinal space that allows the similarity-based relationship between each sample to be plotted. Samples which are closer together are more similar to one another in terms of community composition, while samples which are further apart are less similar. This type of clustering analysis allows you to see if certain types of samples, for example, those from a particular habitat type, are more clustered together and therefore more similar to one another compared to other groups.
nucleotide	An individual unit of genetic material which, when strung together constitutes a DNA (or RNA) strand/sequence.
OTU	Operational Taxonomic Unit; similar sequences are clustered into OTUs at a defined similarity threshold. OTUs are approximately equivalent to species and are treated as such in our analyses. Species-level taxonomic assignments may or may not be possible, depending on the availability of reference sequences and the similarity between closely related species in the amplified marker. It may be possible to refine the taxonomic assignment for an OTU later as more sequences are added to reference databases.
PCR	Polymerase Chain Reaction; a process by which millions of copies of a particular DNA segment are produced through a series of heating and cooling steps. Known as an 'amplification' process. One of the most common processes in molecular biology and a precursor to most sequencing-based analyses.

positive control	Used to determine whether the PCR is working correctly.
primers	Short sections of synthesised DNA that bind to either end of the DNA segment to be amplified by PCR. Can be designed to be totally specific to a particular species (so that only that species' DNA will be amplified from a community DNA sample), or to be very general so that a wide range of species' DNA will be amplified. Good design of primers is one of the critical factors in DNA-based monitoring.
rarefaction curve	A plot showing the number of taxa as a function of the sequencing depth (number of reads). Rarefaction curves grow rapidly at first as common species are found then reach a plateau as only the rarest species remain to be detected. Rarefaction curves can provide an indication as to whether the species being studied have been comprehensively sampled.
rarefy	A normalisation technique which transforms the data to remove biases associated with uneven sampling depth (number of reads) across samples. The sampling depth of each sample is standardised to a specified number of reads (usually that of the sample with the lowest depth) by random resampling.
reference databases	Over time, the DNA sequences of many species have been compiled into publicly accessible databases by scientists from around the world. These databases serve as a reference against which unknown sequences can be queried to obtain a species identification. The most commonly accessed database is NCBI, which is maintained by the US National Institute of Health. Anyone can search for DNA sequences at https://www.ncbi.nlm.nih.gov.
richness	The total number of taxa within a sample.
rRNA	Ribosomal RNA.
SAC species	Typically the presence of these species potentially elevates the conservation status of a site to a Special Area of Conservation (SAC). Special Areas of Conservation (SACs) are strictly protected sites designated under the EC Habitats Directive.
sequence(s)	A DNA sequence is made up of four nucleotide bases represented by the letters A, T, C & G. The precise order of these letters is used to compare genetic similarity among individuals or species and to identify species using reference databases. In high-throughput sequencing analyses (e.g. metabarcoding), many identical copies of the same sequence are obtained for each species in the sample. The number of copies obtained per species is known as the number of sequence reads, and this is often -

	although not always - related to the relative abundance of the species.
SILVA	SILVA is a database of small (16S/18S, SSU) and large subunit (23S/28S, LSU) ribosomal RNA sequences for all three domains of life (Bacteria, Archaea and Eukarya).
taxon (s.) / taxa (pl.)	Strictly, a taxonomic group. Here we use the term to describe groups of DNA sequences (OTUs) that are equivalent to species. We do not use the term species because we are unable to assign complete identifications to all of the groups at this time due to gaps in the available reference databases.
taxonomy	The branch of science concerned with classification of organisms. species (s./pl.) - A group of genetically similar organisms that show a high degree of overall similarity in many independent characteristics. Related species are grouped together into progressively larger taxonomic units, from genus to kingdom. Homo sapiens (human) is an example of a species. genus (s.) / genera (pl.) - A group of closely related species. Each genus can include one or more species. Homo is an example of a genus. family (s.) / families (pl.) - A group of closely related genera. Homo sapiens is in the Family Hominidae (great apes). order (s.) / orders (pl.) - A group of closely related families. Homo sapiens is in the Order Primates. class (s.) / classes (pl.) - A group of closely related orders. Homo sapiens is in the Class Mammalia. phylum (s.) / phyla (pl.) - A group of closely related classes. Homo sapiens is in the Phylum Chordata.
UKBAP species	UK Biodiversity Action Plan species have been identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan.
UNITE	A ribosomal RNA database for identification of fungi.