Hydro Québec
TransÉnergie

Connecting the Rose Lithium-Tantalum Mine and Relocating a Segment of the 315-kV Line

Environmental Impact Statement

March 2018

Produced by
Services de communication
Hydro-Québec

Connecting the Rose Lithium-Tantalum Mine and Relocating a Segment of the 315-kV Line

Environmental Impact Statement

Hydro-Québec TransÉnergie
March 2018

This Environmental Impact Statement was prepared in accordance with Hydro-Québec's internal guidelines and the directive issued by the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MDDELCC) [Québec department of sustainable development, the environment and the fight against climate change]. It describes Hydro-Québec's project design approach, particularly in relation to community stakeholders, summarizes the many studies that have stemmed from it and explains the choices which resulted in the solution selected. Based on the environmental impact assessment process, Hydro-Québec adopted mitigation or environmental compliance monitoring measures with a view to carrying out the best possible project. This approach, which is specific to Hydro-Québec, is not a substitute for any analysis the MDDELCC may conduct under section 31.1 of the Environment Quality Act.

This is a translation of the original French text. Only the French version is official.

This study was conducted for Hydro-Québec TransÉnergie by Hydro-Québec Innovation, équipement et services partagés in collaboration with the Vice-présidence – Communications et affaires gouvernementales d'Hydro-Québec.

A detailed list of contributors is provided in Appendix A (CD-ROM).

Summary

Corporation Éléments Critiques, a mining company, plans to commission the Rose Lithium-Tantalum Mine in the Baie-James region, west of Eastmain 1 reservoir. The Rose facilities will include an open-pit tantalum and lithium mine and waste rock stack, as well as an industrial complex for processing the ore. The future pit will be located beneath the Eastmain-1–Nemiscau 315-kV double-circuit line, which connects Eastmain-1 powerhouse to Nemiscau substation. To enable the mine project to go forward, Hydro-Québec must relocate a 4.1-km segment of the Eastmain-1–Nemiscau line about four kilometres east. The relocated line segment will be supported by 13 four-leg lattice towers resembling those on the existing Eastmain-1–Nemiscau line. In addition, Corporation Éléments Critiques will build a 315/25-kV transformer substation near the Eastmain-1–Nemiscau line to supply its new facilities with electricity. Connecting the customer to the Hydro-Québec grid will require three additional 315-kV current transformers in the Eastmain-1 substation yard. Relocating the 315-kV line segment will make it possible to dismantle the decommissioned segment of the Eastmain-1–Nemiscau line, recommission a borrow pit and open a new quarry.

Overall, the impacts of relocating the segment of 315-kV line on the biophysical and human environments will be of minor significance, given the mitigation measures to be implemented. The greatest impacts on the biophysical environment will relate to the loss of forest cover in the relocated line segment's right-of-way and of potential forest wildlife habitat. Two towers will be built in wetlands, and the foundations of two others will partly encroach on these areas. The towers' presence will result in the loss of 720 m^2 of wetlands. The project will have no adverse effects on special-status plant and wildlife species, or fish habitat.

The project's main impact on the human environment will relate to the presence of the relocated line segment and right-of-way. The relocated line segment will not hinder the pursuit of traditional Cree activities in any way. In terms of landscape, views of the line from the Nemiscau–Eastmain-1 road will be sporadic and sometimes screened by forest vegetation.

Work to build the 315-kV line segment, connect the customer to the grid, dismantle a segment of the existing line and add three current transformers to the Eastmain-1 substation will be carried out in fall 2019. The cost of the work is estimated at $10 million.

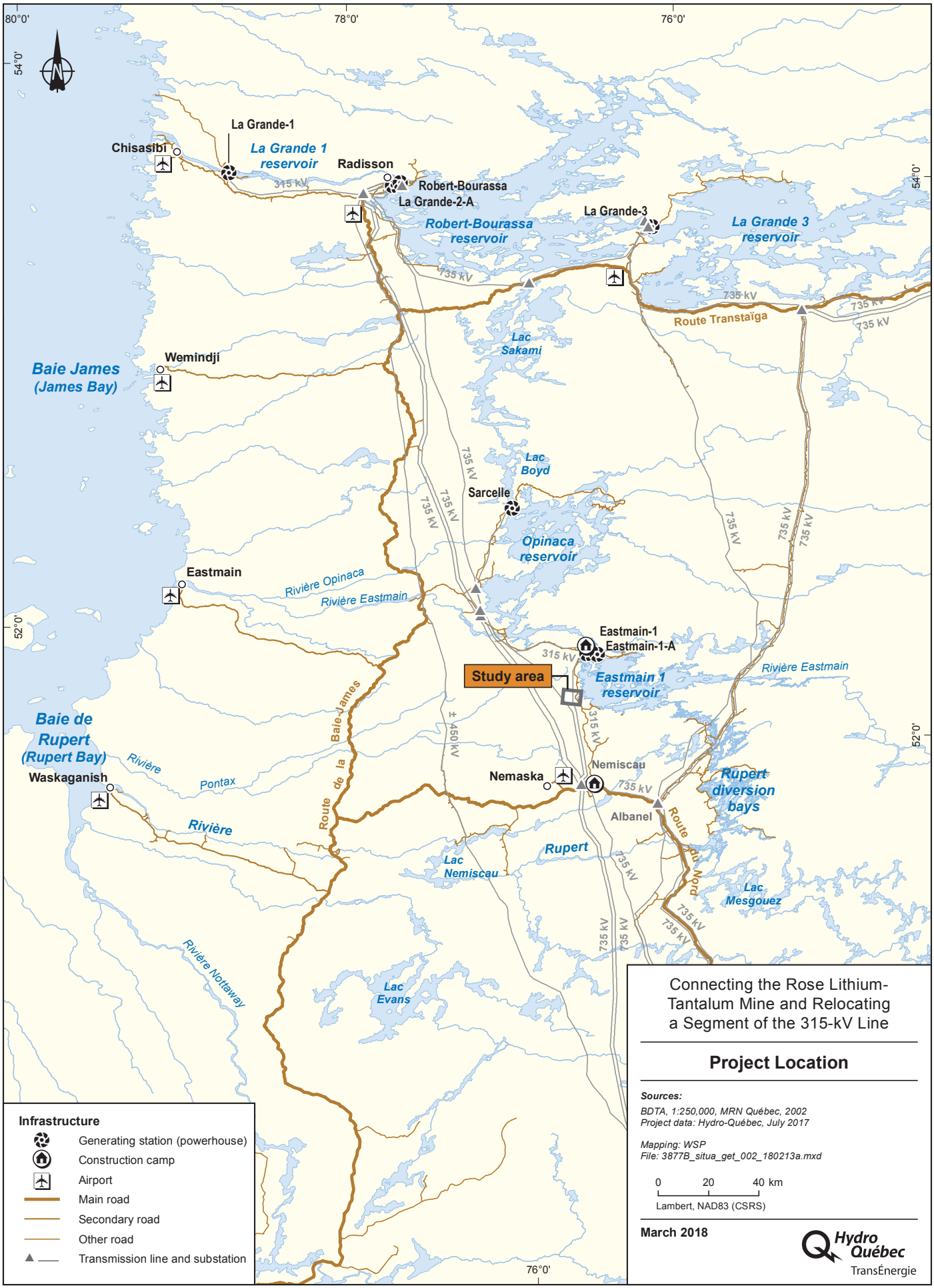


Table of Contents

Tables

Figure

Maps

Photos

Appendices on CD-ROM

1 Introduction

1.1 Proponent's presentation

Following the Québec government's adoption in June 2000 of the *Act respecting the Régie de l'énergie* (CQLR, c. R-6.01), Hydro-Québec underwent restructuring to adapt to the new regulatory framework. In addition to its TransÉnergie division created in 1997, Hydro-Québec established its Production and Distribution divisions in 2001. Though all part of the same company, the divisions are quite distinct from one another. Hydro-Québec Innovation, équipement et services partagés, the company's fourth division, was also created in 2001.

Hydro-Québec TransÉnergie is the proponent of the project to connect the Rose Lithium-Tantalum Mine and relocate a segment of the 315-kV line. TransÉnergie has mandated Hydro-Québec Innovation, équipement et services partagés to carry out the required technical and environmental studies, as well as manage the project. The following sections describe the roles and responsibilities of both Hydro-Québec divisions.

1.1.1 Hydro-Québec TransÉnergie

Hydro-Québec TransÉnergie (HQT) is responsible for the design, operation and maintenance of Québec's power transmission system. HQT's customers are Hydro-Québec Distribution (Québec's main power distributor), Hydro-Québec Production (Québec's largest power generator), and all companies that use the transmission system to wheel power traded on Québec's wholesale electricity markets and on other markets via interconnections with neighboring systems.

Operating the most extensive power transmission system in North America, this division transmits electricity to Ontario, the Maritime Provinces and several states in the northeastern United States via its interconnections and offers its customers reliable service that meets the highest standards on the continent.

HQT conducts all its activities with environmental conservation in mind and uses best practices to harmonize its facilities with the host environment. In 2016, the HQT transmission system included 536 substations, over 34,000 km of power lines at varying voltages and 15 interconnections with neighboring systems.

1.1.2 Hydro-Québec Innovation, équipement et services partagés

Hydro-Québec Innovation, équipement et services partagés (HQIESP) is mandated to carry out Hydro-Québec Production's hydroelectric development projects and HQT's substation and power line projects. HQIESP manages the engineering, supply and construction of the project structures and facilities until they are commissioned.

HQIESP is also responsible for carrying out the environmental impact assessment, conducting environmental compliance monitoring during construction, and implementing mitigation measures up to commissioning. The division thus represents Hydro-Québec TransÉnergie as project prime until the structures and facilities are transferred to HQT (the operator).

To verify that the project's actual impacts correspond to those forecast and evaluate the efficacy of the mitigation measures following commissioning, HQT assumes responsibility for the commitments undertaken during the impact assessment and carries out the appropriate environmental compliance monitoring and follow-up studies in collaboration with HQIESP.

Until the structures and facilities are transferred to the operator, HQIESP is also in charge of ensuring compliance with all project authorization conditions, which are monitored during all phases of the project, i.e., construction, commissioning and operation.

1.2 Legal context

The project to connect the Rose Lithium-Tantalum Mine and relocate a segment of the 315-kV line is subject to the environmental and social impact assessment and review procedure set out in sections 153 to 167 of the *Environment Quality Act*.

1.3 Hydro-Québec's environmental policy and guidelines

Hydro-Québec is committed to promoting the responsible use of resources and ensuring sustainable development. Through its Our Environment policy, the company sets out its focus on sustainable development and describes its strategies for improving its environmental performance.

In addition, the company has adopted a policy entitled Our Social Role, which defines Hydro-Québec as a responsible corporate citizen committed to making an effective contribution to the economic, social and cultural success of the society in which it carries out its activities.

Hydro-Québec also implements the following guidelines and procedures:

- Environmental Management Systems (DIR-07). This guideline sets out the company's requirements regarding the implementation and maintenance of an environmental management system (EMS) certified to international standard ISO 14001:2004.
- Acceptability of company activities and projects (DIR-21). This guideline stems from the commitments undertaken under the company's different policies, particularly Our Environment, Our Social Role and Our Management. It sets out the requirements for achieving the environmental, social and economic acceptability of projects and activities that have a significant environmental impact, while promoting sustainable development.
- Requirements concerning the prevention and control of pollution and nuisances (DIR-22). This is a tool the company and its officers use to carry out the due diligence and strict environmental management required to prevent pollution and nuisances and minimize their effects.
- Procedure for accidental contaminant spills (PR-DPPSE-447-01). Under existing regulations and the requirements concerning the prevention and control of pollution and nuisances, this guideline establishes the rules and procedures for mitigating the environmental impact of a contaminant spill.

Lastly, all calls for tenders issued by HQESP include the Standard Environmental Clauses (Hydro-Québec Équipement et services partagés and SEBJ, 2016), which establish mitigation measures for at-source reduction of the company’s environmental impacts (Appendix B on CD-ROM).

The Cahier des bonnes pratiques en environnement pour la construction de ligne de transport d’énergie [guide to good environmental practices in the construction of power lines] (Hydro-Québec Équipement et services partagés, 2014) outlines the construction methods and mitigation measures favored by Hydro-Québec in its power line projects.

2 Project Rationale and Description

2.1 Project rationale

Corporation Éléments Critiques, a mining company, plans to commission the Rose-Lithium-Tantalum Mine in the Baie-James region west of Eastmain 1 reservoir. The Rose facilities will include an open-pit tantalum and lithium mine and waste rock stack, as well as an industrial complex for processing the ore. Since the future pit will be located beneath the Eastmain-1–Nemiscau 315-kV double-circuit line connecting Eastmain-1 powerhouse to Nemiscau substation, a segment of the power line must be relocated. For electricity supply to its new facilities, Corporation Éléments Critiques will build a 315/25-kV transformer substation near the Eastmain-1–Nemiscau line. Since the mining company bears sole responsibility for building the substation, this Environmental Impact Statement does not provide details on the technical aspects or the impacts associated with the structure.

2.2 Project description

For the Rose Lithium-Tantalum Mine project to go forward, Hydro-Québec will need to relocate a 4.1-km segment of the Eastmain-1–Nemiscau line, which currently cuts through the future open-pit site. The relocated line segment will bypass the pit to the east, keeping a minimal distance of 500 metres from the boundaries of the planned mining site. This distance was requested by the customer and is required for the mine's operations. Hydro-Québec had considered bypassing the pit to the west, but this option was not selected due to a conflict with the mine's other infrastructure.

For electricity supply, Hydro-Québec plans to connect the mine to the 315-kV Eastmain-1–Nemiscau line. The customer will construct a 315/25-kV transformer substation at a location to be determined, west of the connection point. No new structure will be required for this connection, since the substation will be built on the existing 315-kV line. Connecting the customer to the Hydro-Québec grid will require adding three 315-kV current transformers to the Eastmain-1 substation yard.

Commissioning of the new line segment will allow for dismantling of the existing, decommissioned segment, as well as recommissioning of a borrow pit and the opening of a new quarry within the study area.

2.2.1 Construction of 315-kV line segment

2.2.1.1 Technical characteristics

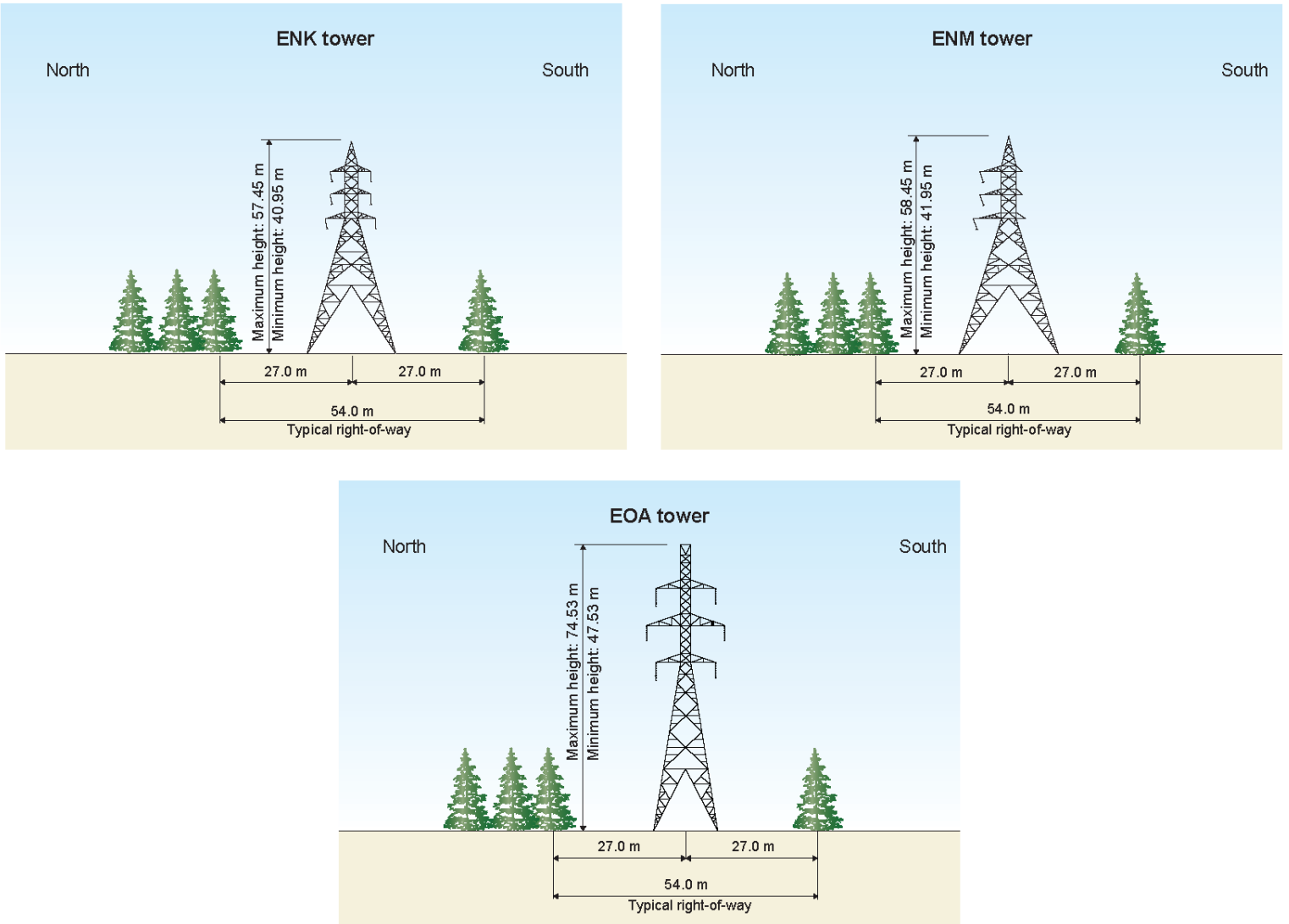
The project will involve relocating a 4.1-km segment of 315-kV double-circuit power line. The relocated segment will be supported by 13 four-leg lattice towers, i.e., two ENM angle or dead-end towers, two ENK angle or dead-end towers, and nine EOA suspension towers (Table 2-1). The towers will be between 41 m and 74.5 m tall (Figure 2-1) and spaced about 360 m apart.

The power line right-of-way will be 54 m wide, including the clearing servitude. Conductor ground clearance will be 8.1 m over most of the line segment but will increase to 14.4 m where the line crosses the Nemiscau–Eastmain-1 road.

Table 2-1: Characteristics of Planned Line Segment

Power line					
Length		4,113 m			
Number of circuits		2			
Number of conductors		12			
Conductor type		Bersfort (35.6 mm in diameter)			
Overhead ground wire		1 fibre optic cable (23 mm in diameter)			
Grounding		2 continuous counterpoise wires (5 SWG)			
Number of support structures		13			
Average span of support structures		360 m			
Total width of right-of-way		54 m			
Minimum conductor clearance: • Overall ground clearance • Over Nemiscau–Eastmain-1 road		 8.1 m 14.4 m			
Towers					
Type	Purpose	Number	Height (m)		Maximum encroachment (m)
			Minimum	Maximum	
ENK	Angle and dead end (0°-60°)	2	40.95	57.45	24.0
EOA	Suspension	9	47.53	74.53	11.6
ENM	Angle and dead end (0°-90°)	2	41.95	58.45	24.0

Figure 2-1: Typical Support Structures and Right-of-Way for Planned Line Segment



2.2.1.2 Work methods

Construction

Access and traffic strategy

During land clearing and construction, jobsite vehicles and machinery will circulate on the access roads used during construction of the Eastmain-1–Nemiscau line and the new access roads that will branch off from them, or the Nemiscau–Eastmain-1 road. However, Hydro-Québec will have to restore or upgrade the existing access roads to ensure that they can support the weight of heavy machinery and vehicles. Jobsite vehicles and machinery will also circulate in the rights-of-way of the existing power line and relocated line segment. A few bypasses will be developed wherever natural terrain-related obstacles, soil with low bearing capacity or wetlands hinder traffic within the right-of-way. In total, some 9,045 m of access roads will be built or upgraded, including approximately 900 m of access roads in wetlands, subject to section 26 of the Standard Environmental Clauses, which sets out the procedure for protecting such areas (Appendix B on CD-ROM). The access roads will be approximately 10 m wide.

Once the work is completed, the temporary access roads no longer needed during the operation phase will be decommissioned and affected wetlands restored, in accordance with section 26 of the Standard Environmental Clauses (Appendix B).

Stream crossings

Temporary bridges will be installed to allow jobsite vehicles and machinery to cross streams. The temporary bridges will be designed to span the entire width of the watercourse without hampering flow or affecting the shoreline on either side. The temporary bridge decks will be installed on fascines placed at the tops of the streambanks or on abutments. Any required abutments will be built above the high-water line. No excavation will be carried out within a stream's littoral zone. All temporary bridges will be dismantled after completion of the work.

Land clearing

Vegetation in the relocated line segment right-of-way will be cleared in summer 2019.

The land-clearing work must comply with the following general guidelines:

- The methods selected must allow for preservation of the topsoil and root systems.
- A five-metre-wide strip in the centre of the right-of-way will be thoroughly cleared to allow personnel and equipment to circulate freely. This strip must be kept free of all residue to allow for cable stringing during construction and for operation of the line.
- Wood debris will be chipped or burned.
- The height of tree stumps within the cleared area must not exceed 10 cm above the highest root.
- All trees will be felled so that they fall within the boundaries of the area to be cleared and do not damage trees adjacent to the right-of-way.

In addition, to minimize environmental impacts, vegetation clearing methods will be adapted to each type of environment encountered, especially in sensitive areas. Section 6.3.2 hereof and Section 4 of the Standard Environmental Clauses in Appendix B provide details on land-clearing methods.

Tower siting

Construction of the relocated line segment will take place from late September to mid-November 2019. All towers will be erected at least 20 metres from the buffer strips of lakes and streams. Although Hydro-Québec has been careful to site the towers so that they avoid sensitive elements, two towers (44A and 48A) will be installed in wetlands and parts of the foundations of two others (51A and 53A) will encroach on such areas (Section 6.4.1.5).

Placing the tower foundations will require excavation, backfilling and leveling. The foundation types will be selected based on the geotechnical survey results. However, an area of 300 m^2 per tower foundation has been used to calculate wetland losses. Depending on the type of soil on site, material will be required to backfill the tower foundations. The fill material will be taken from a recommissioned borrow pit and new quarry in the study area. The volume of fill required is estimated at 11,530 m^3. Following placement of the tower foundations and backfilling of the foundation pits, the surplus fill will either be spread in the right-of-way, away from wetland areas, or transported to an authorized disposal site.

The towers will be assembled next to their installation sites and then erected by crane. Worksites covering a radius of approximately 42 metres around the towers (total area of 5,500 m^2) will be required to allow for the deployment of machinery and equipment.

Details on the construction methods are provided in the *Cahier des bonnes pratiques en environnement, Construction de ligne de transport d'énergie* [guide to good environmental practices in the construction of power lines] (Hydro-Québec Équipement et services partagés, 2014).

Recommissioning of a borrow pit and opening of a new quarry

Fill will be required for the access roads and tower foundations. The material will come from a formerly used borrow pit and new quarry, both located in the study area (Pocket Insert Map A). The borrow pit will be accessed via a decommissioned, revegetated road and the quarry will be accessed via an existing road southwest of dike LE-22 at the edge of Eastmain 1 reservoir.

Worker accommodation

At its peak, the jobsite will employ some 75 workers, who are expected to be lodged in the area's existing accommodation establishments. Hydro-Québec will not build a construction camp for the project.

Operation

Repairs and maintenance

Commissioning of the relocated 315-kV line segment is slated for late November 2019.

In general, the repair and maintenance of a power line includes all operations required to ensure that it is always reliable and functioning properly. More specifically, maintenance involves implementing preventive inspection and correction measures. The crews assigned to this task generally conduct aerial or ground-level inspections of the conductors every three to five years. Depending on the nature of the failure or defect, light or heavy vehicles are used to repair or replace the defective equipment.

Vegetation control

To maintain public and worker safety and system reliability, Hydro-Québec controls vegetation in transmission line rights-of-way. The objective is to maintain low-growing vegetation (i.e., grasses and shrubs) that is compatible with power system operation and eliminate incompatible plant species (such as trees and shrubs more than 2.5 metres tall at maturity).

For this project, the same vegetation control methods as those used in the right-of-way of the existing line will apply to the right-of-way of the relocated line segment. The work will consist of mechanical control methods (selective cutting with brush cutters or chain saws) or chemical methods (selective, manual spreading of herbicides). The length of time between vegetation control operations will vary based on the growth of the forest vegetation.

2.2.2 Dismantling of the existing 315-kV line segment

A 2,425-metre segment of the Eastmain-1–Nemiscau line between towers 43 and 47 will be dismantled following construction of the relocated line segment. The work will be conducted over approximately 10 days, from mid-November to early December 2019.

The access roads used to build the relocated line segment will also be used to dismantle the existing segment.

2.2.3 Related work

Connecting the customer to the Hydro-Québec grid will require the installation of three additional 315-kV current transformers within the Eastmain-1 substation yard, 20 kilometres north of the mine site.

2.3 Project cost and work schedule

The work related to relocating a segment of the 315-kV Eastmain-1–Nemiscau line (construction and dismantling) will be carried out in fall 2019 (Table 2-2). The cost of the work, including the installation of three new current transformers at Eastmain-1 substation, is estimated at $10 million.

Table 2-2: Project Schedule

Stage	Target period
Land clearing in 315-kV line segment right-of-way	Mid-August 2019
Construction of relocated 315-kV line segment	Late September – mid-November 2019
Dismantling of existing 315-kV line segment	Mid-November – early December 2019
Commissioning of relocated 315-kV line segment	Late November 2019

3 Impact Assessment Procedure

An impact assessment for a transmission line project revolves around all the technical, economic, social and environmental aspects relating to it. Through technical and economic studies, the project's precise nature and characteristics are specified, and the optimal cost for carrying it out is determined. Environmental studies and consultations with the host community contribute to integrating the project structures and facilities into the surrounding landscape and reducing their environmental and social impacts, either through improvements to the project from the design phase, or the implementation of mitigation measures.

Once the project rationale is established, the impact assessment procedure is carried out in the following six steps:

- Project description
- Host environment
- Community relations
- Project impact assessment
- Environmental compliance monitoring and follow-up program
- Environmental overview of the project

3.1 Project description

The project description covers the characteristics of the planned structures and facilities, the methods selected to build, maintain and operate them, and the project construction schedule. This section makes it possible to identify the impacts relating to implementation of the future project structures and facilities.

Technical knowledge of the project makes it possible to target the biophysical and human environment components (including landscape) that are relevant to the impact assessment.

3.2 Host environment

In-depth knowledge of the project's host environment is crucial to developing the line route with the least impact. The inventories of the project area's biophysical and human environment components, including its specific landscape features, are based on available data and literature as well as on field surveys and information gathered from stakeholders in the host community.

3.3 Community relations

Communication activities are carried out to inform the various community stakeholders about the project and explain the rationale behind it. The objectives of such activities include explaining the procedure followed and informing and consulting the communities about the project.

Throughout the impact assessment process, Hydro-Québec holds meetings with representatives of the relevant government departments and Aboriginal authorities. It also meets with land users in the host environment to gain a better understanding of their values and concerns about the project, which may lead to a better assessment of its impacts. Hydro-Québec may also publish information brochures about the project.

3.4 Project impact assessment

The impact assessment consists in describing the project's potential impacts on each of the environment's target components, establishing the general and specific mitigation measures to be implemented, assessing residual environmental impacts and establishing compensation measures, where required. The time periods considered in the assessment are the construction and operation phases. Residual impacts are categorized by level of significance (i.e., major, moderate or minor). Mitigation measures are designed to reduce or eliminate negative impacts, and other measures can be applied to optimize positive impacts. Compensation measures may be implemented in cases where negative impacts cannot be reduced.

3.5 Environmental compliance monitoring and follow-up program

The impact assessment results in the development of an environmental monitoring program with the following objectives:

- Identify the main activities or sources of impact to be subject to environmental compliance monitoring in the field.
- Ensure that the recommendations and mitigation measures established as part of the impact assessment and set out in the tender documents are applied at the jobsites.
- Ensure compliance with the conditions and commitments established by the government authorities, and with all applicable laws and regulations.

Hydro-Québec may also set up an environmental follow-up program based on the scope of the project and the types of impacts anticipated. The follow-up program entails verifying the project's actual impact on the environment, measuring the efficacy of the specific mitigation measures applied, and implementing corrective measures, where required.

3.6 Environmental overview of the project

The environmental overview of the project constitutes the final stage of the impact assessment. The overview provides a general picture of the analysis of the project's impacts, including the mitigation and compensation measures to be implemented by Hydro-Québec.

4 Description of Host Environment

This chapter provides a general description of the project's host environment, including the study area, biophysical environment and human environment (including landscape) where the future structures and facilities will be located. Pocket Insert Map A shows the elements inventoried in the study area.

4.1 Study area

The project study area covers approximately 38 km^2. The 315-kV Eastmain-1–Nemiscau line cuts through the centre of the study area, and the Nemiscau–Eastmain-1 road runs to the east of the line (Map 4-1). A section of Eastmain 1 reservoir is included in the eastern part of the study area and the main mining facilities are in the western part.

The study area is part of the territory governed by the *James Bay and Northern Québec Agreement* (JBNQA). It is made up entirely of Category III public lands and includes an Eastmain community trapline (RE1).

The study area is characterized by hilly relief and coniferous vegetation, mainly pines. It contains wetlands, consisting mostly of open peatlands with some treed peatlands, and many lakes and rivers.

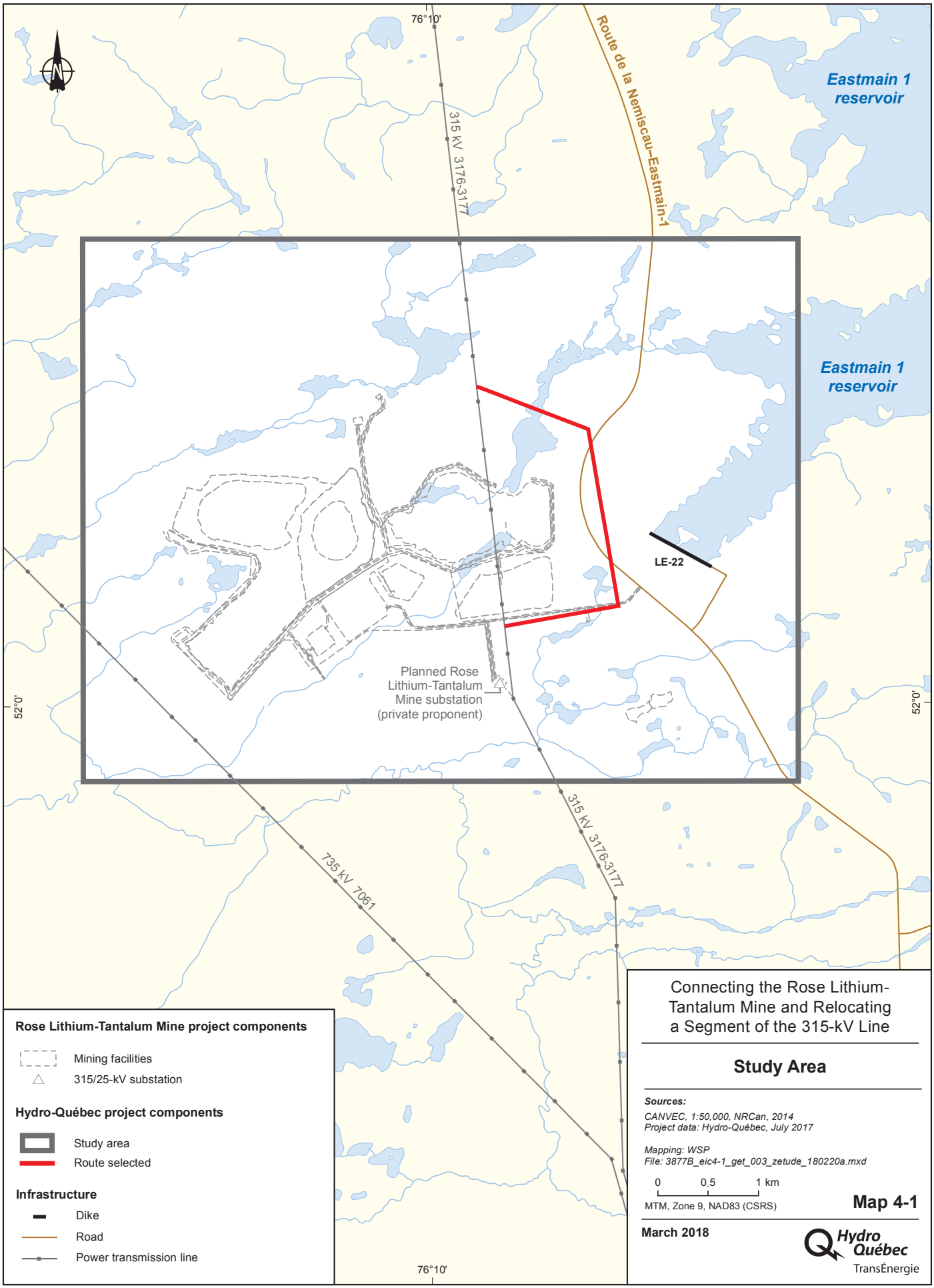
4.2 Biophysical environment

4.2.1 Methodology

Most of the information concerning the biophysical environment was taken from the environmental impact assessment carried out for the Rose Lithium-Tantalum Mine project (WSP Canada, 2017), the environmental review of the 315-kV Eastmain-1–Nemiscau transmission line (Hydro-Québec TransÉnergie, 2004), and the information obtained from the provincial and federal government Web sites in 2017. The inventory methods used are briefly described in each corresponding section of the document.

4.2.2 Local weather conditions

Weather data for the study area comes from the Grande-Rivière airport near Radisson, some 200 km northwest of the planned mining facilities (Canada, ECCC, 2017) (Project Location map).



The region has a subarctic climate (Québec, 2017*b*). Found between the 50th and 58th parallels, this type of climate is characterized by long, very cold winters, short, cool summers and little precipitation. The region's lowest temperatures are recorded in January and its highest occur in July, with respective averages of –23.2°C and 13.7°C (Table 4-1). The mean annual temperature between 1971 and 2000 was –3.1°C, which is in stark contrast with the average of 6.2°C recorded in southern Québec at Montréal–Pierre Elliott Trudeau Airport (Canada, ECCC, 2017).

Table 4-1: Normal Monthly Temperatures at Grande Rivière A Weather Station – 1971–2000

Month	Average temperature (°C)	Standard deviation (°C)	Highest temperature (°C)	Lowest temperature (°C)
January	–23.2	3.0	–18.3	–28.0
February	–21.6	3.4	–15.8	–27.4
March	–14.6	3.2	–8.2	–20.9
April	–4.9	2.6	0.7	–10.5
May	4.3	2.1	10.3	–1.6
June	10.5	2.1	17.1	3.9
July	13.7	1.4	20.0	7.4
August	12.9	1.6	18.4	7.4
September	7.4	1.7	11.6	3.1
October	1.2	1.6	4.4	–2.0
November	–6.3	2.3	–3.3	–9.4
December	–17.1	4.0	–13.0	–21.2
Annual average	–3.1	1.9	2.0	–8.3

Source: Canada. ECCC. 2017.

Annual average precipitation for the 1971–2000 period was 683.9 mm (Table 4-2). As a comparison, annual average precipitation in southern Québec is 978.9 mm (Canada, ECCC, 2017).

An average of 437.6 mm of liquid precipitation (rain and drizzle) falls in the study area every year, mostly from March to November (Table 4-2). The rainiest month is September, with an average of 100.8 mm. Annual average solid precipitation (snow, ice pellets, etc.) is 266.8 cm. Snow begins to fall in September and peaks in November, with an average accumulation of 60.8 cm. Snowfall may occur as late as June but remains significant until May (average of 11.1 cm). Relative humidity in the region varies between 65.5% and 81.1%.

Table 4-2: Normal Monthly Precipitation at Grande Rivière A weather station – 1971–2000

Month	Rain (mm)	Snow (cm)	Total precipitation (mm)
January	0.1	34.2	31.8
February	1.2	23.3	21.8
March	3.0	29.5	29.3
April	11.5	20.9	31.5
May	30.2	11.1	40.3
June	62.3	2.5	64.8
July	79.5	0.0	79.5
August	85.1	0.1	85.2
September	100.8	6.4	106.9
October	52.5	35.5	86.5
November	10.2	60.8	66.3
December	1.2	42.5	40.1
Annual average	437.6	266.8	683.9

Source: Canada. ECCC. 2017.

The region's prevailing winds are westerly (Table 4-3), but occasionally blow from the south and southwest from October to December. Average wind speed is 14.9 km/h. Gusts of up to 122 km/h occasionally blow from the west, northwest and southwest.

4.2.3 Geology, physical geography and surface material

4.2.3.1 Geology

The study area is in the northeast part of the Canadian Shield in the Superior Geological Province, which covers the Abitibi-Témiscamingue and Baie-James regions and the western part of Nunavik. The area's geological formations are among the oldest in the world. Its rocky substrate is made up of highly robust, igneous rock from the Precambrian era, including granite, granodiorite and granitic gneiss. These crystalline rocks cover the study area's entire subsurface.

Table 4-3: Wind Direction and Average Speed at Grande Rivière A Weather Station – 1971–2000

Month	Average speed (km/h)	Direction
January	14.4	West
February	13.8	West
March	14.6	West
April	14.4	West
May	15.0	West
June	15.5	West
July	14.5	West
August	14.6	West
September	15.9	West
October	16.2	South
November	16.0	Southwest
December	14.3	South
Annual average	14.9	West

Source: Canada, ECCC, 2017.

The various stages of glacial advance and retreat have resulted in the formation of a vast peneplain[1] where the bedrock is exposed in many places due to the generally thin, unconsolidated surface layer. Most of these outcrops, which are generally shaped like rolling hills or rocky ridges, are found to the south of Lac Mistumis (Hydro-Québec TransÉnergie, 2004).

4.2.3.2 Physical geography

The study area falls within the highly homogeneous physiographic region of the Eastmain Plain, also known as the Eastmain Lowland (Bostock, 1970). The region corresponds to a vast plateau which slopes gently down toward Baie James (James Bay), characterized by very little difference in elevation and bordered by hills rising 15 m to 60 m over the base level. The uniformity of this extensive area of protracted, lateral erosion is only broken in places by a well-defined quaternary morphology.[2]

[1] Low-relief plain formed by streams and rivers that have created channels and then eroded the elevated terrain between them, creating an almost featurless land surface.
[2] Recent formation of the terrain over geological time, characterized by the return of glaciations.

4.2.3.3 Surface material

The oldest stratigraphic unit in the study area is basal till, which lies in discordance[3] above the bedrock. The sediment, which was deposited in the region during the various stages of glacial flow, is largely made up of sand and boulders and is often covered by a fluvioglacial layer of sand and gravel. Basal till deposits are present throughout the study area, but are only found in valley bottoms, on flat terrain (WSP Canada, 2017).

The deposits to the east and north of the study area are mainly made up of sand and gravel. However, the till in the south part of the study area consists of ice-contact deposits[4] made up of sand or sand and gravel. This type of deposit is often an excellent source of borrow material.

Lastly, the region's most recent deposits consist of the organic materials found in a small portion of the study area. These organic deposits generally either have low bearing capacity or pose environmental challenges (WSP Canada, 2017).

4.2.4 Hydrography

Whether lacustrine or lotic, the region's hydrographic network follows the dominant structural grain of the bedrock left behind by the ice age, i.e., east–east-west or east-northeast–west-southwest. The study area straddles the drainage divide between the Eastmain and Pontax river watersheds at its northern and southern extremities, respectively.

The hydrographic network covers approximately 8% of the study area (Table 4-4) and includes some 30 lakes of varying sizes. Most of these shallow, glacial lakes are wedged into small depressions in the bedrock or enclosed by eskers or till. Eastmain 1 reservoir is the largest body of water in the northeast part of the study area.

Most of the region's rivers and water bodies have high oxygen and low mineral content (WSP Canada, 2017). Low mineral and nutrient concentrations result in low primary production (Hydro-Québec TransÉnergie, 2004).

[3] Rock formation with a surface characterized by rock strata of varying age, each of which may correspond to a period of erosion or sedimentary gap.
[4] Glacial deposit formed by the action of subglacial water as the glacier melts.

Table 4-4: Biophysical Composition of Study Area

Component	Area (ha)	Proportion of study area (%)
Terrestrial vegetation	2,233	59
Wetland	1,238	32
Hydrography	309	8
Anthropogenic events	35	1
Total	3,815	100

Source: Photointerpretation of a satellite image from 2005.

4.2.5 Vegetation

The data on the region's vegetation was taken mainly from the environmental impact assessment carried out for the Rose Lithium-Tantalum Mine project (WSP Canada, 2017). Terrestrial and wetland vegetation boundaries were established through photointerpretation of a 2005 satellite image and using black and white 1:20,000-scale photos from 2006, which were digitized to allow for onscreen viewing in 3D.

Terrestrial forest stands were classified by dominant tree species (e.g., black spruce or white birch) or by type of anthropogenic or natural disturbance (e.g., burn or brushland). Wetland polygons were distributed according to the classes and subclasses used by the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MDDELCC) [Québec department of sustainable development, the environment and the fight against climate change], i.e.: shallow water (pond), marsh, swamp and peatland (ombrotrophic (bog) or minerotrophic (fen), open or treed) (Bazoge et al., 2015). The wetland classes and boundaries were then validated during the field visits carried out for the mine project.

In June and October 2011, Hydro-Québec conducted plant inventories in and around the future mine site. A second field campaign was carried out in September 2016 to round out the data collected in 2011. To get a detailed picture of the plant species in the distinct types of terrestrial and wetland environments surveyed in the study area, a total of 81 plant inventories were conducted during the 2011 and 2016 field campaigns, and 287 control plots were validated in 2011.

For the mine connection and line segment relocation project, Hydro-Québec conducted a plant inventory in the right-of-way of the future line segment in August 2017. Section 6.4.1 provides detailed information on this inventory.

4.2.5.1 Vegetation area and bioclimatic domain

The territory under study is in the boreal vegetation area characterized by the presence of boreal coniferous and intolerant deciduous tree species. It is located near the northern limit of the spruce-moss domain that occupies the northern portion of the continuous boreal forest (Québec, MFFP, 2016*a*).

The spruce-moss bioclimatic domain is largely made up of black spruce (*Picea mariana*), which either grow in pure stands or with companion species, including some conifers. Certain deciduous species such as paper birch (*Betula papyrifera*), are well adapted to this domain. The heath-dominated undergrowth contains few herbaceous plants, and the ground is covered with moss (Québec, MFFP, 2016*a*).

The spruce-moss domain is divided into two subdomains based on precipitation, i.e., west and east. The west subdomain, where the study area is located, receives less precipitation than the east. This means that the west subdomain has a shorter fire cycle, and fire remains the major factor at work in the forest dynamics there (Québec, MFFP, 2016*a*).

4.2.5.2 Terrestrial vegetation

Terrestrial vegetation covers close to 60% of the study area, excluding the river system and wetlands (Table 4-5), and consists mainly of clustered conifer stands (nearly 45% of the study area). The tree layer is mostly made up of jack pine (*Pinus banksiana*), black spruce and white spruce (*Picea glauca*). The shrub layer mainly consists of mountain alder (*Alnus alnobetula subsp. crispa*), lambkill (*Kalmia angustifolia*), Labrador tea (*Rhododendron groenlandicum*), lowbush blueberry (*Vaccinium angustifolium*) and two willow species (*Salix humilis* and *Salix planifolia*). The herbaceous layer is sparse and not very diversified.

Scattered, mixed coniferous or deciduous forests represent approximately 10% of the total study area. The tree layer in these stands consists mainly of jack pine, paper birch, quaking aspen (*Populus tremuloides*), and black and white spruce. The main shrub species are lambkill, blueberry (*Vaccinium angustilium* and *Vaccinium myrtilloides*), Labrador tea, bush willow (*Salix humilis*) and mountain alder. The sparse herbaceous later consists mainly of bog willowherb (*Epilobium leptophyllum*), bunchberry (*Cornus canadensis*), false lily-of-the-valley (*Maianthemum canadense*), common oak fern (*Gymnocarpium dryopteris*) and lady fern (*Athyrium filix-femina*).

Table 4-5: Terrestrial Vegetation in the Study Area

Vegetation	Area (ha)	Proportion of total study area [a] (%)
Coniferous forest	1 714.6	44.9
Mixed coniferous or deciduous forest	378.3	9.9
Deciduous forest	79.6	2.1
Brushland	37.0	1.0
Regenerating burn	18.9	0.5
Plantation	4.7	0.1
Total	2,233.1	58.5

a. The study area covers 3,815 ha.

Source: Photointerpretation of a satellite image from 2005.

The rare, deciduous forests occupying approximately 2% of the study area consist of birch stands concentrated in the northeast part of the territory. These stands are dominated by paper birch and sometimes contain quaking aspen, black spruce and jack pine. Their shrub layer consists of mountain alder and some species of heath, including Labrador tea and lowbush blueberry. The herbaceous plants often found in these forests are bunchberry, northern starflower (*Lysimachia borealis*) and false lily-of-the-valley.

Brushland covers 1% of the study area. It is found in power line rights-of-way, where vegetation is maintained at the shrub and herbaceous stage. The species present include balsam poplar (*Populus balsamifera*), jack pine, lambkill and mountain alder. Herbaceous plants are sparse and consist mainly of false lily-of-the-valley, bog willowherb and several grasses.

Some 20 small, regenerating burns cover less than 1% of the study area. Whether anthropogenic or natural in origin, forest fires are common episodic phenomena here due to the region's relatively dry climate and the presence of moss and lichens, which are particularly conducive to the spread of fire. These areas are dominated by a shrub layer and a moss layer made up of lichens. The shrub layer consists mainly of heath growing with small black spruce and jack pine. Grasses are generally sparse.

Lastly, the study area contains a borrow pit that was used during construction of the Eastmain-1 hydroelectric development and then decommissioned and revegetated. Borrow pits are usually revegetated with mountain alder or jack pine, planted in rows or clusters. The borrow pit is located south of the Nemiscau–Eastmain-1 road.

4.2.5.3 Wetlands

Wetlands occupy a relatively substantial proportion (about 32%) of the study area (Table 4-6). They cover large areas to the west of Eastmain 1 reservoir and at the study area's northwestern extremity (WSP Canada, 2017). In addition to using the data from the inventories carried out for the mine project, Hydro-Québec conducted a characterization study of the wetlands in the planned line segment's right-of-way in summer 2017. The results of the study are covered in Section 6.4.1.5.

Table 4-6: Wetlands in the Study Area

Wetland type	Area (ha)	Proportion of total study area [a] (%)
Open ombrotrophic peatland (open bog)	815.8	21.4
Treed ombrotrophic peatland (treed bog)	352.9	9.2
Treed swamp	32.0	0.8
Shrub swamp	30.8	0.8
Marsh	2.4	0.1
Treed minerotrophic peatland (treed fen)	2.3	0.1
Shallow water (pond)	0.8	< 0.1
Open minerotrophic peatland (open fen)	0.6	< 0.1
Total	1,237.61	32.4

a. The study area covers 3,815 ha.

Source: Photointerpretation of a satellite image from 2005.

There are eight classes of wetland: open ombrotrophic peatland (open bog), treed ombrotrophic peatland (treed bog), open minerotrophic peatland (open fen), treed minerotrophic peatland (treed fen), treed swamp, shrub swamp, marsh, and shallow water (pond).

Open bog

Open ombrotrophic peatlands, or open bogs, cover more than 20% of the study area (Table 4-6). The open bog's tree layer is made up mainly of black spruce and tamarack (*Larix laricina*), and occasionally contains a few jack pines. The shrub layer also contains these species but is dominated by leatherleaf (*Chamædaphne calyculata*) accompanied by Labrador tea, lambkill and swamp laurel (*Kalmia polifolia*). The herbaceous layer contains several species of sedge, including few-seeded sedge (*Carex oligosperma*), mud sledge (*Carex limosa*), three-seeded sedge (*Carex trisperma*) and few-flowered sedge (*Carex pauciflora*), although three-leaved false Solomon's seal (*Maianthemum trifolium*) and cloudberry (*Rubus chamæmorus*) are also often found there. The moss layer essentially consists of lichens, moss and sphagnum.

Treed bog

Treed ombrotrophic peatlands (treed bogs) cover about 9% of the study area (Table 4-6). Their tree layer is dominated by black spruce but also contains tamarack and, less frequently, jack pine. The shrub layer consists of leatherleaf, Labrador tea, lambkill and black spruce, along with speckled alder (*Alnus incana subsp. rugosa*). The species found in the generally sparse herbaceous layer include cloudberry, three-seeded sedge and woodland horsetail (*Equisetum sylvaticum*). At ground level, the moss layer is made up of sphagnum with sparse patches of moss and lichens.

Open fen

There is an open minerotrophic peatland (open fen) northwest of tower 50A, at the intersection of the Nemiscau–Eastmain-1 road and the future line segment (Pocket Insert Map A). The fen was not visited as part of the field surveys conducted for the mine project since no activity was anticipated there at the time.

Treed fen

Two treed minerotrophic peatlands (treed fens) were identified in the study area: one near the open bog and another near the plantation south of the Nemiscau–Eastmain-1 road. Their treed layer is dominated by tamarack and black spruce in equal measure. Their dense shrub layer is made up mainly of leatherleaf, sweet gale (*Myrica gale*), tamarack and Labrador tea. Their sparse herbaceous layer chiefly consists of cloudberry, three-seeded sedge, meadow rue (*Thalictrum pubescens*) and boreal bog sedge (*Carex magellanica subsp. irrigua*). The sphagnum-dominated moss layer covers the entire fen.

Treed swamp

Most of the treed swamps are found in the southwest part of the study area. Covering nearly 32 ha, they represent 0.8% of the territory (Table 4-6). The tree layer in these swamps is dominated by tamarack, along with black spruce. The shrub layer is generally dense, with speckled alder, sweet gale, Labrador tea and black spruce as the dominant species. The herbaceous layer is mostly made up of sheathed sedge (*Carex vaginata*), bluejoint (*Calamagrostis canadensis*), bunchberry and three-seeded sedge.

Shrub swamp

There are small shrub swamps scattered throughout the study area. In total, they cover about 30 ha or 0.8% of the entire territory (Table 4-6). Their tree layer is almost nonexistent, containing only sparse tamarack and black spruce. The shrub layer is dominated by sweet gale, mountain alder, glandular birch (*Betula glandulosa*) and leatherleaf. The moderately dense herbaceous layer consists mainly of sedge species (*Eriophorum vaginatum subsp. spissum*, *Carex pauciflora, Carex magellenica subsp. irrigua* and *Carex echinata*) and meadow rue. These species grow in association with low rough aster (*Eurybia radula*), bog goldenrod (*Solidago uliginosa*), narrow-leaved gentian (*Gentiana linearis*) and Canada mannagrass (*Glyceria canadensis*).

Marsh

There is a marsh covering approximately 2 ha at the southwest extremity of the study area (Table 4-6). This wetland was not visited as part of the field surveys conducted for the mine project since no activity was anticipated there at the time.

Shallow water (pond)

A few small ponds (shallow water with aquatic grass beds) were identified in the study area (Table 4-6). These wetlands are mainly made up of submerged, floating and emergent plant species growing in shallow water. The most frequent and abundant species found here are pondweeds (*Potamogeton spp*.), variegated pond-lily (*Nuphar variegata*), sedges (*Carex oligosperma* and *Carex limosa*) and green-fruited burreed (*Sparganium emersum*). The ponds also contain clumps of shrub species such as leatherleaf and sweet gale.

4.2.5.4 Special-status plant species

The Centre de données sur le patrimoine naturel du Québec (CDPNQ) [Québec natural heritage data centre] has not identified any species that are threatened, vulnerable or likely to be so designated in the study area (CDPNQ, 2017). However, 11 species are likely to be monitored as a result of a review of the documentation on special-status plant species potentially present in the region (Brouillet et al., 2010; Labrecque et al., 2014). Table 4-7 provides a list of these species, their status in Québec, their habitat type and the likelihood of their presence in the study area. It should be noted that none of these species are designated as “special-status” in Canada.

Table 4-7: Special-Status Plant Species Potentially Present in the Study Area

English name	Scientific name	Status in Québec [a]	Habitat type	Likelihood of presence
Largeleaf avens	*Geum macrophyllum* var. *perincisum*	S	Glades, thickets and wet meadows, and along forest roads and sandy banks.	Low
Slenderleaf sundew	*Drosera linearis*	S	Fens and marly lake flats, usually in limestone environments.	Low
Ojibway waterwort	*Elatine ojibwayensis*	S	River and stream banks, deep water or periodically exposed substrate, and marshes.	Low
Robinson's hawkweed	*Hieracium robinsonii*	S	Rocky or clayey shores, dry rocks and sandy fill, often near rapids or waterfalls.	Very low
Wooly beach-heather	*Hudsonia tomentosa*	S	Jack pine glades on sand dunes or terraces, coastal dunes and heaths, and sandy shores.	Low
Roundleaf monkeyflower [b] or James' monkeyflower	*Mimulus glabratus* [b] or *Erythranthe glabrata* [c]	M	Cold sources and stream banks, always in calm water and in areas prone to the formation of peat.	Very low
Purple meadow-rue	*Thalictrum dasycarpum*	S	Peaty shores, glades and wet meadows.	Low
Little-tree willow	*Salix arbusculoides*	S	Lake shores, along streams and fens.	Very low
MacCalla's willow	*Salix maccalliana*	S	Wet meadows, sparse forests, treed or shrub bogs and fens, and marly or pebbly shores.	Very low
False mountain willow	*Salix pseudomonticola*	S	Treed bogs and fens, flood plains and sparse forests.	Low
Twin-stemmed bladderwort	*Utricularia geminiscapa*	S	Bog pools, calm and stagnant water in ponds and lakes.	Low

a. According to the MDDELCC (Québec, MDDELCC, 2017a): M: espèce menacée au Québec [threatened species in Québec]; S: espèce susceptible d'être désignée menacée ou vulnérable au Québec [species likely to be designated as threatened or vulnerable in Québec].

b. Name used in the *Regulation respecting threatened or vulnerable plant species and their habitats*.

c. According to VASCAN nomenclature (Brouillet et al., 2010).

Sources: Brouillet et al., 2010; Labrecque et al., 2014.

The study area contains abundant pine and spruce forests and dry, exposed areas. Most of these environments are unsuitable for special-status plant species due the lack of exposed, sandy soil and dunes, and because the forest stands are less than 30 years old. In addition, there are few to no exposed or dewatered shorelines, rocky shores near rapids, wet meadows or open minerotrophic or marly[5] peatlands in the study area. For these reasons, the likelihood that the 11 species listed in Table 4-7 are present there is low to very low.

[5] Describes soil containing a certain proportion (35% to 65%) of sedimentary rock made up of clay and limestone.

Neither the inventories conducted for the Rose Lithium-Tantalum Mine project, nor the inventory carried out by Hydro-Québec in August 2017 along the route of the planned line segment revealed any special-status plant species. The results of the latter inventory are provided in Section 6.4.1.6.

4.2.5.5 Non-native invasive plant species

The plant inventories conducted for the mine project revealed the presence of reed canary grass (*Phalaris arundinacea*, unidentified variant) in five places in the study area. The two largest colonies were found along the Nemiscau–Eastmain-1 road and in the right-of-way of the existing 315-kV line (circuits 3176-3177), and covered areas of 3,000 m^2 and 90 m^2, respectively. The other colonies covered less than 2 m^2 each. Reed canary grass was part of the seed mixture used to revegetate the areas disturbed by construction of the Eastmain-1 hydroelectric development. Seeding was carried out along the Nemiscau–Eastmain-1 road in 2004.

4.2.5.6 Plant species traditionally valued by the Crees

Based on the information obtained from the Cree communities in 2002 and 2003 as part of the impact assessment carried out for the Eastmain-1-A/Sarcelle/Rupert project, the Rupert diversion bays contain 40 plant species likely to be used by the Crees for traditional, medicinal, food or other purposes (Table 4-8) (Hydro-Québec production, 2004). Twenty-eight of these species were observed in the study area during the plant inventories conducted for the Rose Lithium-Tantalum Mine project (Section 6.4.1.5). The inventory carried out by Hydro-Québec in the planned line segment right-of-way confirmed the presence of 15 species, and the possible presence of three more, likely to be used by the Crees (Table 4-8). These species are generally common throughout the region.

Table 4-8: Plant Species Traditionally Valued by the Crees

French name	Common French name	English name	Scientific name	Occurrence [a]	Presence in study area confirmed
Trees					
Bouleau blanc	Bouleau blanc	White birch	*Betula papyrifera*	30	X [b,c]
Épinette noire	Black spruce	Black spruce	*Picea mariana*	73	X [b,c]
Mélèze laricin	Épinette rouge	Tamarack	*Larix laricina*	37	X [b,c]
Peuplier faux-tremble	Tremble	Quaking aspen	*Populus tremuloides*	15	X [b,c]
Pin gris	Cyprès	Jack pine	*Pinus banksiana*	52	X [b,c]
Sapin baumier	Sapin	Balsam fir	*Abies balsamea*	1	
Shrubs					
Airelle à feuilles étroites	Bleuet	Sweet blueberry	*Vaccinium angustifolium*	50	X [b,c]
Airelle des marécages	Bleuet	Alpine bilberry	*Vaccinium uliginosum*	25	
Andromède glauque	Andromède	Bog rosemary	*Andromeda polifolia* var. *glaucophylla*	39	X [b,c]
Aulne crispé	Aulne vert	Mountain alder	*Alnus viridis ssp. crispa*	38	X [c]
Aulne rugueux	Verne	Speckled alder	*Alnus incana ssp. rugosa*	40	X [b,c]
Cassandre caliculé	Faux-bleuet	Leatherleaf	*Chamædaphne calyculata*	48	X [b,c]
Cerisier de Pennsylvanie	Petit merisier	Pin cherry	*Prunus pensylvanica*	24	X [c]
Cornouiller stolonifère	Hart rouge	Red osier	*Cornus sericea*	21	
Gadellier glanduleux	Gadellier	Skunk-currant	*Ribes glandulosum*	15	X [c]
Gadellier lacustre	Gadellier	Swamp black currant	*Ribes lacustre*	2	
Gaulthérie hispide	Petit thé des bois	Creeping snowberry	*Gaultheria hispidula*	13	
Groseillier hérissé	Fausse-épine	American gooseberry	*Ribes hirtellum*	7	X [b]
Kalmia à feuilles d'andromède	Kalmia	Swamp laurel	*Kalmia polifolia*	31	X [b]
Kalmia à feuilles étroites	Crevard de moutons	Lambkill	*Kalmia angustifolia*	62	X [b,c]
Petit atoca	Atoca	Cranberry	*Oxycoccus microcarpus*	24	
Rhododendron du Groenland	Labrador tea	Labrador tea	*Rhododendron groenlandicum*	56	X [b,c]
Saule à feuilles de poirier	Saule	Balsam willow	*Salix pyrifolia*	23	X [c]
Saule à feuilles planes	Saule	Willow	*Salix planifolia*	13	X [b,c]
Saule brillant	Saule	Shining willow	*Salix lucida*	3	
Saule de Bebb	Chaton	Long-beaked willow	*Salix bebbiana*	15	X [c]
Saule humble	Saule	Bush willow	*Salix humilis*	28	X [c]

Table 4-8: Plant Species Traditionally Valued by the Crees *(cont.)*

French name	Common French name	English name	Scientific name	Occurrence [a]	Presence in study area confirmed
Saule pédicellé	Saule	Bog willow	*Salix pedicellaris*	15	X [c]
Saule satiné	Saule	Silky willow	*Salix pellita*	8	
Sorbier d'Amérique	Cormier	American mountain ash	*Sorbus americana*	1	X [c]
Sorbier plaisant	Cormier	Mountain ash	*Sorbus decora*	16	
Viorne comestible	Pimbina	Mooseberry	*Viburnum edule*	19	X [c]
Grasses					
Berce très grande	Grande berce	Cow parsnip	*Heracleum lanatum*	13	
Cornouiller du Canada	Bunchberry	Bunchberry	*Cornus canadensis*	21	X [b,c]
Menthe des champs	Menthe	Common mint	*Mentha arvensis*	20	
Ményanthe trifolié	Trèfle d'eau	Buckbean	*Menyanthes trifoliata*	12	
Pigamon pubescent	Pigamon	Meadow rue	*Thalictrum pubescens*	5	X [b,c]
Ronce pubescente	Catherinette	Dwarf raspberry	*Rubus pubescens*	17	X [b,c]
Sarracénie pourpre	Petits cochons	Pitcher plant	*Sarracenia purpurea*	8	X [c]
Typha à feuilles larges	Quenouille	Common Cattail	*Typha latifolia*	24	X [b]

a. Number of occurrences is based on number of sampling points (n = 107).
b. Species confirmed in right-of-way during plant inventories conducted by Hydro-Québec in August 2017.
c. Species confirmed in study area during plant inventories conducted for Rose Lithium-Tantalum Mine project.

Source: Hydro-Québec Production, 2004.

4.2.6 Wildlife

4.2.6.1 Mammals

To characterize the use of the study area by mammals, Hydro-Québec used the following main sources of information:

- Data from a sector-based study conducted in 2012 and 2016 for the Rose Lithium-Tantalum Mine project. The study focused specifically on micromammals but also cited opportunistic use by other mammal species.
- Data on special-status species from the Ministère des Forêts, de la Faune et des Parcs du Québec (MFFP) [Québec department of forests, wildlife and parks] and the CDPNQ.
- Published scientific articles and reports on mammal species in the project area or their biology.

4.2.6.1.1 Large wildlife

The study area is likely used by three large wildlife species: moose (*Alces alces*), black bear (*Ursus americanus*) and caribou (*Rangifer tarandus caribou*).

Moose

The wildlife inventories of birds, reptiles and amphibians and micromammals conducted for the mine project in 2012 and 2016 revealed evidence of moose (scat and tracks) in the study area.

Moose density in hunting zone 22, which encompasses the study area, is among the lowest in Québec at approximately 0.5 moose per 10 km^2 (Morin, 2015). The exhaustive inventory of a 5,669-km^2 area, which includes the study area, carried out as part of a follow-up study for the Eastmain-1 hydroelectric development in the winter of 2007–2008 established moose density at 0.66 per 10 km^2 (Del Degan, Massé et Associés, 2008). Trapline RE1, which also includes the study area, was shown to have a density of 0.94 moose per 10 km^2, which is higher than the value obtained during the 2008 inventory.

Some 156 moose were harvested in zone 22 between 2013 and 2016 (Québec, MFFP, 2016*b*). In addition, based on information provided by the Cree Trappers' Association (2017), hunters from the community of Eastmain harvested an average of 30.6 moose a year from 2012 to 2016.

The low moose density in Québec's boreal region is essentially due to the lack of productive habitat. Moose distribution depends mainly on the availability of suitable habitat and food, and the study area contains very little of the species' preferred habitat, i.e., mixed forest, hardwood stands and shrub swamp (Prescott and Richard, 1996). During calving season, moose tend to seek out the shores of lakes and rivers, coniferous forests and hilltops (Chekchak et al., 1997), all of which are present in the study area.

Caribou

Caribou in the study area fall into two ecotypes: migratory and woodland. Migratory (or barren-ground) caribou are the more social of the two and are associated with the tundra. They live in large herds with strong migratory behavior, such as the Rivière George and Rivière aux Feuilles herds. Caribou in the second, woodland ecotype are shyer and relatively sedentary. In winter, they form small, isolated herds that remain confined to specific regions north of the 49th parallel such as the Rivière Eastmain watershed. Woodland caribou seek open formations exposed to the wind, such as lichen-covered spruce stands, large peatlands and barren plateaus with abundant food (sedges, lichens, bushes and grasses) (Hydro-Québec TransÉnergie, 2004).

The study area lies in an area that overlaps the ranges of both woodland caribou and Rivière aux Feuilles migratory caribou (Couturier et al., 2004). Individuals from both ecotypes are likely to be present in the study area. Those from the migratory group likely only frequent the area in winter, whereas those of the woodland ecotype may use it all year.

Woodland caribou

Woodland caribou have double protection status, as follows:

- Following recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2002), woodland caribou became a threatened species in Canada under the *Species at Risk Act* in June 2003.
- The species was designated as vulnerable in Québec in February 2005 under the *Act respecting threatened or vulnerable species* (Order in Council 75-2005) (Publications du Québec, 2005).

Woodland caribou from the local Nottaway herd, which frequents the region north of Matagami, are the ones most likely to be found in the study area. According to the working group for the recovery of woodland caribou created under the Comité scientifique – Nord-du-Québec [scientific committee for the Nord-du-Québec region], the Nottaway herd had an estimated population of 137, 50, 26 and 17 caribou in 2003, 2007, 2009 and 2011, respectively. Given its range of approximately 36,400 km^2, the herd's density was estimated at 0.1 woodland caribou per 100 km^2 in 2011 (Rudolph et al., 2012).

Based on MFFP data (Québec, MFFP, 2017*a*), no recent occurrences of woodland caribou have been reported in the study area. However, the MFFP states that the species has previously been observed approximately 3 km south of the study area.

Regarding the Rose Lithium-Tantalum Mine project, the MFFP's Direction de la gestion de la faune du Nord-du-Québec [Nord-du-Québec wildlife management division] provided information on the caribou inventories and telemetric surveys conducted within a 50-km radius of the planned mine (WSP Canada, 2017). The data shows that during the 2005–2009 period, when these observations were recorded, the number of caribou with active tracking collars was 11 to 18 in the Assinica herd and three to six in the Nottaway herd. There were no location points in the study area, the closest to the planned mine site being approximately 8 km away. It is important to note that collar tracking data does not constitute an exhaustive portrait of the use of the territory by all caribou.

Several authors acknowledge that when choosing their habitat, woodland caribou seek out peatlands and mature coniferous forests containing lichens, as well as other lichen-rich areas (Équipe de rétablissement du caribou forestier du Québec, 2008). They are also known to avoid recently disturbed environments (Moreau et al., 2012), although they do occasionally adapt to six-to-forty-year-old forest stands that are in the process of regenerating after felling or forest fires, especially in spring (Hins et al., 2009). In summer, woodland caribou mainly frequent coniferous forests more than 50 years old (Lantin, 2003; Courbin et al., 2009; Hins et al., 2009), peatlands and dry barrens (lichen heaths).

Migratory caribou

The overall situation of the Rivière aux Feuilles caribou herd is of concern. Based on inventories conducted in May and July 2011, the MFFP estimated the herd's population at 430,000 caribou. However, the department's analysis of the more recent inventories carried out between July 28 and August 2, 2016 revealed that the number of Rivière aux Feuilles caribou had dropped to 199,000 (Québec, MFFP, 2016*c*). Although migratory caribou have no special protection status, COSEWIC considers that the recent data from the Species at Risk Public Registry designates the migratory caribou as an endangered species (Canada, 2017).

Monitoring of migratory caribou survival and recruitment confirms that the Rivière aux Feuilles herd has been declining in recent years, particularly due to the low survival rate of fawns, males and females (Québec, MFFP, 2016*c*). In collaboration with the Comité conjoint de chasse, de pêche et de piégeage [joint committee on hunting, fishing and trapping] and its main wildlife management partners, the MFFP is currently developing a management plan for this herd. In December 2016, the department announced new regulations, which include prohibiting the sport hunting of migratory caribou in Québec as of February 1, 2018, for an indeterminate period. As stipulated in the *Paix des Braves* agreement, Aboriginal communities will be able to continue harvesting caribou for their own needs and will monitor and manage their hunting and harvesting activities (Québec, MFFP, 2016*d*).

The number of migratory caribou in the study area is considered low (Équipe de rétablissement du caribou forestier du Québec, 2008). The data obtained from the MFFP indicates that 11 Rivière aux Feuilles migratory caribou with tracking collars had crossed into the study area during the 2010–2015 period, including seven in 2010, two in 2013, one in 2014 and one in 2015. All these occurrences were recorded in the winter, between December 1 and January 6. The caribou stayed in the area for 2 to 16 days (Québec, MFFP, 2016*c*). As is the case for woodland caribou, there were no location points in the study area. Almost all the location points were more than 25 km from the future mine site (WSP Canada, 2017).

Black bear

The presence of black bear in the study area was confirmed through sightings and other evidence such as tracks and scat. Note that the Aboriginal communities have the exclusive right to hunt and trap black bear. According to the Cree Trappers' Association (2017), the community of Eastmain harvested an average of 12.6 black bear per year between 2012 and 2016.

The study area provides rich potential habitat for black bear because of its wetlands, deciduous and mixed shrublands and old burns, which are rich sources of food. Black bear also shelter in spruce forests (Prescott and Richard, 1996; Samson, 1996).

4.2.6.1.2 Fur-bearing animals and small wildlife

Depending on their ranges, there are likely to be several fur-bearing and small wildlife species in the study area (Table 4-9). The inventories conducted for the mine project in 2012 and 2016 confirmed the presence of six species, including American beaver, red squirrel, river otter, gray wolf, muskrat and red fox (WSP Canada, 2017).

Table 4-9: Fur-Bearing and Small Wildlife Species Present or Potentially Present in the Study Area

English name	Scientific name	Presence in study area confirmed
Least weasel	*Mustela nivalis*	
American beaver	*Castor canadensis*	X
Red squirrel	*Tamiasciurus hudsonicus*	X
Northern flying squirrel	*Glaucomys sabrinus*	
Ermine	*Mustela erminea*	
Snowshoe hare	*Lepus americanus*	
Gray wolf	*Canis lupus*	X
River otter	*Lontra canadensis*	X
Lynx	*Lynx canadensis*	
Woodchuck	*Marmota monax*	
American marten	*Martes americana*	
Striped skunk	*Mephitis mephitis*	
American porcupine	*Erethizon dorsatum*	
Common muskrat	*Ondatra zibethicus*	X
Red fox	*Vulpes vulpes*	X
American mink	*Mustela vison*	

Sources: Prescott and Richard, 1996; WSP Canada, 2017.

4.2.6.1.3 Micromammals

Based on the documentation consulted, 14 small mammal species may be present in the study area (Québec, MDDEP, 2006; Desrosiers et al., 2002) (Table 4-10).

An inventory focusing mainly on the southern bog lemming and rock vole, both of which are likely to be designated threatened or vulnerable in Québec, was carried out for the mine project in September 2016. Victor and pitfall traps were installed near the future mine site, along eight transects[6] in habitat areas suitable for both species (WSP Canada, 2017). The inventory confirmed the presence of six small mammal species, i.e., southern red-backed vole, meadow vole, masked shrew, pygmy shrew, deer mouse and meadow jumping mouse. Masked shrew and southern red-backed vole made up more than 80% of all captures (WSP Canada, 2017).

Table 4-10: Small Mammal Species Present or Potentially Present in the Study Area

Order	Species		Presence in study area confirmed
	English name	Scientific name	
Rodents	Southern red-backed vole	*Clethrionomys gapper*	X
	Meadow vole	*Microtus pennsylvanicus*	X
	Rock vole [a]	*Microtus chrotorrhinus*	
	Northern bog lemming	*Synaptomys borealis*	
	Southern bog lemming [a]	*Synaptomys cooperi*	
	Heather vole	*Phenacomys intermedius*	
	Deer mouse	*Peromyscus maniculatus*	X
	Meadow jumping mouse	*Zapus hudsonius*	X
	Woodland jumping mouse	*Napœozapus insignis*	
Insectivores	Star-nosed mole	*Condylura cristata*	
	Arctic shrew	*Sorex arcticus*	
	Masked shrew	*Sorex cinereus*	X
	American water shrew	*Sorex palustris*	
	Pygmy shrew	*Sorex hoyi*	X

a. Species likely to be designated threatened or vulnerable in Québec.

Sources: Québec, MDDEP, 2006; Québec, MFFP, 2017*a*; Desrosiers et al., 2002; WSP Canada, 2017.

[6] Each transect contained 20 Victor traps baited with peanut butter and two pitfall traps containing approximately 10 cm of water. A pitfall trap was placed at either end of each transect and the Victor traps were spaced 10 metres apart. The traps were inspected daily to check for captures, open traps that had been triggered but were empty, and re-bait the traps as needed (WSP Canada, 2017).

4.2.6.2 Birds

The general description of bird life is based on the data from the Québec Breeding Bird Atlas (QBBA, 2017), the bird inventory conducted for the mine project during nesting season in 2012, and observations made during other wildlife inventories also carried out for the mine project in 2012 and 2016 (WSP Canada, 2017).

Waterfowl and raptors were surveyed by helicopter, and the transect method was used to survey wetland and shore birds. In total, 17 transects were established in the mine project study area.

For the inventory of land-based birds, 108 listening stations were set up in four types of habitat in the study area, i.e., conifer-lichen, conifer-sphagnum, mixed and deciduous forests. The birds were counted using the fixed-radius point count (FRPC) method, which consists in counting all birds seen or heard from a fixed point within a specific radius and during a given period (Bibby et al., 1992; Ralph et al., 1995). All bird sightings by observers moving between listening stations were also recorded. In addition, four evening listening stations were set up to check for the presence of the common nighthawk, a special-status species. These stations were also used to listen for the different owl species.

During the inventory, the observers paid special attention to the birds' behavior to determine their breeding status (confirmed, probable or possible) in accordance with QBBA codes. Probable breeders corresponded to pairs of birds observed in their breeding habitat or birds whose behavior may have indicated the presence of an occupied nest nearby, whereas birds simply observed in their breeding habitat were recorded as possible breeders.

In total, 85 bird species were inventoried in the study area and surrounding locations. Six of these species—the peregrine falcon, short-eared owl, bald eagle, common nighthawk, olive-sided flycatcher and rusty blackbird—have special status in Québec or Canada (Appendix C on CD-ROM and Section 4.2.6.6).

Waterfowl and other aquatic birds

In total, 23 species of waterfowl and aquatic birds were identified in the study area (Appendix C). The dominant species, i.e., the common merganser, hooded merganser, American black duck, green-winged teal and Canada goose, were found to be the same as those generally observed in the Baie-James region. Out of all species inventoried, two were recorded as confirmed breeders, 11 as probable breeders and seven as possible breeders. The other three species (the great blue heron, ring-billed gull and herring gull) were observed but not classified, since they nest on islands in Eastmain 1 reservoir (Morneau et al., 2010).

Raptors

Seven species of raptor were identified in the study area (Appendix C). A breeding pair of osprey were found nesting on a platform Hydro-Québec had installed at the edge of Eastmain 1 reservoir, in a bay near dike LE-22. The red-tailed hawk, great horned owl and short-eared owl were recorded as possible breeders. The rough-legged hawk, peregrine falcon and bald eagle were observed in the study area but not classified.

Land birds

In total, 45 species of land birds were identified in the study area, including six confirmed breeders, 10 probable breeders and 28 possible breeders. The rusty blackbird was observed but not classified.

The average species richness of forest birds proved to be similar in the various types of habitat, i.e., conifer-lichen or conifer-sphagnum stands and deciduous and mixed stands. The denser species included the white-throated sparrow in all types of forest stands, the palm warbler in coniferous and mixed stands, the magnolia warbler and Wilson's warbler in deciduous stands, the dark-eyed junco in conifer-lichen stands, the ruby-crowned kinglet in conifer-sphagnum stands and the yellow-rumped warbler in mixed stands.

The main species of land birds associated with open wetlands were Lincoln's sparrow, swamp sparrow, palm warbler and dark-eyed junco.

4.2.6.3 Fish

Most of the data used to characterize the study area's fish populations and their habitat was taken from the inventories conducted for the mine project in 2011 and 2016, which focused on five lakes, five rivers and one bay in Eastmain 1 reservoir. The inventories were carried out using experimental nets and bait traps in Eastmain 1 reservoir and portable electrofishing equipment in the rivers, in accordance with the standard methods set out in the Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures (Québec, MRNF, 2011) [guidelines for the standardization of fish inventory methods in inland waters]. The data obtained from the MFFP was used to round out the list of species present or potentially present in the study area (Québec, MFFP, 2017*a*).

Lastly, in August 2017, Hydro-Québec conducted a characterization study of the rivers crossed by the relocated line segment right-of-way. The presence of fish (confirmed through visual observation) and potential spawning habitat areas were recorded during the study.

Based on the MFFP data (Québec, MFFP, 2017*a*), there are likely 23 fish species in the study area, the presence of 12 of which was confirmed by the inventories conducted for the mine project (Table 4-11).

Table 4-11: Fish Species Present or Potentially Present in the Study Area

English name	Scientific name	Presence in study area confirmed
Mottled sculpin	*Cottus bairdii*	X
Slimy sculpin	*Cottus cognatus*	X
Lake cisco	*Coregonus artedi*	
Walleye	*Sander vitreus*	X
Brook stickleback	*Culæa inconstans*	
Ninespine stickleback	*Pungitius pungitius*	
Lake sturgeon	*Acipenser fulvescens*	
Logperch	*Percina caprodes*	
Northern pike	*Esox lucius*	X
Lake whitefish	*Coregonus clupeaformis*	X
Burbot	*Lota lota*	X
Lake chub	*Couesius plumbeus*	X
Round whitefish	*Prosopium cylindraceum*	
White sucker	*Catostomus commersonii*	X
Longnose sucker	*Catostomus catostomus*	
Pearl dace	*Margariscus margarita*	X
Longnose dace	*Rhinichthys cataractæ*	X
Blacknose dace	*Rhinichthys atratulus*	
Brook trout	*Salvelinus fontinalis*	X
Trout-perch	*Percopsis omiscomaycus*	
Fallfish	*Semotilus corporalis*	
Yellow perch	*Perca flavescens*	X
Lake trout	*Salvelinus namaycush*	

Sources: WSP Canada, 2017; Québec, MFFP, 2017*a*.

Moreover, 11 potential spawning grounds were identified in the study area, including six at or near the mouths of lake tributaries in areas containing many aquatic and riparian grass beds, which provide potential reproduction and rearing habitat for northern pike and yellow perch. Four other spawning grounds likely to attract brook trout were found along a few rivers at the study area's southern extremity (Pocket Insert Map A). Hydro-Québec also identified a potential brook trout spawning ground during the field surveys it conducted in a river that crosses the planned line segment (Section 6.4.1.9.4).

According to the MFFP, Eastmain 1 reservoir's river system is lake sturgeon habitat (WSP Canada, 2017). In fact, as part of the Eastmain-1 hydroelectric development project, Hydro-Québec implemented a program to stock lake sturgeon in the reservoir. The results of the follow-up studies show that the lake sturgeon stocking program was successful (Hydro-Québec Équipement et services partagés, 2014).

Note that the Aboriginal communities have the exclusive right to harvest lake sturgeon, lake whitefish, burbot and white sucker, as stipulated in the *Act Respecting Hunting and Fishing Rights in the James Bay and New Québec Territories*.

4.2.6.4 Reptiles and amphibians

The data on reptiles and amphibians came from the MFFP (Québec, MFFP, 2017*a*) and from an inventory conducted for the mine project in 2016 during their active period (late May to early September). The inventory of frogs and toads was carried out using automated recording equipment (MagnétoFaunes[7]). In accordance with the Bouthillier et al. (2015) method, the recorders were installed at several stations near potential breeding habitat areas, i.e., along the shores of water bodies and wetlands where frogs and toads are likely to mate and lay their eggs.

The inventory of salamanders focused mainly on forest species. The method consisted in conducting active searches by disturbing the species' natural shelters (i.e., rocks, stumps, debris, etc.). This method was also used to inventory snakes, in addition to putting artificial shelters in place (asphalt shingles), as recommended by the MFFP (Larochelle et al., 2015). In total, 147 artificial shelters were installed along six transects at the edges of wetlands and watercourses near the planned mining facilities.

According to the MFFP data, the study area is likely to contain 11 species of reptiles and amphibians. The inventory conducted for the mine project confirmed the presence of seven of them, i.e., six amphibian species and one reptile species (Table 4-12), none of which has special status in Québec.

A study of the boreal chorus frog (a species likely to be designated threated or vulnerable in Québec) revealed that this species is more likely to frequent coastal areas and has not been seen in the inland boreal forest (Ouellet et al., 2009).

[7] The MagnétoFaune is a programmable, automated animal vocalization recorder which, once installed in the biophysical environment, can function autonomously for several weeks. In particular, the device make it possible to conduct inventories in remote locations that are often difficult to access at night. The data collected by the device is stored on a memory card, which is then analyzed.

Table 4-12: Reptile and Amphibian Species Present or Potentially Present in the Study Area

English name	Scientific name	Presence in study area confirmed
Amphibians		
American toad	*Anaxyrus americanus*	X
Wood frog	*Lithobates sylvaticus*	X
Mink frog	*Lithobates septentrionalis*	X
Northern leopard frog	*Lithobates pipiens*	
Green frog	*Lithobates clamitans*	X
Northern spring peeper	*Pseudacris crucifer*	X
Boreal chorus frog [a]	*Pseudacris maculata*	
Two-lined salamander	*Eurycea bislineata*	X
Blue-spotted salamander	*Ambystoma laterale*	
Yellow-spotted salamander	*Ambystoma maculatum*	
Reptiles		
Common garter snake	*Thamnophis sirtalis*	X

a. Species likely to be designated threatened or vulnerable in Québec (Québec, MFFP, 2017*b*).

Sources: AARQ, 2017; Desroches and Rodrigue, 2004; Hydro-Québec Production, 2004; Nemaska Lithium, 2013.

4.2.6.5 Bats

The information concerning bats stemmed from the MFFP data obtained for this impact assessment (Québec, MFFP, 2017*a*) and the Rose Lithium-Tantalum Mine project (Québec, MFFP, 2017*c*), as well as from the Réseau québécois d'inventaires acoustiques de chauves-souris (RQIACS) [Québec network of acoustic inventories of bats] for the Nord-du-Québec region (Jutras and Vasseur, 2011).

Based on the available data on bats in Québec (Jutras et coll., 2012), the study area is likely to contain five of the eight bat species present in Québec (Table 4-13). The study area lies at the northern limit of the geographical range of the hoary bat, northern long-eared bat, red bat and big brown bat. Only the little brown bat's range extends farther north.

Based on RQIACS data, the dominant species in the Nord-du-Québec region are the hoary bat (54.7% of recordings from 2003 to 2009) and bats of the *Myotis* genus (39.6% of recordings) (Jutras and Vasseur, 2011). The data obtained from the MFFP for the mine project confirmed the presence of the little brown bat and northern long-eared bat in the study area (Québec, MFFP, 2017*c*). The MFFP data also revealed that the hoary bat, red bat and big grown bat had been sighted more than 50 km from the mine project study area.

Table 4-13: Bat Species Potentially Present in Nord-du-Québec Region

English name	Scientific name	Migratory or resident species
Hoary bat [a]	*Lasiurus cinereus*	Migratory
Northern long-eared bat [b]	*Myotis septentrionalis*	Resident
Red bat [a]	*Lasiurus borealis*	Migratory
Big brown bat	*Eptesicus fuscus*	Resident
Little brown bat [b]	*Myotis lucifugus*	Resident

a. Species likely to be designated threatened or vulnerable in Québec (Québec, MFFP, 2017*b*).
b. Endangered species in Canada under Schedule 1 of the *Species at Risk Act* (Canada, 2017).

Source: WSP Canada, 2017.

The hoary bat and red bat are migratory species, while the other three are considered resident species in Québec (Prescott and Richard, 1996). In summer, riparian environments are particularly important for these insectivores (Menzel et al., 2005). The nearby lakes, rivers, streams and swamps are abundant sources of insects and water, and the adjacent forest areas provide daytime roosts for arboreal bats (McDuff et al., 1999).

According to the MFFP's regional office, there are no known bat nursery colonies or hibernation sites within a 10-km radius of the planned mine. The office also states that all known nursery colonies in the region are on buildings such as hunting camps, construction camp buildings or Cree dwellings. This is likely due to the lack of large-diameter trees in the region's forests (WSP Canada, 2017).

It should be noted that certain bat populations have declined significantly in Québec, particularly since the appearance of white-nose syndrome (WNS) in many hibernation sites, which has led to high mortality among hibernating bats (Canada, ECCC, 2015). This is the case with the northern long-eared bat and little brown bat, both of which are now listed as endangered species in Canada under Schedule 1 of the *Species at Risk Act*. The hoary bat and red bat are likely to be designated threatened or vulnerable in Québec (Section 4.2.6.6).

4.2.6.6 Special-status wildlife species

Based on the field inventories carried out for the mine project and the MFFP data relating to the Hydro-Québec project, there are 16 special-status wildlife species in the study area. Table 4-14 describes the status and typical habitat of each species.

Table 4-14: Special-Status Wildlife Species Present or Potentially Present in the Study Area

English name	Scientific name	Status		Typical Habitat	Presence in study area confirmed
		Québec [a]	Canada [b]		
Large wildlife					
Woodland caribou	*Rangifer tarandus caribou*	V	T	Peatlands, mature coniferous forests containing lichens, and other lichen-rich environments.	
Micromammals					
Rock vole	*Microtus chrotorrhinus*	S	—	Rocky habitat in mature mixed or coniferous forests, wet microhabitat, transition and disturbed environments.	
Southern bog lemming	*Synaptomys cooperi*	S	—	Wetlands (peatlands, glades and mossy rocks).	
Birds					
Golden eagle	*Aquila chrysætos*	V	—	Nests on cliffs and rocky slopes; hunts in open areas (peatlands, marshes and tundra).	
Harlequin duck	*Histrionicus histrionicus*	V	SC	Large rivers at heads of river basins. Feeds in rapids in such rivers.	
Common nighthawk	*Chordeiles minor*	S	T	Coniferous forests with or without deciduous trees. Nests in several types of open habitat with no vegetation (burns, beaches, deforested areas, rocky outcrops and barrens).	X
Anatum peregrine falcon	*Falco peregrinus anatum*	V	SC	Nests on cliffs; hunts in open areas (rivers and streams, shorelines, marshes, beaches, mudflats, etc.).	X
Short-eared owl	*Asio flammeus*	S	SC	Open habitats (open peatlands and sandy riparian areas)	X
Olive-sided flycatcher	*Contopus cooperi*	S	T	Open habitats (swamps and burns) featuring perches (trees or large snags).	
Canada warbler	*Wilsonia canadensis*	S	T	Wet woodland with a dense deciduous shrub layer and trees that can be used as perches.	
Bald eagle	*Haliæetus leucocephalus*	V	—	Mature forests near large water bodies.	X
Rusty blackbird	*Euphagus carolinus*	S	SC	Wetland shores.	X
Bats					
Hoary bat	*Lasiurus cinereus*	S	—	Treed and semi-treed areas. Hunts over glades and water bodies; roosts on trees (snags).	
Northern long-eared bat	*Myotis septentrionalis*	—	E	Boreal forest. Roosts and rears young on arboreal or rocky structures, and buildings.	
Red bat	*Lasiurus borealis*	S	—	Spruce-moss forests.	
Little brown bat	*Myotis lucifugus*	—	E	Riparian, forest or anthropogenic environments. Rests and rears young on arboreal or rocky structures, and buildings.	

a. According to MFFP (Québec, MFFP, 2017*b*): V: espèce vulnérable [vulnerable species]; S: espèce susceptible d'être désignée menacée ou vulnérable [species likely to be designated threatened or vulnerable].
b. According to Schedule 1 of the *Species at Risk Act* (Canada, 2017): T: threatened species; SC: species of special concern; E: endangered species.

Sources: Canada, 2017; Desrosiers et al., 2002; Duhamel and Tremblay, 2013; Québec, MFFP, 2017*a*, 2017*b* and 2017*c*; WSP Canada, 2017.

Large wildlife

Sightings of woodland caribou have been reported near the study area, which suggests that the species may sporadically frequent the region. Woodland caribou seek out peatlands, mature coniferous forests containing lichens, and other lichen-rich environments (Équipe de rétablissement du caribou forestier du Québec, 2008; Hydro-Québec TransÉnergie, 2004). Although they tend to avoid recently disturbed environments (Moreau et al., 2012), they sometimes adapt to six-to-forty-year-old forest stands that are regenerating following felling or fire, particularly in spring (Hins et al., 2009). In the summer, woodland caribou are found mainly in coniferous forests more than 50 years old (Lantin, 2003; Courbin et al., 2009; Hins et al., 2009), as well as peatlands and dry barrens (lichen heaths).

Micromammals

Rock vole

The rock vole seeks out rocky habitat in mature mixed or coniferous forests, as well as wet microhabitat in transition zones and disturbed environments (Duhamel and Tremblay, 2013). Mature forest stands are rare in the study area. Potential habitat for this species is found mainly along the edges of a few spruce-sphagnum stands next to rivers or streams. Given that the inventories conducted for the mine project adequately covered the rock vole's potential habitat but that no occurrence of it was reported, the potential presence of this species in the study area is considered low.

Southern bog lemming

Southern bog lemmings normally live in wetlands with abundant vegetation, where the soil is covered with a thick humus layer. They are found in sphagnum- and heath-dominated peatlands, grassy marshes and nearby wet, mixed forests. The species also frequents glades created by tree felling and mossy rocks (Desrosiers et al., 2002). Although potential habitat for the southern bog lemming consists mainly of open peatlands, it is considered low in the study area. No southern bog lemmings were found during the inventories carried out for the mine project.

Birds

Golden eagle

These birds of prey seek out wide-open spaces. Golden eagles usually nest on cliff ledges and hunt in relatively open environments such as peatlands, marshes and tundra. They normally frequent mountainous areas dotted with valleys and canyons with steep, rocky slopes (Québec, MFFP, 2017*b*). No golden eagles were sighted in the study area, which is devoid of steep, rocky slopes.

Harlequin duck

Harlequin ducks spend most of the year in coastal areas (Canada, 2017). In spring, they move inland to mate near large streams or clear, fast-flowing rivers at the heads of river basins and feed in the fast-flowing stretches of these rivers. No harlequin ducks were found in the study area, which does not contain any rivers providing suitable habitat for them. Moreover, the study area is located south of the species' breeding ground (COSEWIC, 2013).

Common nighthawk

The common nighthawk nests on the ground in a wide variety of open, unvegetated habitat areas such as dunes, beaches, burns, deforested areas, rocky outcrops, rocky barrens, peatlands, marshes, and the shores of lakes and rivers. The species is also found in coniferous forests with or without deciduous trees (Québec, MFFP, 2017*b*). A few nighthawks were seen at the edges of lakes and along a road in the central part of the study area, as well as at dike LE-22. It is likely that the common nighthawk nests in the study area.

Peregrine falcon

Peregrine falcons hunt in wide-open spaces such as water bodies, rivers, marshes and beaches, since these areas provide good visibility and make it easier for the falcons to pursue and capture their prey. They prefer to nest on cliffs, particularly when they are next to a water body (Québec, MFFP, 2017*b*). The study area does not contain any suitable nesting habitat for the species. One, obviously migrating peregrine falcon, was seen at the edge of a large lake east of the existing 315-kV line (circuits 3176-3177).

Short-eared owl

The short-eared owl has long been associated with marshland. It also frequents other types of open environments such as sandy riversides and peatlands. It avoids deep forest and nests on the ground in open areas (Québec, MFFP, 2017*b*). One short-eared owl was seen in the southwest part of the study area. It is possible that this species nests there.

Olive-sided flycatcher

Olive-sided flycatchers seek out relatively open habitat featuring perches that provide them with an unobstructed view of their surroundings. They usually perch on standing dead trees, sparse crowns and dead limbs on live trees. They are found mainly in coniferous or mixed forests. In the study area, the most suitable habitat for the species is in or near wetlands (Québec, MFFP, 2017*b*). Although no olive-sided flycatchers were identified during the inventory, the study area does contain potential habitat for the species.

Canada warbler

Depending on where it is in its range, the Canada warbler breeds in a variety of environments but most often does so in wet forests containing a dense deciduous shrub layer, a complex understory, and trees it can use as perches (Canada, 2017). Although no occurrences of the species were reported, it may, nonetheless, be present in the study area.

Bald eagle

Bald eagles prefer to nest in large trees in mature forests near major stretches of water (i.e., large lakes, fast-flowing rivers and vast reservoirs), and are also found on islands (Québec, MFFP, 2017*b*). They usually build their nests less than 200 m from water bodies with abundant fish. Although one bald eagle was seen in the study area, it is unlikely that the species nests there, due to the lack of mature forest.

Rusty blackbird

The rusty blackbird nests in the boreal forest, where it seeks out the shores of wetland environments such as slow-flowing streams, peatlands, marshes, swamps and beaver ponds. In woodland areas, it rarely ventures deep into the forest. Most rusty blackbirds migrate to the United States for the winter, although a very small number overwinter sporadically in the southern parts of most Canadian provinces. Rusty blackbirds have been seen in the study area and, given their breeding environment, it is possible that the species nests there (Canada, 2017).

Bats

Hoary bats

Although the hoary bat's range extends to the spruce-moss forest domain, the species is rare in Québec. Hoary bats usually inhabit woodland and semi-woodland areas and mainly hunt moths over glades and water bodies. They roost in trees in the summer and, in the fall, they migrate south to overwinter in the United States and the Caribbean (Québec, MFFP, 2017*a*). No hoary bats were identified in the study area.

Northern long-eared bat and little brown bat

The northern long-eared bat and little brown bat are both resident species in Québec. They stay in their feeding and breeding grounds until fall when they move to their hibernation sites, which are usually located in caves or old mine shafts. Northern long-eared bats are found almost exclusively in the boreal forest, while little brown bats frequent a wider variety of habitats including riparian, forest and anthropogenic environments. In summer, both species may be found in arboreal structures (i.e., natural or woodpecker-generated holes in trees, cracks under tree bark, etc.), buildings, or rocky structures they use as roosts or nursery sites (WSP Canada, 2017). Neither species was seen in the study area.

Red bats

Like the hoary bat, the red bat is a migratory species. Its range in Québec extends to the spruce-moss forest domain. During the daytime in summer, red bats generally rest by hanging upside down from a tree branch or bush. At night, they hunt for insects like beetles, grasshoppers, moths and flies. Around early September, they migrate as a group to southern climes where temperatures almost never go below freezing, returning to our regions in late May (Québec, MFFP, 2017*b*). No red bats were seen in the study area.

4.2.7 Protected areas

The study area contains no protected wildlife habitat as defined in the *Act respecting the conservation and development of wildlife* and the *Regulation respecting wildlife habitats*, other than the rivers, streams and water bodies which make up the fish habitat (Québec, MFFP, 2017*a*). There are no plans to designate any protected areas in the study area or surrounding region (Québec, MDDELCC, 2017*b*).

4.3 Human environment

4.3.1 Methodology

The information used to describe the human environment was taken in large part from the impact assessment conducted for the Rose Lithium-Tantalum Mine project (WSP Canada, 2017). Online information published by the governments of Québec and Canada, the Eeyou Istchee James Bay Regional Government and the Weh-Sees Indohoun Corporation was also consulted in September 2017. Other studies, including those carried out by Hydro-Québec for the Eastmain-1 hydroelectric development project, also helped complete the description of the human environment.

The archaeological data was taken from a study of archaeological potential conducted by (2016) for the Rose Lithium-Tantalum Mine project.

The method used for the landscape inventory and analysis was based on Hydro-Québec's *Méthode d'étude du paysage pour les projets de lignes et de postes de transport et de répartition* (1992) [landscape study method for power line and transmission and distribution substations] and the *Méthode d'analyse visuelle pour l'intégration des infrastructures de transport* [visual analysis method for the integration of transmission infrastructure] of Québec's Ministère des Transports, de la Mobilité durable et de l'Électrification des transports du Québec [department of transport, sustainable mobility and transportation electrification] (Gaudreau et al., 1986). The landscape descriptions in the impact assessment were also used in the analysis of the landscape affected by the mine project (WSP Canada, 2017).

4.3.2 Administrative framework and land tenure

The study area lies within the Nord-du-Québec administrative region, which encompasses towns, northern villages and Cree communities. Various management methods apply to the region's territories, depending on whether they are north of the 55th parallel, in the territory of the Kativik Regional Government, or south of it, in the territory of the Eeyou Istchee James Bay Regional Government (EIJBRG) (Québec, 2017*a*). The study area is in the territory of the EIJBRG (Map 4-2).

Established in 2014, the EIJBRG is the only regional government in Québec. The territory it manages encompasses the following (Map 4-3) (EIJBRG, 2017):

- The nine Nord-du-Québec Cree communities of Chisasibi, Eastmain, Mistissini, Nemaska, Oujé-Bougoumou, Waskaganish, Waswanipi, Wemindji and Whapmagoostui
- The four Baie-James municipalities of Chibougamau, Chapais, Lebel-sur-Quévillon and Matagami
- The three Baie-James communities of Valcanton, Radisson and Villebois

Connecting the Rose Lithium-Tantalum Mine and Relocating a Segment of the 315-kV Line

Nord-du-Québec

Sources:
BDGA, 1:5,000,000, NRCan, 2010

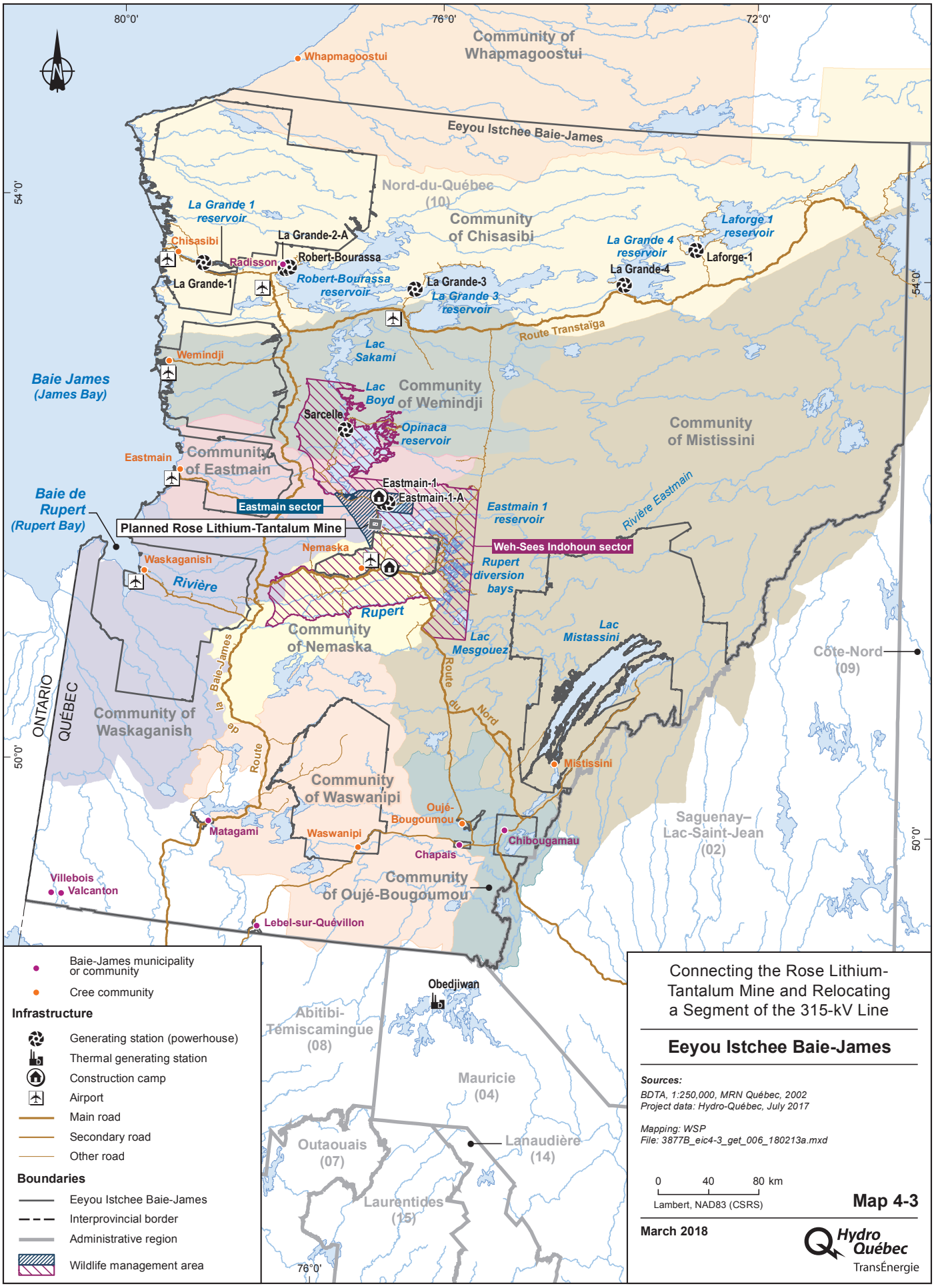
Mapping: WSP
File: 3877B_eic4-2_get_005_nord_qc_180213a.mxd

0 90 180 km
Lambert, NAD83 (CSRS)

Map 4-2

March 2018

Hydro Québec TransÉnergie



Document for information purposes only. For any other use, please contact Géomatique at Hydro-Québec Innovation, équipement et services partagés.

The Cree communities are each administered by a band council and together, are governed by the Grand Council of the Crees. The regional and government bodies represented in each community are the Cree Regional Authority, the Cree Trappers' Association, the Cree Nation Youth Council and the Cree Hunters and Cree Trappers Income Security Board (TISB).

Moreover, in accordance with the *James Bay and Northern Québec Agreement* (JBNQA), the lands in the Nord-du-Québec region are divided into three categories (I, II and III), the use of which is subject to certain conditions designed to preserve the Aboriginal communities' culture and subsistence economy. The entire study area falls within the Category III lands of the community of Eastmain. Category III lands are public lands under Québec jurisdiction. Here, the Crees hold the exclusive right to trap fur-bearing animals. They also enjoy certain advantages in terms of outfitting businesses, but do not hold the exclusive right to operate them.

4.3.3 Demographic profile and socioeconomic structure

4.3.3.1 Demographic profile

4.3.3.1.1 Jamesian population

The non-Aboriginal or Jamesian population of Nord-du-Québec is mainly concentrated in the seven administrative entities (four municipalities and three communities) of the Eeyou Istchee Baie-James region (Section 4.3.2). In 2016, Jamesians numbered 13,941 and represented 31% of the region's total population (Table 4-15). More than half (7,608 people or 55%) were living in the town of Chibougamau.

Table 4-15: Populations of Baie-James, Eastmain and Eeyou Istchee in 2006, 2011 and 2016

Territory	Population			
	2006	2011	2016 [a]	Variance between 2006 and 2016 (%)
Baie-James	14,946	14,284	13,941	–7.2
Eastmain [b]	660	776	826	25.2
Eeyou Istchee [b]	14,367	16,528	17,677	23.0
Nord-du-Québec	40,291	43,023	45,107	12.0
Québec	7,631,873	8,007,656	8,326,089	9.1

a. Preliminary data.
b. Residents of Cree communities (Aboriginal and non-Aboriginal).

Sources: ISQ, 2016*a*, 2017*a* and 2017*b*.

The Baie-James region saw its population decrease by 7.2% between 2006 and 2016. The average age of the Baie-James population was 39.6 years in 2015, which was slightly under the average of 41.7 years for all Quebecers (ISQ, 2016*a*).

4.3.3.1.2 Cree population

The Crees of the EIJBRG territory live in nine Cree communities collectively known as Eeyou Istchee. From north to south, the communities of Whapmagoostui, Chisasibi, Wemindji, Eastmain and Waskaganish are located along the coasts of Baie d'Hudson (Hudson Bay) and Baie James (James Bay), at the mouths of the region's main rivers. Nemaska, Mistissini, Oujé-Bougoumou and Waswanipi are inland communities. Cree villages are located on Category IA lands.

In 2016, Eeyou Istchee had a population of 17,677, or 39% of the total population of the Nord-du-Québec region (ISQ, 2017*a*). Chisasibi and Mistissini were the largest Cree communities with respective populations of 4,790 and 3,725, and Eastmain (826), Nemaska (786) and Oujé-Bougoumou (764) were the least populated (ISQ, 2017*b*).

Between 2006 and 2016, the population of Eeyou Istchee decreased by 23% (Table 4-15). In 2015, the average age of the region's population was 29.1 years—making it one of the youngest of all regional county municipalities (MRCs) in Québec, along with the territory of the Kativik Regional Government at 27.2 years (ISQ, 2016*a*).

4.3.3.2 Socioeconomic structure

4.3.3.2.1 Jamesian population

In 2015, the Baie-James region's 6,208 workers aged 25 to 64 years contributed to a labor rate of 78.6% (ISQ, 2017*c*). These workers' average employment income of $53,989 clearly surpassed the total average income of $47,636 in Québec as a whole (ISQ, 2016*b*). However, the average family income (4.3% in 2014) in Baie-James was lower than that of Quebecers in general (8.2%) (ISQ, 2017*c*).

The Jamesian economy relies heavily on energy, mining and forestry. Hydro-Québec's activities have contributed to the creation of new construction and service companies in Baie-James. The company also acquires goods and services from the region's businesses to operate its facilities. In 2011, Hydro-Québec employed approximately 1,000 workers in the Nord-du-Québec region (Hydro-Québec, 2012).

The Baie-James region's subsurface offers high potential for as yet untapped deposits and ores. In 2014, the number of jobs in the Nord-du-Québec region's mining extraction sector was estimated at 2,885, with an associated salary mass of $334 million (Québec, MERN, 2016). In 2016, a mining sector employee in the region earned an average annual salary of $111,259, compared to $105,067 in Québec as a whole (ISQ, 2017*d*).

Machinery rentals make up a large part of the activities of Jamesian construction companies. The region's construction and transport contracts, most of which come from mining and forestry companies, experienced a boom with the construction of the Eastmain-1 and Eastmain-1-A/Sarcelle/Rupert projects (CREBJ, undated).

4.3.3.2.2 Cree population

In 2015, the Eeyou Istchee region's 4,582 workers aged 25 to 64 represented a labor rate of 77%, which was comparable to that of Baie-James (ISQ, 2017*c*). However, the workers' average employment income of $43,263 was lower than those of Jamesians and Quebecers as a whole ($53,989 and $47,636) (ISQ, 2016*b*). Moreover, the rate of low-income Cree families was high, reaching 22.4% in 2014 vs. 8.2% throughout Québec (ISQ, 2017*c*).

The Cree economic structure is based mainly on the service industry, with a large majority of jobs relating to band councils and educational and health institutions. However, traditional hunting, fishing and trapping are still highly valued activities in the communities of Eeyou Istchee. In 2014–2015, 15.7% of all Eeyou Istchee Cree community members participated in the Income Security Program for Cree Hunters and Trappers (ISP), including 10% in Eastmain (CHTISB, 2015). This family program guarantees an annual income to Crees who have chosen hunting, fishing and trapping as their subsistence lifestyle. Its objective is to encourage Crees to pursue their traditional activities by providing them with a guaranteed income, benefits and other incentives (CHTISB, 2015).

Following the signing of the JBNQA in 1975, the Cree communities experienced a major economic boom that resulted in the establishment of several businesses such as the Cree Regional Economic Enterprises Company (CREECO), which employs 525 people and manages a number of businesses including the Cree Construction and Development Company (CCDC), a leader in the Québec construction industry, and Air Creebec, which employed 260 people in 2014. Several community and private enterprises are also active in the Cree communities (CHTISB, 2015).

The Council of the Cree Nation of Eastmain employed some 75 people in 2011. The Council's activities are distributed among the following eight services (Cree Nation of Eastmain, 2011):

- Administration and human resources
- Public works
- Public safety
- Public health
- Special projects
- Culture, youth, sports and recreation
- Housing
- Police services

Eastmain's economic activities relate mainly to the service, food, transportation, construction and trapping industries and, to a lesser extent, to the commercial and outfitting sectors. The mandate of the Wabannutao Eeyou Development Corporation is to promote the development of businesses in the community. The corporation also manages various community enterprises and runs both of Eastmain's outfitters (WSP Canada, 2017).

4.3.4 Land use

This section discusses use of the land by both Crees and non-Crees (Jamesians and visitors). More specifically, it covers Cree traditional land use, the harvesting of natural resources (i.e., forestry, mining and hydropower), and the recreational, tourist and vacationing activities of Jamesians and visitors to the region.

4.3.4.1 Cree traditional land use

Cree lands are organized according to a specific land-use and resource harvesting management system. Since their creation by the Canadian government (1932–1954), the territory has been divided into beaver reserves, which in turn, are subdivided into traplines. Each trapline is assigned to a family and, in accordance with tradition, is passed on from generation to generation within that family, subject to certain rules.

The tallyman's main responsibility is to manage the beaver populations within the boundaries of his trapline. Each year, he also determines the specific resources to be harvested and the areas to be preserved to ensure the sustainability of the wildlife species harvested. Despite the significant changes Cree culture has undergone over the last century, the tallyman remains an important figure, as he is considered a guardian of the Cree traditional lifestyle and knowledge he is entrusted with. The tallyman represents and manages the group of people who use the trapline on a regular basis, which mainly consists of the members of his extended family and of his hunting partners' families (Hydro-Québec Production, 2004).

The study area falls within the Rupert beaver reserve and touches on Eastmain trapline RE1.

Trapline RE1

Trapline RE1 is more than 150 km east of the village of Eastmain. It encompasses several Hydro-Québec facilities, including the Eastmain-1 and Eastmain-1-A powerhouses, Muskeg substation, and several power lines. However, the portion of the trapline that lies within the study area is crossed by only two power lines and contains dike LE-22 at the edge of Eastmain 1 reservoir (Pocket Insert Map A).

Trapline RE1 is accessible year-round, either from the Route de la Baie-James via the access road to OA-11 dam and the Muskeg–Eastmain-1 road, or via the Route du Nord and Nemiscau–Eastmain-1 road, which crosses the study area from south to north.

Ernie Moses has been tallyman of trapline RE1 since 2002, when he replaced his uncle, Harry Moses.

There is only one campsite containing two hunting camps in the study area, at Km 42 of the Nemiscau–Eastmain-1 road. Built in 2003, it was the tallyman's and his family's main campsite until a new camp and access road were built near a lake farther north in 2011.

According to the information obtained by Hydro-Québec, the tallyman and his family members still use the Km 42 campsite for moose hunting in winter and goose hunting in spring.[8]

In winter, trapline RE1 users travel by snowmobile to hunt moose over a vast expanse of the study area extending westward from the campsite, and in spring, they hunt goose in a bay of Eastmain 1 reservoir that falls within the study area.

A few trapline users fish in a lake about one kilometre west of the Km 42 campsite. The lake is especially valued by the trapline users—particularly the elders among them—as they consider it a good fishing site.

Moreover, the study area contains plant species that are valued by the Crees. According to the tallyman, trapline users sometimes pick berries underneath the power line. However, these plants are quite abundant on the trapline, as well as in other areas (Section 4.2.5.6).

[8] Based on the interview of trapline RE1 tallyman Ernie Moses conducted by Kathia Lavoie of Hydro-Québec on December 1, 2017.

Communal sites

The study area contains no communal use sites, although many members of the Cree communities of Nemaska and Eastmain hunt moose along the Nemiscau–Eastmain-1 road (Pocket Insert Map A) (WSP Canada, 2017).

4.3.4.2 Logging

There are no commercial logging operations in the study area since it is located beyond the northern logging limit (Québec, MFFP, 2016*e*).

4.3.4.3 Mining, pits, quarries and claims

The study area touches on part or all of 76 Corporation Éléments Critiques mining claims. No mining activities are carried out in the study area other than those associated with the Rose Lithium-Tantalum Mine project.

Moreover, part of the study area on the east side is reserved for the State for work associated with Eastmain 1 reservoir. Within this sector, which encompasses the bay containing dike LE-22, mining research and operations may be carried out on surface mineral substances only. In addition, any mining exploration in the area occupied by Eastmain 1 reservoir and in the rights-of-way of the two power lines crossing the study area is subject to certain conditions (Québec, MERN, 2017). However, given that mining operations in general are incompatible with power lines, a segment of one of the lines will have to be relocated for this project.

4.3.4.4 Existing hydropower resources

The study area is located near major hydroelectric structures, including Eastmain 1 reservoir, which supplies the Eastmain-1 and Eastmain-1-A powerhouses, Sarcelle powerhouse at the outlet of Opinaca reservoir, and the La Grande complex generating stations. In 2017, the generating facilities in the Nord-du-Québec region produced close to 17,500 MW of power, which is nearly half of the installed capacity in Québec (Hydro-Québec, 2017).

4.3.4.5 Recreation, tourism and vacationing by Jamesians and visitors

Tourism and vacationing

The study area contains no outfitters and is not subject to any cottage or rough shelter vacation lease.

The study area does not affect any canoe routes designated by the Fédération québécoise du canot et du kayak (FQCK, 2005) [Québec canoeing and kayaking federation].

Sport hunting and fishing

Wildlife harvesting is subject to the rules and land regime set out in the JBNQA. More specifically, the Crees hold exclusive hunting and fishing rights on Category I and II lands. Jamesians and visitors may hunt and fish on Category III lands, provided they are harvesting species that are not exclusively reserved for the Crees and doing so for recreational purposes only.

The study area, which falls within hunting and fishing area 22, is entirely encompassed by the special hunting and fishing area managed by the Weh-Sees Indohoun Corporation. It overlaps both sectors in the special Weh-Sees Indohoun area, i.e., the Eastmain sector to the west of the Nemiscau–Eastmain-1 road and the Weh-Sees Indohoun sector to the east (Map 4-3).

The Weh-Sees Indohoun sector is managed by the Weh-Sees Indohoun subcommittee, which is made up of representatives from the Cree Nation Government, the Cree communities of Nemaska, Waskaganish, Wemindji, Eastmain and Mistissini, the Cree Trappers' Association, the MFFP, and the Hunting, Fishing and Trapping Coordinating Committee. The zone is subject to specific management measures governing fishing passes and a catch registry (Weh-Sees Indohoun Corporation, undated).

Moose hunting is prohibited in the Eastmain sector. Although it is permitted in the Weh-Sees Indohoun sector, the hunting season there is shorter than in the rest of hunting area 22, and only males and calves may be harvested. Caribou hunting is prohibited throughout the sector.

The hunting of small game and waterfowl, including grouse and ptarmigan, black duck, common merganser, Canada goose, ring-necked duck and common goldeneye, is permitted in the area managed by Weh-Sees Indohoun. However, only JBNQA beneficiaries have the right to snare and trap hare.

The study area is in District A as defined under the *Migratory Birds Hunting Regulations*. The 2017–2018 migratory bird hunting season extended from September 1 to December 16, 2017. Spring hunting for snow geese, an overabundant species in Québec, is permitted from May 1 to June 30, 2018 (Canada, ECCC, 2017).

The main species of interest to sport anglers in the Weh-Sees Indohoun sector are walleye, northern pike, lake trout and brook trout. Sport fishing for lake sturgeon, whitefish, sucker, burbot and goldeye is not permitted under the JBNQA. Anglers in the Weh-Sees Indohoun sector must obtain a daily pass to fish there (Weh-Sees Indohoun Corporation, undated).

Based on statistics compiled by Hydro-Québec, 818 people made 2,953 fishing trips and caught 16,627 fish in the Weh-Sees Indohoun sector in 2013. Two thirds of these catches were taken by tourists and the rest were caught by Eastmain-1-A/Sarcelle/Rupert project workers living at Sarcelle (closed in 2014) and Eastmain workcamps, or by Hydro-Québec TransÉnergie employees. Walleye was the most popular species, making up three quarters of unreleased catches in 2013 (Hydro-Québec Production, 2014*b*).

According to the same source, only four moose were harvested by sport hunters in the Weh-Sees Indohoun sector in 2013. However, most of the study area was not used for sport hunting since it lies within the Eastmain sector, where sport hunting for moose is prohibited. Furthermore, based on the information obtained from the tallyman of trapline RE1, very few Jamesians or visitors frequent the study area.[9]

4.3.5 Infrastructure and equipment

4.3.5.1 Road network

The Nemiscau–Eastmain-1 road is the only major road in the study area. It links the Route du Nord to the Route de la Baie-James and is extended by the Muskeg–Eastmain-1 and Sarcelle roads. An access road branches off from the Nemiscau–Eastmain-1 road to dike LE-22 at the edge of Eastmain 1 reservoir.

Québec's Ministère des Transports, de la Mobilité durable et de l'Électrification des transports and Hydro-Québec are responsible for managing and maintaining the upper road network (i.e., Route de la Baie-James and first 150 kilometres of Route du Nord) and the other roads in the region. (WSP Canada, 2017).

The Sûreté du Québec is responsible for road safety except in the territories of the Cree communities, which are under the responsibility of the Cree police forces. There is no available data on the volume of traffic on the Nemiscau–Eastmain-1 road (WSP Canada, 2017).

4.3.5.2 Power transmission system

The study area is crossed by two power lines: one 315-kV line (circuits 3176-3177) between Eastmain-1 and Nemiscau substations, and one 735-kV line (circuit 7061) between La Grande-2 and Nemiscau substations.

4.3.5.3 Communications towers

There are no communications towers in the study area.

[9] Based on the interview with RE1 trapline tallyman Ernie Moses by Kathia Lavoie of Hydro-Québec on December 1, 2017.

4.3.6 Development projects

This project to connect the Rose Lithium-Tantalum Mine and relocate a segment of 315-kV line is linked to the Rose Lithium-Tantalum Mine project. The planned facilities will include an open-pit mine and an industrial complex for processing the ore. The anticipated nominal extraction rate is approximately 4,600 t of ore per day, and the mine is expected to remain in operation for 21 years.

Nemaska Lithium's Whabouchi Mine project is currently being carried out in the territory of the Cree community of Nemaska, approximately 45 km south of the study area. The Whabouchi project, which consists in operating a spodumene deposit, includes an open-pit and underground mine, as well as a mineral concentrator. The mine is expected to produce 3,000 t of ore per day for 26 years. Construction began in September 2016 (WSP Canada, 2017).

4.3.7 Archaeology

4.3.7.1 Known archaeological sites

The Inventaire des sites archéologiques du Québec (ISAQ) [inventory of Québec archaeological sites] maintained by the Ministère de la Culture et des Communications du Québec [Québec Department of Culture and Communications] cites no known archaeological sites in the study area.

4.3.7.2 Areas with archaeological potential

A total of 13 areas with archaeological potential have been identified in the study area, five of which are located near its southern boundary. The other eight are near lakes located on either side of the 315-kV Eastmain-1–Nemiscau line in the north-central part of the study area. These are the areas most likely to contain vestiges of human occupation from the prehistoric period to the 20th century.

4.3.8 Landscape

4.3.8.1 Regional landscape

The plateau formed by the Mistassini Highlands natural province occupies most of the study area. The area contains many hills varying in elevation from 300 to 600 m, as well as abundant glacial deposits and fluvioglacial sand and gravel. It also includes a multitude of lacs and peatlands of varying sizes. The upper reaches of several rivers (i.e., the Nottaway, Broadback, Rupert, Chibougamau and Témiscamie) make up most of the river system. In terms of vegetation, conifers make up a large part of the forest cover, which varies in density. There are burns from different periods containing heaths that have grown there during various stages of regeneration. To the west of the natural province are the Monts Otish, rising 1,135 m at their highest peak,

and vast Lac Mistassini, which covers an area of 2,335 km^2. Most of the population of these highlands lives in the villages of Nemaska and Vieux-Nemaska (Old Nemaska) (Québec, MDDELCC, 2014).

A small portion of the James Bay Lowlands natural province cuts across the southwestern end of the study area. This vast, boggy plain is in striking contrast with the surrounding hills of the Mistassini Highlands. This natural province contains only a small portion of the lowlands that surround Baie James (James Bay). East of Waskaganish, the plain is more fragmented, with scattered rocky outcrops. The lower reaches of several large rivers (i.e., the Nottaway, Broadback and Rupert) make up most of the river system, while a branching network of streams crisscrosses the plain, which is insufficiently drained. The lowlands contain many pools connected to peatlands, but few lakes. The region's vegetation grows in the ombrotrophic peatlands (bogs) between the rivers and streams, and in the typical coniferous woodlands of the minerotrophic peatlands (fens) along the surface water discharge zones. The two Cree villages of Waskaganish and Eastmain, which house most of the natural province's population, are located near Baie James, on the shores of the Rupert and Eastmain rivers, respectively.

4.3.8.2 Study area landscape

The study area is dominated by a natural landscape. Apart from Eastmain 1 reservoir in the eastern part of the study area, woodlands, open or treed peatlands, water bodies, glacial deposits and rocky outcrops alternate to form an elongated, northeast-to-southwest configuration that follows the irregular shape of the bedrock. This alternating pattern also contains hills, small valleys and watercourses which influence the distribution of the region's vegetation. Deciduous or deciduous-dominated stands constitute a peculiar feature of this landscape that stands out in the area's vast coniferous or conifer-dominated forests.

The Nemiscau–Eastmain-1 road is the region's main thoroughfare. Since the area surrounding Eastmain 1 reservoir, which is encompassed within the study area, was partially modified approximately a decade ago by the construction of dikes for the Eastmain-1 hydroelectric development, the study area's landscape is shaped not only by the two natural provinces it crosses, but also by human intervention. The highest hills, power transmission equipment and communications tower (located just north of the study area) are the region's most visible landmarks.

Eastmain trapline RE1 encompasses the entire study area, and there is a permanent Cree camp along the Nemiscau–Eastmain-1 road. Cree users of the camp are considered temporary stationary observers. However, whenever they move around by snowmobile, namely during moose-hunting season, they become traveling observers, as do the users of the Nemiscau–Eastmain-1 road and the water bodies and rivers. Fishers and hunters can be temporary stationary or traveling observers.

4.3.8.3 Landscape units

Establishing and evaluating landscape units makes it possible to identify the visual challenges that could affect the overall study area and human population. A landscape unit is a distinct, homogeneous portion of territory characterized by a group of similar visual elements. Each unit's boundaries are determined mainly by its landscape components. Terrain and vegetation set the boundaries of some units, while land use may be the determining factor for others.

Analysis of the visible landscape elements in the study area led to the identification of eight landscape units grouped into three types, as follows:

Landscape of Mistassini Highlands:
- Units CO1 and CO2: Hills of Mistassini Highlands
- Unit VA1: Small valleys of Mistassini Highlands
- Unit RS1: Eastmain 1 reservoir

Landscape of James Bay Lowlands
- Unit PL: Boggy plains of James Bay Lowlands

Anthropogenic landscape:
- Unit RN1: Nemiscau–Eastmain-1 road
- Unit TN1 and TN2: Transmission line

Tables 4-16 to 4-21 describe these landscape units based on the following components:

- Boundaries and specific land use
- Roads
- Land use components
- Terrain
- Hydrography
- Vegetation
- Spatial organization
- Observers
- Visual field
- Visual perspective and scenic quality

Landscape of Mistassini Highlands: Units CO1, CO2, VA1 and RS1

The Mistassini Highlands occupy most of the study area and are made up of a land-dominated portion and a water-dominated portion.

The land-dominated portion includes scattered, gently sloping hills and a succession of small valleys and natural lakes. Glacial deposits without vegetation, usually light in color, either crop out or are strewn on the ground over areas varying greatly in size.

Vegetation grows in groups of equally variable composition, distribution and size. Together, the terrain, vegetation and glacial deposits form a patchy landscape with a complex organization based mainly on the surrounding dominant hills.

The depth and openness of the typical visual fields in this landscape are mostly determined by the terrain and the presence of high, dense vegetation. The land-dominant part of the Mistassini Highlands is divided into two types of landscape unit based on their terrain, i.e., units CO1 and CO2, which correspond to the hills of the Mistassini Highlands, and unit VA1, which corresponds to the small valleys of the Mistassini Highlands (Pocket Insert Map A and photos 4-1 and 4-2). The Mistassini Highlands' hills stand out in the study area by their overall elevation and higher peaks (Table 4-16). The highlands' valley landscape is marked by a succession of small valleys that are lower in elevation than the hills (Table 4-17).

Photo 4-1: Hills of the Mistassini Highlands

Photo 4-2: Small Valleys of the Mistassini Highlands

Table 4-16: Hills of the Mistassini Highlands (Landscape Units CO1 and CO2)

Landscape component	Description
Boundaries and specific land use	• Landscape units CO1 and CO2 occupy most of the study area. Unit CO1 stretches east to west over approximately 25 km^2 (66% of the area). Unit CO2 only occupies a small area toward the southeastern part of the study area. • Parts of units CO1 and CO2 border the western boundary of Eastmain 1 reservoir. • These units contain a succession of rolling forests and heaths, rivers and water bodies, open and treed peatlands, and areas of glacial deposits and rocky outcrops. • The Nemiscau–Eastmain-1 road and a power line cross landscape unit CO1 in a generally north-to-south direction.
Roads	• The Nemiscau–Eastmain-1 road crosses approximately 4 km of landscape unit CO1. • From the Nemiscau–Eastmain-1 road, smaller roads branch off to the west in unit CO1 and to the east in unit CO2. • A snowmobile trail connects two lakes in unit CO1.
Land use components	• Landscape unit CO1 includes two moose-hunting areas, one of which encompasses the Nemiscau–Eastmain-1 road, a fishing site, a drinking water supply source, a Cree camp and a goose-hunting area. • Unit CO2 includes a goose-hunting area near Eastmain 1 reservoir.
Terrain	• Units CO1 and CO2 vary in overall elevation between 275 m and 305 m. The hills begin to stand out more clearly at an elevation of 305 m and can reach 335 m at the centre of the study area. The hills' elongated shape and northeast-to-southwest orientation reflect the structure of the bedrock.
Hydrography	• Generally rectilinear rivers drain the landscape units from the highest elevations. The units contain several scattered bodies of water, which are small in comparison to the reservoir, mainly located at the foot of hills.
Vegetation	• Vegetation is diverse and patchy. The area is characterized by conifer-dominant forests, isolated deciduous stands and large peatlands in shallow depressions.
Spatial organization	• Overall, the landscape unit's spatial organization stems from a vast, natural pattern that may not be easily discernable to the human eye. • The Nemiscau–Eastmain-1 road and power transmission corridor are the main elements breaking this pattern, as their spatial organization is clearly visible. • The road is encompassed within a hunting area.
Observers	• The main observers are the users of the Nemiscau–Eastmain-1 road crossing landscape unit CO1 (traveling observers). • Users of the Cree camp and hunters and fishers are temporary stationary observers.
Visual field	• The depth and openness of the observers' visual field mainly depends on the presence of trees.
Visual perspective and scenic quality	• The deepest or most open visual perspectives are those from large water bodies. In general, the views from rivers, roads and power transmission corridors are deep within the axis of these landscape components, but somewhat restricted due to the presence of shrubby vegetation. Elevated observation points may offer deep, panoramic views down to the horizon. • The scenic quality of landscape units CO1 and CO2 depends on the natural aspect of the area.

Table 4-17: Small Valleys of the Mistassini Highlands (Landscape Unit VA1)

Landscape component	Description
Boundaries and specific land use	• Unit VA1 stretches from Eastmain 1 reservoir in the east to the study area boundary in the west. It covers approximately one fifth of the study area. • This landscape unit contains a succession of vast, rolling woodlands, watercourses and water bodies, open, generally linear peatlands and areas with glacial deposits and rocky outcrops. • The unit is crossed by the Nemiscau–Eastmain-1 road and two power lines.
Roads	• The Nemiscau–Eastmain-1 road crosses approximately 3 km of the landscape unit in a generally north-to-south direction. • From the Nemiscau–Eastmain-1 road, smaller roads branch off to the west and east (to Eastmain 1 reservoir).
Land use components	• Unit VA1 includes two moose-hunting areas, one of which encompasses the Nemiscau–Eastmain-1 road, and a goose-hunting area.
Terrain	• The landscape unit's overall elevation varies between 250 m and 260 m. The valley summits can be up to 270 m high. Some of the small valleys have an elongated shape and northeast-to-southwest orientation that follows the structure of the bedrock, while others follow a perpendicular axis.
Hydrography	• The landscape unit contains many scattered water bodies and is drained by meandering rivers.
Vegetation	• The unit's relatively homogeneous vegetation consists of a network of open peatlands dotting vast coniferous forests.
Spatial organization	• Overall, the landscape unit's spatial organization stems from a vast, natural pattern that may not be easily discernable to the human eye. • The Nemiscau–Eastmain-1 road and power transmission corridors are the main elements breaking this pattern, as their spatial organization is clearly visible • The road is encompassed within a hunting area.
Observers	• The main observers are the users of the Nemiscau–Eastmain-1 road crossing the landscape unit (traveling observers). • Hunters are temporary stationary observers.
Visual field	• The depth and openness of the observers' visual field mainly depends on the presence of trees.
Visual perspective and scenic quality	• The deepest or most open visual perspectives are those from large water bodies. In general, the views from rivers, roads and power transmission corridors are deep within the axis of these landscape components, but somewhat restricted due to the presence of shrubby vegetation. Elevated observation points may offer deep, panoramic views down to the horizon. • The scenic quality of landscape unit VA1 depends on the natural aspect of the area.

The water-dominated part of the Mistassini Highlands consists mainly of a portion of the vast Eastmain 1 reservoir in the eastern section of the study area (Pocket Insert Map A and Photo 4-3). It also includes the reservoir's islands and shores, dike LE-22, and a few turnaround areas and access roads to structures. Together, all these components make up the Eastmain 1 reservoir landscape unit (RS1). This landscape centred on a huge body of water offers vast panoramic views. The depth and openness of the visual fields varies greatly, depending on the presence of high, dense shrubby vegetation or large expanses of water. One such vast body of water is landscape unit RS1's most prominent feature. (Table 4-18).

Photo 4-3: Eastmain 1 Reservoir

Table 4-18: Eastmain 1 Reservoir (Landscape Unit RS1)

Landscape component	Description
Boundaries and specific land use	• Landscape unit RS1 occupies the northeast section of the study area. It includes part of Eastmain 1 reservoir (approximately 2.5 km^2), the reservoir's shores and islands, and dike LE-22. Almost all the reservoir's shoreline is natural.
Roads	• A small road to Eastmain 1 reservoir and dike LE-22 branches off from the Nemiscau–Eastmain-1 road. • The navigable portions of the reservoir are also travel routes.
Land use components	• Landscape unit RS1 includes a goose-hunting area and goose pond just east of the study area.
Terrain	• The landscape unit borders the hills of the Mistassini Highlands. The water body here has an elevation of approximately 260 m and features mainly gently sloping banks along its shoreline.
Hydrography	• Eastmain 1 reservoir was created by construction of several dikes, one of which (LE-22) is located within the study area.
Vegetation	• Most of the vegetation in this landscape unit consists of coniferous forests dotted with open or treed peatlands, as well as treed or shrub swamps at the edge of the reservoir.
Spatial organization	• The landscape unit's spatial organization is governed by the vast water body and forested shoreline.
Observers	• The unit's main observers are the users of small, neighboring roads and the reservoir (traveling observers). • Hunters are temporary stationary observers.
Visual field	• The depth and openness of the observers' visual field mainly depends on the presence of trees.
Visual perspective and scenic quality	• The deepest or most open visual perspectives in this landscape unit are associated with views from the reservoir over a distance which allows the observer to see over the treetops. • In general, the scenic quality of landscape unit RS1 depends on the natural aspect of the area. Large structures like dikes are visually significant because they are large and stand out against the surrounding natural environment.

James Bay Lowlands: Landscape unit PL1

The James Bay Lowlands cut through the southwestern extremity of the study area. The lowland portion represents only a fraction of the extensive boggy plain that lies in the study area's western sector. With few lakes, large expanses of relatively homogeneous vegetation and few glacial deposits, this flat terrain forms a vast, green landscape with no distinctive features. The depth and openness of visual fields typical of this landscape depend on the presence of high, dense shrubby vegetation. Because of the homogeneous nature of its visible elements, this small area of low terrain constitutes the unit representing the boggy plains of the James Bay Lowlands (landscape unit PL1) (Pocket Insert Map A and Photo 4-4). This landscape unit stands out in the study area by its relatively flat terrain and vast peatlands (Table 4-19).

Photo 4-4: Boggy Plains of the James Bay Lowlands

Table 4-19: Boggy Plains of the James Bay Lowlands (Landscape Unit PL1)

Landscape component	Description
Boundaries and specific land use	• The large, open peatlands that dominate landscape unit PL1 represent only a fraction of the vast peatlands found in the western part of the study area. Although this landscape unit only occupies a small area at the study area's southwestern end, it clearly shows the study area's geographical position between the James Bay Lowlands and Mistassini Highlands. One power line crosses the landscape unit.
Roads	• There are no roads in landscape unit PL1.
Land use components	• The unit includes a moose-hunting area.
Terrain	• This relatively flat landscape unit has an overall elevation of 245 m to 250 m.
Hydrography	• The landscape unit is drained by meandering, branching rivers. Water bodies are rare and small.
Vegetation	• Vegetation in this landscape unit alternates between jack pine stands and open or treed peatlands.
Spatial organization	• Overall, the landscape unit's spatial organization stems from a vast, natural pattern that may not be easily discernable to the human eye.
Observers	• The main observers (hunters) in this landscape unit are traveling or temporary stationary observers.
Visual field	• The depth and openness of the observers' visual field mainly depends on the presence of trees.
Visual perspective and scenic quality	• The deepest or most open visual perspectives are associated with views from water bodies and open peatlands. Views along river axes are generally deep, but somewhat restricted due to the presence of vegetation. • The scenic quality of landscape unit PL1 depends on the natural aspect of the area.

Anthropogenic landscape: units RN1, TN1 and TN2

Roads and power lines constitute linear anthropogenic landscapes.

The Nemiscau–Eastmain-1 road is the only major road in the study area. Running in a generally north-to-south direction, the road follows the snaking shape of the rolling terrain beneath it. A few access roads to structures—one going east toward dike LE-22 at the edge of Eastmain 1 reservoir and others going west to lakes or rivers—and a snowmobile trail branch off from the Nemiscau–Eastmain-1 road. The visual field along the Nemiscau–Eastmain-1 road is generally deep but somewhat restricted due to the presence of tall, dense vegetation. Because of its visible and homogeneous character and its importance in terms of landscape perception and organization, the Nemiscau–Eastmain-1 road constitutes its own landscape unit, i.e., RN1 (Pocket Insert Map A and Photo 4-5). This landscape unit stands out by its mineral aspect (Table 4-20).

Photo 4-5: Nemiscau–Eastmain-1 Road (Landscape Unit RN1)

Table 4-20: Nemiscau–Eastmain-1 Road (Landscape Unit RN1)

Landscape component	Description
Boundaries and specific land use	• Landscape unit RN1 covers the entire 45-m width of the Nemiscau–Eastmain-1 road (including crushed-stone road surface and shoulders). • While the landscape unit is not rectilinear, it crosses the study area in a generally north-to-south direction.
Roads	• The landscape unit encompasses about 6 km of the Nemiscau–Eastmain-1 road.
Land use components	• The Nemiscau–Eastmain-1 road is encompassed within a large moose-hunting area.
Terrain	• The road profile reflects the structure of the underlying terrain with an elevation of 263 m to 319 m. The highest elevations are in the hills of the Mistassini Highlands in the centre of the study area.
Hydrography	• The landscape unit is drained by the ditches along either side of the Nemiscau–Eastmain-1 road.
Vegetation	• Views from the road are framed by the vegetation in adjacent landscape units, which is made up of alternating coniferous forests and open or treed peatlands of varying sizes.
Spatial organization	• The landscape unit's spatial organization reflects the road's relatively sinuous route. • The shrubby vegetation along the road forms a visual screen.
Observers	• The main observers in this landscape unit are the users of the Nemiscau–Eastmain-1 road (traveling observers). • Hunters are temporary stationary observers.
Visual field	• In general, the observers' visual field is screened by the trees on either side of the road.
Visual perspective and scenic quality	• The deepest visual perspectives in this landscape unit are associated with views from the straightest sections of the road, particularly at higher elevations. • The scenic quality of landscape unit RN1 is based on the vegetation in adjacent areas and its deep visual perspectives, some of which offer views of a natural landscape, depending on the curves in the road.

Moreover, two power transmission corridors cut through the study area. The wide right-of-way of a 735-kV line (circuit 7061) crosses the study area from northwest to southeast about four kilometres west of the Nemiscau–Eastmain-1 road. Closer to the road, a 315-kV double-circuit power line (circuits 3176–3177) crosses the study area from north to south. Views are generally deep within the power line axes and the visual field is restricted by high, dense vegetation. Based on their visible and homogeneous elements and their significance in terms of the perception and organization of the landscape, the two power lines constitute separate landscape units TN1 and TN2 (Pocket insert Map A and Photo 4-6). These units stand out by the height of the power line support structures and conductors, which are visible above the treetops, and by the absence of high vegetation in the rights-of-way (Table 4-21).

Photo 4-6: Transmission Lines (Landscape Units TN1 and TN2)

Table 4-21: Transmission Lines (Landscape Units TN1 and TN2)

Landscape component	Description
Boundaries and specific land use	• Landscape units TN1 and TN2 include power transmission structures and facilities and their associated corridors containing controlled vegetation. • These two units cross the study area in a generally north-to-south direction. They are spaced at least 3 km apart and are farther apart, the farther north they go. • Landscape unit TN1 includes a 315-kV double-circuit line and controlled vegetation corridor up to 60 m wide. Pyramid-shaped lattice towers at least 40 m high support three vertically stacked wires. • Landscape unit TN2 includes a-735 kV line and controlled vegetation corridor approximately 70 m wide. Tubular lattice-towers approximately 54 m high support three sets of side-by-side wires. • Both landscape units are west of the Nemiscau–Eastmain-1 road. Unit TN1 is located at least 0.8 km from the road, and unit TN2 is more than 5 km away from it.
Roads	• Landscape unit TN1 is crossed by smaller roads and a snowmobile trail that branch off from the Nemiscau–Eastmain-1 road.
Land use components	• Landscape units TN1 and TN2 cross a moose-hunting area.
Terrain	• The power line rights-of-way follow the terrain of the landscape units they cross. The terrain and elevation of unit TN1 resemble those of the Nemiscau–Eastmain-1 road unit. Unit TN2 has a less pronounced terrain and lower elevation.
Hydrography	• The two landscape units cross several rivers and a few small water bodies.
Vegetation	• Vegetation control is carried out in both landscape units. The controlled vegetation is generally lower than the adjacent, natural vegetation.
Spatial organization	• The land unit's spatial organization is governed by the power line routes. • Parts of transmission structures that are visible above the treetops become landmarks in the study area's landscape.
Observers	• The main observers in this landscape unit are the users of the snowmobile trail and small roads (traveling observers). • Hunters are temporary stationary observers.
Visual field	• The observers' visual field is generally somewhat restricted by the trees on either side of the power lines.
Visual perspective and scenic quality	• Visual perspectives are deep in the axes of the power lines, especially since the vegetation is low. • The scenic quality of landscape units TN1 and TN2 depends on the diversity of the controlled vegetation in the rights-of-way and the deep views.

5 Public Participation

5.1 Objectives of the public participation process

For every project, Hydro-Québec implements a public participation program which covers the entire project, from the draft-design phase to the filing of the Environmental Impact Statement with the MDDELCC.

The purpose of public participation is to enable the local communities to contribute to the technical and environmental study process with a view to ensuring that the new structures blend into the host environment as seamlessly as possible. It also creates a communication link with the host communities, which is maintained throughout the project.

The public participation process for the project to connect the Rose Lithium-Tantalum Mine and relocate a segment of the 315-kV line was implemented with the following objectives:

- To inform the host communities about the technical, environmental and economic aspects of the project
- To consult all stakeholders concerning the proposed line route
- To gather all stakeholders' concerns and comments with a view to incorporating them into the project.

The process focused on the trapline RE1 users concerned by the project, the Council of the Cree Nation of Eastmain and the Eeyou Istchee James Bay Regional Government (EIJBRG).

5.2 Meetings and communication with the host community

In June 2017, Hydro-Québec initiated communication with the Council of the Cree Nation of Eastmain (Appendix D.1 on CD-ROM), the tallyman of trapline RE1 and the EIJBRG, and forwarded an information brochure containing preliminary information about the project to the political representatives (Appendix D.2). Further correspondence was sent to the EIJBRG in September 2017. Table 5-1 provides the schedule of meetings held. Appendix D.3 contains the minutes of the meeting held on November 15, 2017.

Table 5-1: Schedule of Public Participation Meetings

Date and location	Participants
November 15, 2017, Montréal	Council of the Cree Nation of Eastmain: • Chief Kenneth Cheezo • Deputy Chief Emily Whiskeychan • Raymond Shanoush (Councillor) • Graham Cheezo (Councillor) • Daniel Mark-Stewart (Councillor) • David Peter (Treasurer) • Isaac Isheroff (Cree Nation Government) • Jean-Sébastien Lavallée (President and CEO of Corporation Éléments Critiques)
December 1, 2017, Val-d'Or	Ernie Moses, Tallyman, trapline RE1

5.3 Stakeholders' concerns and questions

Overall, the stakeholders met received the project well, understood the project rationale and technical details, and considered the public participation process to be adequate and complete.

The members of the Council of the Cree Nation of Eastmain made the following recommendations regarding the project:

- Hold a meeting between the tallyman of trapline RE1, his family members and Hydro-Québec; the meeting took place on December 1, 2017.
- Provide the Council members with the results of the archaeological inventory planned in summer 2018 as soon as possible; Hydro-Québec will meet with the Council members to inform them of the results.
- Respect goose- and moose-hunting seasons; Hydro-Québec will send the hunting season dates to the consultants and contractors.

Although the tallyman of trapline RE1 had no specific concerns about the project, he did have expectations relating to economic spinoffs. He expressed great interest in the land-clearing work required for the relocated line segment. Hydro-Québec plans to implement measures to help generate local economic spinoffs.

5.4 Communication tools

Hydro-Québec representatives presented the general project components at the meeting held with the members of the Council of the Cree Nation of Eastmain on November 15, 2017. The Council members were also provided with an information document covering several aspects of the project, i.e., the study area, preferred line route, public participation process, environmental studies and project schedule (Appendix D.2 on CD-ROM).

5.5 Other public participation activities planned

Hydro-Québec will inform the Nemaska Band Council and the tallyman of trapline R19 about the project.

Hydro-Québec will also produce an information brochure to inform the stakeholders concerned about the line route selected and work schedule.

5.6 Conclusion

The meetings held with the members of the Council of the Cree Nation of Eastmain and the tallyman of trapline RE1, and the communication with the EIJBRG revealed that the host communities have very few concerns about the project. In fact, the various groups concerned said that they were favorable to the project.

Hydro-Québec will factor the results of the public participation process into the project and will continue to listen to the host population and stakeholders concerned throughout the construction phase.

6 Impacts and Mitigation Measures

This chapter describes the impacts that carrying out Hydro-Québec's project might have on the biophysical and human environments. It covers the method used to assess project impacts (Section 6.1), the main sources of impacts (Section 6.2) and the general and specific mitigation measures (Section 6.3) that will be applied for this project. This is followed by descriptions of the impacts on the biophysical and human environments of each of the major activities required to execute the project:

- Build and operate the 350-kV line segment (Section 6.4)
- Dismantle a segment of the existing 350-kV line (Section 6.5)
- Connect the substation for the planned mine to the Eastmain-1–Nemiscau line (Section 6.6)
- Recommission a borrow pit and open a new quarry (Section 6.7)
- Add equipment at Eastmain-1 substation (Section 6.8)

The chapter ends with a summary of the project's residual impacts (Section 6.9).

Note that the work covered by this impact assessment will be carried out while the mining facilities are being built, in 2018-2019.

6.1 Impact assessment method

The impact assessment is based on the description of the project, the description of the host environment, the input of community stakeholders and lessons learned from other projects:

- The project description makes it possible to identify sources of impact, that is, project aspects during the construction or operation phase which might alter or benefit an environment component.
- The description of the host environment explains the natural and social setting for the project.
- The input of community stakeholders (Aboriginal and non-Aboriginal) indicates their concerns about the project.
- The lessons learned from earlier projects help in identifying sources of impacts, evaluating recurrent project impacts and selecting suitable mitigation measures.

The impact analysis is a three-step process:

- Describe sources of impacts connected with building and operating the planned structures
- Identify possible impacts on the biophysical and human environments (including the landscape) and select appropriate general and specific mitigation measures
- Assess residual impacts, that is, impacts persisting after appropriate mitigation measures have been applied

The impact assessment method is described in Appendix E (on CD-ROM). The objective is to determine the significance of each impact based on three criteria: its magnitude, geographic extent and duration. The significance of the impact is then accordingly rated as major, moderate or minor.

6.2 Sources of impacts

With a line project, the sources of impacts include project components as well as construction and operating activities that can alter an environment component. The main sources of impacts associated with relocating a segment of the Eastmain-1–Nemiscau line, based on the information provided in Chapter 2, are described below.

6.2.1 Construction

Building/upgrading access roads

Existing roads may have to be upgraded and temporary roads built to construct the planned line segment. Whenever possible, temporary roads will be built in the right-of-way, barring obstacles that hinder traffic (e.g., difficult terrain, soil with low-bearing capacity or wetlands). The presence of the Nemiscau–Eastmain-1 road was considered in developing the worksite access strategy (see Section 2.2.1.2). When building new roads, Hydro-Québec will preferably use the cut-and-fill method, to minimize the volume of fill material required from borrow sources.

Building/upgrading access roads also includes installing temporary water crossing structures on roads used for clearing, transporting material and circulation of jobsite machinery. Culverts will be installed where streams cross construction roads and the Nemiscau–Eastmain-1 road. This way, the ditches of the existing road can be crossed without violating the provisions of the *Règlement sur l'aménagement durable des forêts du domaine de l'État* on management of forest roads.

Clearing

Clearing involves felling trees and removing bushes in the rights-of-way of the planned line segment and temporary roads using the methods stipulated in clearing plans and specifications. The clearing operations are generally mechanized (fellers, skidders, etc.)—except in fragile areas, such as riparian buffer strips and wetlands, where the cutting is manual (chain saws and brush cutters). Given the distance from processing plants, methods for disposal of the felled trees and wood debris shall be determined with the MFFP. The clearing is scheduled for mid-August 2019 according to the preliminary work schedule and will take about 30 days.

Line construction

According to the preliminary work schedule, the 315-kV line segment will be built between the end of September and mid-November 2019. There are three main stages to the work, as described below.

Installation of tower foundations

Laying tower foundations involves excavation, backfilling and levelling. The foundations vary depending on tower type, nature of the soil and depth of the bedrock. In overburden, grillage foundations are most commonly used. A geotechnical study conducted at the detailed engineering stage of the project will make it possible to determine the right type of foundation for each tower. The work will require bringing in fill material from a recommissioned borrow pit and a new quarry, both in the study area. An estimated 11,530 m^3 of fill will be required.

Tower assembly and conductor stringing

Building a line involves assembling and erecting towers, stringing conductors and installing line hardware. Each tower is assembled on the ground in the line right-of-way. It takes one to three days to assemble a tower. A telescopic crane is then used to lift the towers upright. The overhead conductors are tension strung to prevent them from sliding along the ground. Generally a track-mounted puller is used to string the wires. The stringing area where the reels and pullers are installed occasionally extends a little ways beyond the right-of-way.

Installation of counterpoise wires

Counterpoise wires are buried conductors that provide an electrical connection between power line towers and the ground. A counterpoise wire is installed around each tower. The tower connects the counterpoise wire to the overhead ground wires above the conductors. This arrangement ensures grounding that protects the line from lightning.

Counterpoise wires consist of two conductors buried 600 mm deep, one on either side of the middle of the line. Burying is by means of a bulldozer with a conductor reel at the front and a ripper at the back that opens a trench to lay the counterpoise wire. A hydraulic shovel follows the bulldozer and backfills the trench. The counterpoise wire is continuous, except where it encounters a sensitive environment component (stream, lake, certain wetlands, etc.) or road infrastructure, at which point the end of the counterpoise wire is attached to a rod buried in the ground.

Transport and traffic

During the construction phase, workers, heavy vehicles and construction site machinery required to build/upgrade roads, clear land and construct the line must travel or be transported to the jobsites. The Nemiscau–Eastmain-1 road, existing roads and new temporary access roads will be used for these purposes.

6.2.2 Operation

Line presence

Land in the footprint of a tower cannot be used for anything else. In addition, towers can be a visual nuisance: much taller than trees, they dominate the landscape and may encroach on visual fields from the Nemiscau–Eastmain-1 road and valued sites. A line right-of-way also imposes restrictions on land use: building construction, for example, is prohibited in a line right-of-way.

Line maintenance

Line maintenance includes all operations required to ensure the line is reliable and functioning properly. It consists above all in preventive inspection and remedial measures and the reconditioning and replacement of faulty equipment. Depending on the nature of the failure or fault, light or heavy vehicles may have to travel along the right-of-way.

Vegetation control

In line rights-of-way, vegetation is controlled mechanically (selective cutting with chainsaws and brush cutters of woody vegetation incompatible with power system operation) or chemically (manual, localized herbicide application) depending on the immediate environment. The purpose is to prevent regrowth in the right-of-way of woody vegetation incompatible with operation of an electric power system. Time between vegetation control operations depends on the growth period of the vegetation. The current maintenance program for the existing Eastmain-1–Nemiscau 315-kV line will be applied to the relocated line segment.

6.3 General and specific mitigation measures

6.3.1 Mitigation measures

For all its projects, Hydro-Québec implements general mitigation measures to lessen the environmental impacts of its activities. These general mitigation measures are described in the Standard Environmental Clauses (Hydro-Québec Équipement et services partagés and SEBJ, 2016) in Appendix B (on CD-ROM). These clauses are revised periodically to reflect changes in environmental legislation and best practices. The general measures are written into tendering documents for contractors as standard clauses with which contractors must comply.

Besides these general measures, Hydro-Québec implements specific mitigation measures to further reduce the impacts of its projects on the host environment. These measures are adapted to the environment receiving the planned structures. Specific measures for the project are mainly designed to protect streams, stream banks, wetlands and wildlife and to ensure the safety of land users.

The specific mitigation measures selected for this project are outlined in sections 6.4 to 6.8, which describe the project impacts, and in Table 6-6 (Section 6.9), which summarizes the residual project impacts.

Routine practices and a number of specific measures applied when building a power transmission line are included in the Cahier des bonnes pratiques en environnement, Construction de ligne de transport d'énergie, Hydro-Québec's guide to good environmental practices in the construction of power lines (Hydro-Québec Équipement et services partagés, 2014).

6.3.2 Clearing methods

To minimize environmental impacts, vegetation clearing methods are adapted to the different environments encountered, especially in sensitive areas. The clearing is carried out in accordance with the following guidelines:

- The clearing methods selected must allow preservation of the topsoil and the root systems.
- A 5-m wide strip in the centre of the right-of-way must be completely cleared to enable personnel and equipment to move about freely. This strip must be kept free of all waste to allow cable stringing and operation of the line.
- Tree stumps in the cleared areas must not be more than 10 cm higher than the highest root. Where the highest root is more than 30 cm above average ground level, tree stumps must not be more than 30 cm above the ground.
- Trees must be felled so they remain within the area to be cleared without damaging trees adjacent to the right-of-way.
- Vegetation that will never interfere with operation of the line may be preserved, terrain permitting, particularly in incised river valleys.

Method A

Clearing method A is used in areas where there are no sensitive components and on land that forestry equipment can reach without causing erosion. This method consists in manual or mechanical cutting and disposal or recovery (for commercial or other purposes) of all trees, shrubs and debris more than 30 cm high.

Method APS (method A with protection of the soil)

Method APS is used in wetlands with a load-bearing capacity that allows mechanical clearing (e.g., treed swamps in the dry season). The same shrub species are preserved as in methods B and B2, with vehicles and construction machinery restricted to no more than 25% of the cleared area. If ruts appear, a switch is made to method B and the ruts are filled.

Method B

Clearing method B is designed to protect sensitive environment components and to reduce the risks of erosion during clearing. This method consists in manual cutting of trees, with preservation of shrubs and brush no more than 2.5 m high at maturity. Method B is used on land with a low load-bearing capacity located near sensitive components, such as erodible soil, bogs and swamps (wetlands), lakeshore, river banks and certain wildlife habitats. Areas cleared using method B are subject to the following special requirements:

- The shrub layer (all species no more than 2.5 m high at maturity) must be preserved within 20 m of permanent streams and 6 m of intermittent streams as well as in areas sensitive to erosion. Construction machinery is prohibited except on roads leading to stream crossings.
- Should mechanical skidding be required, machinery that exerts little pressure on the soil must be used. A single traffic lane no more than 5 m wide is allowed, the load-bearing capacity of the soil permitting.
- Wood debris may be disposed of by burning or chipping. In case of chipping, heaps must not be formed.
- A strip 5 m wide must be cleared and cleaned in the centre of the right-of-way for conductor stringing and passage of machinery and vehicles.

Method B2

Method B2 is a variant of method B. It is used at sites with the same profile as those where method B applies, but where the density of the vegetation to be cleared is very low. Felled trees and shrubs are trimmed, bucked into lengths of less than 1.2 m and left where they are. In other words, method B2 does not call for recovery of trees or disposal of wood debris. Like method B, a strip 5 m wide must be cleared and cleaned in the centre of the right-of-way for conductor stringing and passage of machinery and vehicles.

Method C

Clearing method C is used in sensitive areas and is designed to preserve trees compatible with power system operation. It is used only where conductor clearance over vegetation permits, along stream banks and main roads, on steep slopes or near sensitive components. This method consists in manually cutting woody vegetation incompatible with power line operations and total clearing of a centre strip 5 m wide for conductor stringing and passage of machinery and vehicles. The trees to be preserved in each area are indicated on clearing plans and specifications. All trees above the specified height are felled, trimmed, bucked into lengths of less than 1.2 m and left in place without forming piles.

6.4 Construction and operation of the 315-kV line segment

The potential impacts of building and operating the 315-kV line segment are described and assessed in the sections that follow. To determine the potential impacts of activities, sources of impact and environment components that might be affected were correlated (Table 6-1).

Table 6-1: Matrix of Potential Impacts of Construction and Operation of the Planned Line Segment

Environment component	Source of impact						
	Construction				Operation		
	Building/ upgrading access roads	Clearing	Line construction	Transport and traffic	Line presence	Line maintenance	Vegetation control
Biophysical environment							
Soil	■	■	■	■		■	■
Water	■	■	■	■		■	■
Air		■		■			
Forest vegetation		■					■
Wetlands	■	■	■	■	■		■
Special-status plant species							
Non-native invasive plant species			■	■			
Plant species traditionally valued by the Crees		■					■
Wildlife	■	■	■	■			■
Special-status wildlife species	■	■	■	■			■
Human environment							
Cree land use	■	■	■	■			
Mining					■		
Recreation, tourism and vacationing – Jamesians and visitors			■	■			
Road network				■			
Development projects							
Archaeology	■	■	■				
Soundscape	■	■	■	■			
Landscape					■		■

6.4.1 Impacts on the biophysical environment

Table 6-2 shows all components of the biophysical and human environments that will be crossed by the planned line segment.

Table 6-2: Environment Components Crossed by the Planned Line Segment

Environment component	Number of components[a]	Total length (area)	Portion of line segment[b] (%)
Biophysical environment			
Physical environment			
Lake	1	170 m	4.0
Permanent stream	5	10 m	0.3
Intermittent stream	3	1.5 m	—
Vegetation			
Coniferous forest	11	2,341 m (12.3 ha)	57.0
Mixed forest	3	224 m (1.0 ha)	5.0
Brushland	2	55 m (0.5 ha)	1.0
Wetlands			
Treed bog	16	580 m (3.6 ha)	14.0
Open bog	15	550 m (3.0 ha)	13.0
Open fen	1	0 m (0.03 ha)	0.0
Treed/shrub swamp	2	43 m (0.3 ha)	1.1
Human environment			
Mining operation			
Mining claim[c]	6	1,751 m (9.9 ha)	—
Infrastructure			
Nemiscau–Eastmain-1 road	2	138 m	3.4
Archaeology			
Area with archaeological potential[c]	1	66 m (0.4 ha)	—
Total	—	4,113 m	100.0

a. Number of components crossed by the right-of-way of the planned line segment.
b. The planned line segment is 4.1 km long.
c. Component not counted in total length or portion of the line segment (superposed on another component).

6.4.1.1 Soil

Anticipated construction-phase impacts and mitigation measures

Soil surface and profile

Potential impacts on soil are related to changes in slope as well as compaction and rutting due to the passage of vehicles and heavy machinery, which make the soil more unstable and prone to erosion. Such impacts may occur during clearing, when building/upgrading access roads (including installation of temporary stream crossings) and during construction work. In addition, surface horizons will be modified by grading around the new support structures.

To minimize impacts on the soil, Hydro-Québec will implement the general measures stipulated in sections 4, 10, 15 and 21 of the Standard Environmental Clauses (Appendix B on CD-ROM). These sections cover clearing, excavation and earthwork, equipment and traffic as well as site restoration. In addition, restricting vehicles and machinery to the marked off work area limits the impact on the soil.

Soil quality

Operation and refuelling of construction machinery and trucks during the work are potential sources of soil contamination by petroleum products in case of damage, spill or equipment failure. In such an event, the general mitigation measures for contaminant spills and contaminated soil will be implemented (see sections 6 and 24 of the Standard Environmental Clauses, Appendix B). The soil contamination risk is, however, reduced, since Hydro-Québec requires that contractors submit an oil spill response plan as soon as they start work; otherwise, the contractor must use the plan established by Hydro-Québec. The response plan must contain a response flow chart and alerting procedure, and the contractor must have at least one spill kit at the jobsite.

In addition to the measures regarding contaminant spills and contaminated soil, the contractor is required to apply the measures regarding equipment, traffic, hazardous waste management and residual waste management in sections 15, 16 and 17 of the Standard Environmental Clauses (Appendix B).

Anticipated operation-phase impacts and mitigation measures

Line maintenance and vegetation control activities in the right-of-way require only very occasional use of vehicles and machinery. The risk of soil contamination by petroleum products in the event of damage is negligible.

Residual impact assessment

During construction of the line segment, the soil will be disturbed for a short period of time and then restored when the work is completed. Only areas occupied by towers will be permanently altered. With the general mitigation measures that will be implemented, the alterations and risks of soil contamination are minor: the magnitude of the impact is low, its extent is site-specific and its duration is long term. The significance of the residual impact on the soil is thus minor.

6.4.1.2 Water

Anticipated construction-phase impacts and mitigation measures

The planned line segment crosses a lake (between planned towers 44A and 45A) as well as seven streams, four permanent and three intermittent. Permanent stream 1 (between planned towers 42A and 45A) is crossed twice by the right-of-way (see Pocket Insert Map A). Vehicles and construction machinery will use the different planned access roads to bypass the lake and the temporary bridges to cross the streams, in compliance with Section 12 of the Standard Environmental Clauses (Appendix B on CD-ROM). Installing the temporary bridges will not affect the stream banks: the bridges will straddle the entire stream and will not affect either the streambed or the stream flow. Hydro-Québec will remove the temporary bridges when the work is completed and restore affected stream banks (see Section 21 of the Standard Environmental Clauses, Appendix B).

Installing and removing temporary bridges can cause suspension of fine particles in streams, and this could in turn cause a temporary increase in turbidity. Hydro-Québec characterized all streams crossed by the planned line segment in the summer of 2017 (August 13 and 14) (Table 6-3). No towers are to be built on the riparian buffer strips of the lake or streams crossed by the planned line segment. To protect water quality, the following specific measure will be applied:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.

Table 6-3: Streams Crossed by the Planned Line Segment

Stream	Line span (towers)	Type of flow	Stream width (m)	Substrate
1[a]	42A-43A	Permanent	0.2	Pebbles, gravel and sand
	44A-45A	Permanent	1.5	Organic matter
2	45A-46A	Permanent	5	Organic matter
3[b]	45A-46A	Intermittent	0.4	Organic matter
4[c]	47A-48A	Intermittent	—	—
5	49A-50A	Intermittent	0.3	Gravel, pebbles and organic matter
6	51A-52A	Permanent	0.5	Rock, boulders, pebbles and gravel
7	52A-53A	Permanent	3	Organic matter

a. Stream crossed twice.
b. Stream with undetermined direction of flow (disappears into ground at both ends). Possible hydrologic connection with stream 2.
c. Stream 4 was not found in the summer of 2017.

As method B stipulates, jobsite machinery is prohibited in riparian buffer strips, except where a stream must be crossed.

The work required to build the line segment could alter soil drainage by creating ruts, but site restoration and the contractor's obligation to consider natural drainage and take all measures necessary to maintain normal flow limit the risks of disturbance (see sections 7 and 21 of the Standard Environmental Clauses, Appendix B). If pumping is required to dewater a work area to lay the foundations for a tower, the contractor must manage the wastewater as required by Hydro-Québec (see Section 9 of the Standard Environmental Clauses, Appendix B).

Lastly, operation and refueling of construction machinery and trucks during the work are possible sources of surface water and groundwater contamination by petroleum products in the event of an accidental spill. Hydro-Québec shall apply general mitigation measures for contaminant spills, contaminated soil, equipment and traffic as well as the management of hazardous materials and waste in order to protect surface water and groundwater quality (see sections 6, 15, 16, 17 and 24 of the Standard Environmental Clauses, Appendix B).

Anticipated operation-phase impacts and mitigation measures

Line maintenance requires only very occasional use of vehicles and machinery. The risks of contamination of surface water and groundwater are thus negligible.

Residual impact assessment

The use of temporary bridges will have very little impact on streams thanks to the general mitigation measures Hydro-Québec applies. Natural runoff and the quality of surface water and groundwater could be impacted, mainly when the line is being built. Application of general measures to protect drainage and limit the risks of contamination will greatly reduce such impacts.

On the whole, the magnitude of the impact is small, the extent is site-specific and the duration is short. The significance of the residual impact is deemed minor.

6.4.1.3 Air

Anticipated construction-phase impacts and mitigation measures

There may be a temporary alteration in air quality during the clearing operations and when the line segment is being built. The main sources of air pollutants are burning of wood debris, transport of materials and movement of equipment and workers. These activities generate dust, particulate matter, exhaust gas and smoke in the ambient air.

To minimize the impact of the work on air quality, the contractor must apply the general mitigation measures for clearing, equipment, vehicle traffic and air quality (see sections 4, 15 and 20 of the Standard Environmental Clauses, Appendix B on CD-ROM). Among other things, these measures call for regular maintenance of equipment that can be a source of air pollutants and use of dust control agents. Felled trees may be burned using the methods approved by the Société de protection des forêts contre le feu (SOPFEU).

Anticipated operation-phase impacts and mitigation measures

Line segment maintenance activities will not have any impact on air quality.

Residual impact assessment

Apart from matter that could be carried far by vehicles after they leave the jobsite as well as smoke from burning of wood debris, the construction work will not appreciably alter ambient air quality. Possible impacts would be felt by a small number of people, mainly Hydro-Québec employees. Impact significance is thus considered minor. Impact duration is temporary, the length of the construction period.

6.4.1.4 Forest vegetation

The planned line segment crosses through woodland for more than half its length (62%), not counting treed wetland. The line right-of-way cuts through eleven coniferous stands and three mixed stands. Where it intersects with the existing line, the planned line segment will occupy brushland within the existing right-of-way.

Hydro-Québec characterized the woodlands in the summer of 2017 (August 13 and 14). A sufficient number of survey plots were inventoried to obtain a representative picture of the diverse forest stands the planned right-of-way cuts through. A total of ten survey plots were selected in coniferous forest, two in mixed forest and one in brushland. A detailed ecological characterization of each of these plots was performed, based on percent cover of each vegetation layer and on the plant species present and their abundance (see plant fact sheets F01 to F10, Appendix F on CD-ROM).

The data collected show that the tree layer of the coniferous and mixed forests is no more than 15 m high, with cover ranging from 30 to 40%. Jack pine dominates the coniferous forest, while black spruce and white birch are the main species in the mixed stands. The brushland in the existing right-of-way is colonized mainly by scrub birch, lambkill and Labrador tea.

Total surface area occupied by woodland in the planned right-of-way is estimated at 13.3 ha: 12.3 ha of coniferous forest and 1.0 ha of mixed forest. Brushland accounts for 0.5 ha in the existing right-of-way.

Anticipated construction-phase impacts and mitigation measures

The main impact of the planned line segment on woodland in the study area will stem from clearing the right-of-way: trees will be cleared from a total of 13.3 ha. During the construction phase, it is likely that building/upgrading temporary access roads will also require clearing—particularly for bypass roads, which are built outside the right-of-way to avoid obstacles to traffic (e.g., difficult terrain, soil with low-bearing capacity or wetlands). These temporary roads do not generally cover much ground. Exact figures will be provided for the clearing permit applications.

The general mitigation measures in Section 4 of the Standard Environmental Clauses (Appendix B on CD-ROM) will be applied during the clearing operations. Hydro-Québec will select an appropriate clearing method for each environment crossed.[1] The following specific mitigation measure will also be applied:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.

As method B stipulates, jobsite vehicles and machinery are prohibited in the riparian buffer strip, except where a stream must be crossed. Clearing is done manually here, except for vegetation on the fringe of the buffer strip that branches out over an area subject to method A clearing, which can be cut mechanically. In such cases, all trees felled are removed intact from the method B area with a line skidder and stacked in the method A area. Shrubs no more than 2.5 m high at maturity are preserved.

Anticipated operation-phase impacts and mitigation measures

During the line operation phase, vegetation control operations in the planned right-of-way will have an impact on the vegetation, which will be kept at the bush and grass stages. For the safety of workers and land users as well as system reliability, tree species cannot be tolerated within a line right-of-way.

Residual impact assessment

The loss of 13.3 ha of woodland coupled with vegetation control in the right-of-way will mean a disturbance of low magnitude, since the right-of-way is in an area that includes numerous similar forest stands. The impact is site-specific, as the areas affected are small considering all of the woodland in the study area. The impact is of long duration, since the vegetation in the right-of-way will be kept permanently at the bush and grass stages. The significance of the residual project impact on the coniferous and mixed forests is thus minor.

Note that no impact on brushland in the existing right-of-way is anticipated. In addition, an increase in treed area in the right-of-way of the line segment to be dismantled is anticipated: 7.6 ha of this right-of-way will not be used by the planned mining facilities, and since Hydro-Québec will no longer control the vegetation there, the plant succession process will take hold once again (see Section 6.5).

[1] Clearing methods are described in Section 6.3.2 herein as well as in Section 4 of the Standard Environmental Clauses included in Appendix B (on CD-ROM).

6.4.1.5 Wetlands

The right-of-way of the planned line segment cuts through 34 wetlands, including 16 treed bogs, 15 open bogs, one open fen, one treed swamp and one shrub swamp (see Table 6-4).

Table 6-4: Wetlands Intersected by the Planned Line Segment Right-of-Way

Type	Number	Total area (ha)	Area in right-of-way (ha)	Number of towers planned	Ecological value
Treed bog	16	21.7	3.6	2	High to moderate
Open bog	15	93.1	3.0	2	High to moderate
Open fen	1	0.6	0.03	0	Undetermined[a]
Treed swamp	1	0.23	0.1	0	Moderate
Shrub swamp	1	1.7	0.2	0	Moderate
Total	34	117.2	6.9	4	—

a. At the time of the inventory, this fen was not affected by the line route and was thus not inventoried. Its ecological value cannot be estimated without inventory data.

Hydro-Québec characterized the wetlands in the planned right-of-way in the summer of 2017 (August 13 and 14). Thirteen survey plots were established in treed bogs, four in open bogs and two in swamps (a treed swamp and a shrub swamp). The characterization was performed as recommended in *Identification et délimitation des wetlands du Québec méridional* (Bazoge et al., 2015). The boundaries of each wetland visited were delineated and the presence of a surface hydrologic connection was checked. In addition, a plant list was established and other diverse data were collected (see plant fact sheets MH01 to MH13, Appendix F on CD-ROM). Moreover, organic layer thickness was measured with a threaded rod.

The method described in Appendix G (on CD-ROM) was used to determine the ecological value of the wetlands inventoried. This method uses 17 criteria broadly based on the criteria recommended by Joly et al. (2008) in the *Guide d'élaboration d'un plan de conservation des milieux humides*. It also takes into account the types of indicators and the commonly used criteria mentioned in the guide produced by Bazoge et al. (2015).

Plant community composition in the **treed bogs** intersected by the planned right-of-way is similar to that of treed bogs in the study area. There is a tree layer, but it is often sparse. Black spruce and jack pine are present mainly as tall shrubs. The ecological value of the treed bogs is moderate, except the two located between towers 52A and 53A, whose ecological value is high.

The plant species found in the **open bogs** intersected by the right-of-way are similar to those found in all bogs in the study area. The tree layer is absent or barely present, while the shrub layer is well developed. Leatherleaf dominates the shrub layer, accompanied by Labrador tea among other species. The ecological value of these open bogs ranges from moderate to high.

There is an **open fen** southwest of the intersection of the Nemiscau–Eastmain 1 road (to the south) and the planned line segment (see Pocket Insert Map A). A very small part of this fen, at its western end, is located in the planned line right-of-way, but there is already an anthropogenic footprint there (the right-of-way of the road). The fen was not inspected during the field surveys for the mining project or during the inventories conducted by Hydro-Québec, as no activities were planned where it is located.

The **treed swamp** crossed by the line right-of-way south of the Nemiscau–Eastmain 1 road (between towers 49A and 50A) is dominated by black spruce. The tree layer covers more than 25% of this swamp. Highly developed, the shrub layer is largely occupied by speckled alder. The ecological value of this swamp is considered moderate.

The **shrub swamp** crossed by the line right-of-way between towers 51A and 52A is composed mainly of speckled alder, with willow. The ecological value of this swamp is considered moderate.

Wetlands occupy a total of 6.9 ha in the line right-of-way (see Table 6-4). Peat thickness in these wetlands, where measured, ranged from 0.1 m to 1.9 m, apart from one place between towers 45A and 46A (treed bog), where the peat was 2.5 m thick.

Hydro-Québec has taken care to site the towers so as to avoid the wetlands. Average distance between towers is 360 m, making it possible to straddle most of them. However, the planned line right-of-way crosses several wetland complexes, and two towers (44A and 48A) will be sited within these. In addition, the foundations of two other towers (51A and 53A) will be partially located in wetland.

Anticipated construction-phase impacts and mitigation measures

There is a risk that wetlands will be affected by building/upgrading access roads, clearing the line right-of-way, excavation and earthwork, transport and traffic.

Hydro-Québec's traffic strategy is designed to avoid wetlands as much as possible. However, jobsite vehicles and machinery will have to travel about 875 m along temporary roads in wetlands in the planned right-of-way. Hydro-Québec will take measures to reduce the impact of these roads and will restore the wetlands after the work is completed, as stipulated in Section 26 of the Standard Environmental Clauses (Appendix B on CD-ROM).

The project impact on the wetlands is related to clearing of treed bogs and treed swamp. The planned right-of-way occupies a total of 3.7 ha of these wetlands (see Table 6-4). The clearing operations will have little or no impact on treeless wetlands (open bogs, open fens and shrub swamp), which cover a total of 3.2 ha in the line right-of-way.

In addition to the general mitigation measures in Section 26 of the Standard Environmental Clauses designed to protect wetlands (see Appendix B), Hydro-Québec will implement the following specific measures:

- Determine and mark off the boundaries of wetlands in the right-of-way to keep construction machinery off wetlands as much as possible.
- Use clearing method B, B2, APS or C in wetlands if trees must be felled.

Method B conserves a maximum of shade and soil moisture. Manual felling also results in less impact on the soil.

The erection of four towers will require work areas covering a total of 12,925 m^2 that will temporarily encroach on wetlands (see Table 6-5). The work will be monitored to ensure compliance with Section 26 of the Standard Environmental Clauses on wetland protection (Appendix B), as will the wetland restoration when the construction is completed (see Section 26.3 of the Standard Environmental Clauses).

Table 6-5: Tower Work Areas that Might Temporarily Encroach on Wetland

Tower	Type	Size of work area (m^2)	Portion of wetland affected[a] (%)	Type of wetland
44A	EOA	3,850	70	Treed bog and open bog
47A	EOA	2,475	45	Open bog
48A	EOA	5,500	100	Treed bog and open bog
51A	ENM	1,100	20	Treed bog and open bog
Total	—	12,925	—	—

a. Based on a circular work area (radius = 42 m; area = 5,500 m^2) around the tower.

Anticipated operation-phase impacts and mitigation measures

Despite efforts to avoid wetlands when determining the planned line route, two towers (44A and 48A) will be built in treed bogs and the foundations of two others will partly encroach on treed bogs (see Pocket Insert Map A). The presence of these towers will result in permanent loss of an estimated 720 m^2 of wetlands at the site of the tower foundations (granular material). This loss represents a 0.06% reduction in wetlands in the study area or a 1% reduction in wetlands in the right-of-way.

Vegetation control activities in the planned right-of-way during the line operation phase will affect the vegetation in treed wetlands, which will be kept at the bush and grass stages. In addition, line maintenance and repair operations require occasional use of vehicles and machinery. Hydro-Québec will take the necessary measures to protect wetlands in the right-of-way in the operation phase.

Residual impact assessment

Numerous measures will be taken to avoid disturbing wetlands in executing the project: institution of a traffic strategy to avoid wetlands as much as possible; special land clearing methods; use of vehicles and machinery that exert little pressure on the soil; travel over logs or fascines; restoration of affected wetlands when the work is completed; etc. Given that clearing the right-of-way will affect only a small area of wetland and that only 720 m^2 of wetlands will be lost, the magnitude of the impact is low. The extent of the impact is site-specific, as only treed wetlands will be affected by clearing the right-of-way. The impact is of long duration: the treed wetlands will be kept permanently at the bush and grass stages and the loss of wetland occasioned by building the four towers is permanent. In sum, the significance of the residual impact on the wetlands is minor.

6.4.1.6 Special-status plant species

A search for special-status plant species was conducted in environments with the greatest potential for harbouring these species, mainly stream banks and wetlands. Survey teams did not note any special-status plant species during the plant inventories conducted in the summer of 2017. Accordingly, no impact on this biophysical environment component is anticipated.

6.4.1.7 Non-native invasive plant species

Anticipated construction-phase impacts and mitigation measures

During the plant inventories of the summer of 2017, reed canary grass was identified bordering the Nemiscau–Eastmain-1 road and in the right-of-way of the Eastmain-1–Nemiscau 315-kV line. Today considered a non-native invasive plant species, this plant was part of the seed mix used to revegetate areas disturbed when building the Eastmain-1 hydroelectric development. The Nemiscau–Eastmain-1 roadside was seeded in 2004.

To prevent propagation of this species or introduction of other non-native invasive plant species (NNIS) during the work, Hydro-Québec will implement the following specific measures:

- Require that the contractor wash all vehicles and machinery before bringing them to the jobsite.
- Mark off areas affected by reed canary grass to prevent vehicles and machinery from going there.
- Require that the contractor wash all vehicles and machinery before leaving work areas where NNIS are found, removing all dirt and plant fragments. If pressurized water cannot be used, machinery tracks/tires and shovels must be carefully rubbed clean.

Anticipated operation-phase impacts and mitigation measures

Measures taken during the construction phase to prevent propagation or introduction of NNIS will also be applied, as needed, when maintaining the line and the right-of-way.

Residual impact assessment

Given the specific measures planned, the significance of the residual impact associated with propagation or introduction of NNIS is negligible.

6.4.1.8 Plant species traditionally valued by the Crees

Anticipated construction-phase impacts and mitigation measures

As mentioned in Section 4.2.5.6, at least 28 plant species possibly traditionally used by the Crees (medicine, food, etc.) were found in the study area. During the plant inventories of the summer of 2017, 18 of these species were found in the right-of-way of the planned line segment. Clearing of the right-of-way and the access roads to it will impact some of these species. However, there is no information suggesting that the Crees collect these plants in the study area, which would not however preclude opportunistic collection.

Anticipated operation-phase impacts and mitigation measures

No impact on plant species traditionally valued by the Crees is anticipated as a result of line segment maintenance activities, apart from those involving tree species in the right-of-way, which will be felled for purposes of vegetation control.

Residual impact assessment

As the species in question are all common in this part of Québec, the magnitude of the impact is low. The extent of the impact is site-specific, as only a few species will be affected by the project. Lastly, the impact on grass and shrub species is temporary as they will recolonize the line right-of-way, while the impact on tree species is long term, because of the planned vegetation control operations. The significance of the residual impact is minor.

6.4.1.9 Wildlife

Generally speaking, the main sources of impact on wildlife species are associated with 1) clearing the line segment right-of-way, which will mean a loss of habitat for forest species, and 2) construction activities, which could disturb some animals and cause them to shift their home range to neighboring habitats. When the work is completed, most of the animals will return to environments in the right-of-way and bordering it.

More specifically, the project could affect large wildlife species, small wildlife species, fur-bearing animals and micromammals, birds, fish, reptiles and amphibians and even bats.

6.4.1.9.1 Large wildlife

Moose

Anticipated construction-phase impacts and mitigation measures

Moose is present in the Québec boreal forest, but population density is very low because the habitat is not very productive. The two key factors in moose presence are habitats favorable for their establishment and food availability Mixed and deciduous forests are high quality habitats for moose. Regenerating forest, wetlands and scrubland are also good habitats.

The main source of project impacts on moose is the clearing of the right-of-way, which will permanently reduce available moose habitat because of the tree layer loss. The environments to be cleared include 1 ha of high quality moose habitat (mixed stands) and 3.7 ha of treed wetlands (0.1 ha of treed swamp and 3.6 ha of treed bog).

Construction work and concomitant noise, transport, traffic and even just the presence of workers could disturb moose whose home ranges overlap the planned right-of-way. The disturbance will be temporary, however, and the affected animals will be able to move to the numerous replacement habitats in the vicinity. When the work has ended, they will return to habitats adjacent to the right-of-way or even to the right-of-way itself.

In addition to the general measures in sections 2, 4 and 26 of the Standard Environmental Clauses (Appendix B on CD-ROM), Hydro-Québec will apply the following specific measures to limit project impacts on moose:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

Anticipated operation-phase impacts and mitigation measures

In the operation phase, Hydro-Québec will control the vegetation in the planned right-of-way to prevent regrowth of woody vegetation incompatible with the presence of a power line. These maintenance operations could temporarily disturb moose that use the right-of-way and feed on the shrubs and low trees there.

Residual impact assessment

The magnitude of the impact on moose is considered to be low given the small amount of habitat that will be modified (4.7 ha) compared to the total forest habitat available in the area. Some moose may use parts of the right-of-way where conditions are favorable for moose, for feeding in particular. The extent of the impact is site-specific, as moose use of the environment will be altered only in certain parts of the right-of-way. The impact is of long duration with respect to the forest habitat loss, but the disturbance of the animals during the construction phase is of short duration. Overall, the significance of the impact on moose is minor.

Caribou

Anticipated construction-phase impacts and mitigation measures

Though the study area can be used by both types of caribou (woodland and migratory), only woodland caribou risk being affected by the project. However, telemetry monitoring by the MFFP has not to date demonstrated that woodland caribou are present in the study area (see Section 4.2.6.1.1). Woodland caribou have been found no closer to the study area than approximately 8 km from the planned mining site (WSP Canada, 2017). Migratory caribou, on the other hand, are found in the study area only in winter, and since the line segment will be built from late summer through fall, the line construction will not impact this type of caribou.

A number of researchers believe the preferred habitats of woodland caribou are peatland, mature coniferous stands with lichen and other lichen-rich environments (Équipe de rétablissement du caribou forestier du Québec, 2008). Woodland caribou are also known to avoid recently disturbed environments (Moreau et al., 2012), though sometimes they are found in 6-40 year-old regenerating forest (cuts or burns), particularly in spring (Hins et al., 2009). In summer, woodland caribou generally inhabit >50-year-old forest (Lantin, 2003; Courbin et al., 2009; Hins et al., 2009), peatland and dry barrens (lichen heathland).

The main sources of project impact on woodland caribou are clearing of the right-of-way, transport and traffic, presence of workers and construction activities. Clearing the right-of-way will mean a loss of 12.3 ha of coniferous forest prized by woodland caribou and 3.6 ha of wooded peatland which could also be used by the species. Disturbances during the construction phase caused by construction activities, transportation and traffic as well the presence of workers will cause caribou affected to shift their home ranges depending on neighbouring habitats. A number of studies have demonstrated that caribou make little use of environments near areas disturbed by human activity (Courtois et al., 2007; Vistnes and Nellemann, 2008). However, there are already anthropogenic elements in the study area, including the 735-kV line corridor (circuit 7061), the 315-kV line corridor (circuits 3176-3177), the Nemiscau–Eastmain-1 road and dike LE-22, not to mention the upcoming activities of the Rose Lithium-Tantalum Mine.

Hydro-Québec will apply the general mitigation measures in sections 2, 4 and 26 of the Standard Environmental Clauses (Appendix B on CD-ROM) during the work to limit project impacts on woodland caribou. In addition, the following specific measures will be implemented:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

Anticipated operation-phase impacts and mitigation measures

The sources of impacts on woodland caribou during the operation phase are mainly associated with the presence of the right-of-way and vegetation control within it. Woodland caribou generally seek out mature coniferous forests in winter where they can find the lichen on which they feed. Vegetation control will result in habitats not generally used by woodland caribou in winter. In other words, the right-of-way will not offer an attractive winter habitat for woodland caribou. The habitat loss will be small, however, given the species' extensive home ranges and the great availability of replacement habitats (coniferous forest) in the territory (see Pocket Insert Map A).

Residual impact assessment

The significance of the impact on woodland caribou of building and operating the planned line segment should be minor. Impact magnitude is low, as few caribou use the project area. In addition, the size of the habitat lost (15.9 ha) is small relative to the woodland habitat available in the area. The extent of the impact is site-specific, as habitat favorable for woodland caribou will only be altered over a short stretch of the planned right-of-way (about 3 km). Impact duration is long term, the useful life of the line. Importantly, however, avoidance of this area by woodland caribou will not be intensified by the project, given the existing and upcoming (Rose Lithium-Tantalum Mine) anthropogenic elements present in the study area.

Black bear

Anticipated construction-phase impacts and mitigation measures

The presence of black bear in the study area was confirmed by bear sightings and signs of bear use of the area (tracks, excrement, etc.). The study area offers good habitat potential for black bear with its wetlands, mixed and deciduous shrubbery and old burns that provide food. The bears use the wooded areas for shelter.

The main source of project impacts on black bear is connected to clearing the right-of-way, which will affect 17.0 ha of wooded habitats that might be used by the species. These are essentially coniferous (12.3 ha) and mixed (1.0 ha) stands as well as treed wetlands (3.7 ha). Most of the wetlands and shrub swamp crossed by the line segment will be preserved or only slightly altered by the project, because the substantial distance between towers (span) means towers can be sited on either side of wetlands rather than in them.

In addition to the clearing operations, black bear may be disturbed by the construction work and associated noise, the transport operations, the traffic and even just the presence of workers. These may cause them to shift their home ranges depending on neighboring habitats. However, when the work has ended, the bears will move back to favorable environments in the right-of-way and the surrounding area.

Black bears generally seek areas free of all human presence, but opportunistic behaviour could bring them to the work areas. The smell of food, feeding of animals and poorly stored food could attract bears, posing a threat to worker safety and leading to relocation or slaughter of bears. To avoid this, Hydro-Québec will take the following specific measures:

- Encourage workers to store food properly and to refrain from feeding animals, so they won’t be attracted to work areas.
- Relocate bears that approach work areas if they pose a threat to worker safety.

Lastly, in addition to the general measures stipulated in sections 2, 4 and 26 of the Standard Environmental Clauses (Appendix B), Hydro-Québec will apply the following specific mitigation measures to limit project impacts on black bear:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

Anticipated operation-phase impacts and mitigation measures

The main sources of impact on black bear during the operation phase are associated with the presence of the right-of-way and control of the vegetation there. Preservation of the shrub and grass layers will provide a potential feeding habitat for black bear.

Residual impact assessment

The main project impact on black bear is the loss of wooded habitats in the right-of-way. Magnitude of the impact is low because the habitat loss is small compared to the available forest habitats in the area. The black bear population will be maintained, and some bears will continue to use parts of the right-of-way where conditions will be favourable for them, for feeding in particular. The extent of the impact is site-specific, as black-bear use of the environment will not be altered except in certain parts of the right-of-way. The impact will be of long duration as far as the forest habitat loss is concerned, whereas disturbance during the construction phase will be of short duration. The significance of the overall residual impact on black bear is minor.

6.4.1.9.2 *Small wildlife, fur-bearing animals and micromammals*

Anticipated construction-phase impacts and mitigation measures

Clearing the right-of-way will lead to loss of an estimated 17.0 ha of woodland habitats for small wildlife, fur-bearing animals and micromammals. According to the preliminary work schedule, the clearing will take place in late summer, which is not a young-rearing period for many mammal species.

The clearing as well as disturbances caused by transport, vehicle traffic, construction activities and the presence of workers will cause the animals to shift their home ranges depending on neighbouring habitats. When the work ends, the animals will move back to habitats near and even within the planned right-of-way.

To limit project impacts on these animals, Hydro-Québec will apply the general measures in sections 2, 4 and 26 of the Standard Environmental Clauses (Appendix B on CD-ROM) as well as the following specific measures:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

Anticipated operation-phase impacts and mitigation measures

During the operation phase, vegetation control activities will be undertaken in the line right-of-way to prevent regrowth of forest vegetation. These maintenance activities may disturb wildlife that uses the different environments in the right-of-way.

Residual impact assessment

The execution of the project will have an impact of minor significance on small wildlife, fur-bearing animals and micromammals. The magnitude of the impact is considered low because the habitat loss is small compared to the available forest habitats in the territory. Some species may continue to use parts of the right-of-way where conditions are favorable, for feeding in particular. Only a few forest species (e.g., hare, porcupine and squirrel) are likely to be affected by the presence of the right-of-way, but without any appreciable effect on their population dynamics. In addition, the presence of a line right-of-way in a forest environment is generally favorable for small mammal communities (Fortin and Doucet, 2008). The extent of the impact is site-specific, as use of the environment by the different species will only be altered in certain parts of the right-of-way. Impact duration is long term with respect to loss of woodland habitats but short term in the case of disturbance of animals during the construction phase.

6.4.1.9.3 Birds

Anticipated construction-phase impacts and mitigation measures

The main source of impacts on birds is associated with clearing 17.0 ha of woodland in the planned right-of-way and the resulting habitat loss. The clearing operations are scheduled for mid-August, which is not in the nesting or brood-rearing period (generally early May to mid-August). In addition, the line construction activities will run from late September to mid-November, when many migratory bird species are no longer present.

Forest species in particular will be affected, as these birds will have to find a new habitat. Clearing the right-of-way will have little impact on birds that prefer open environments, as they will not be affected by the clearing operations. Birds that inhabit the forest fringe will not be affected either by the loss of woodland. A number of species that feed and nest in clearings might benefit from the increase in open environments as a result of clearing the right-of-way.

In addition to clearing the right-of-way, the construction activities as well as transport and traffic could disturb birds and cause them to temporarily shift their home ranges depending on available neighbouring habitats. Of note, the construction work will take place in the fall, when many migratory bird species are no longer present.

To limit project impacts on birds, Hydro-Québec will apply the general measures in sections 2, 4 and 26 of the Standard Environmental Clauses (Appendix B on CD-ROM) as well as the following specific measures:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

Anticipated operation-phase impacts and mitigation measures

Vegetation control activities in the line segment right-of-way could disturb birds that use the different environments there.

Residual impact assessment

The magnitude of the impact on birds will be low, as none of the work will take place during the nesting and brood-rearing period. The extent of the impact is site-specific, as use of the environment by the different bird species will be altered only in certain parts of the right-of-way. The impact on forest birds will be long term because of the loss of habitat, but the impact on other bird species, which might use the open environments and forest fringes after the construction has been completed, will be short term. The disturbance of birds during the construction phase will also be short term. Overall, the significance of the impact on birds is considered minor.

6.4.1.9.4 Fish

Anticipated construction-phase impacts and mitigation measures

The inventories carried out for the Rose Lithium-Tantalum Mine project confirm the presence of 12 species of fish in the lakes and certain streams in the study area. However, Hydro-Québec did not observe any fish when characterizing the streams along the planned line segment on August 13 and 14, 2017. One stream crossed by the line segment between towers 51A and 52A (see Pocket Insert Map A) may harbor a potential brook trout spawning ground given its substrate and a flow that promotes water oxygenation.

The planned line segment crosses one lake, between towers 44A and 45A, as well as seven streams, four of them permanent and three intermittent (see Map A). Jobsite vehicles and machinery will bypass this lake, using a variety of access roads. Temporary bridges will be installed so the streams can be crossed.

The temporary bridges will be installed in way that will protect fish habitats (see sections 4, 6, 7, 9, 12 and 21 of the Standard Environmental Clauses, Appendix B on CD-ROM). The bridges will span the entire stream without hampering flow or affecting the streambed. When the work is completed, Hydro-Québec will remove the temporary bridges and restore affected stream banks. The measures taken to protect surface water quality (see Section 6.4.1.2) will also be effective in protecting fish habitats in general.

Among other things, Hydro-Québec will apply the following specific measure where the line crosses the lake and the streams to protect the riparian buffer strip and, accordingly, fish habitats:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.

Anticipated operation-phase impacts and mitigation measures

No impact on fish habitats is anticipated during the operation phase of the planned line segment.

Residual impact assessment

The measures taken by Hydro-Québec during the construction phase will protect fish habitats. As a result, no impacts on fish species or their habitats are expected.

6.4.1.9.5 Reptiles and amphibians

Anticipated construction-phase impacts and mitigation measures

Most reptile and amphibian species likely to use the planned right-of-way are associated with wetlands and streams at some point in their life cycle. Some species prefer woodlands, such as blue-spotted salamander, yellow-spotted salamander, American toad, northern spring peeper, wood frog and common garter snake (see Table 4-12, Section 4.2.6.4).

Hydro-Québec will apply the general measures in sections 4, 12, 21 and 26 of the Standard Environmental Clauses (Appendix B on CD-ROM) during the work to limit project impacts on reptile and amphibian habitats. Hydro-Québec will also implement the following specific measures:

- Determine and mark off the boundaries of wetlands in the planned right-of-way to keep construction machinery off wetlands as much as possible.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.
- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.

Anticipated operation-phase impacts and mitigation measures

Hydro-Québec has considered the presence of wetlands and aquatic environment buffer strips in siting its towers. As the average distance between towers is 360 m, in most cases towers can be sited on either side of rather than in wetlands. The foundations of two towers however (44A and 48A) will be built in wetlands.

Vegetation control operations during the line operation phase will keep the planned right-of-way permanently in the shrub and grass stages. This type of environment is not generally favorable for reptile and amphibian forest species.

Residual impact assessment

The planned line segment will only affect woodland species. The magnitude of the impact is low because on the whole only some species will be affected and population maintenance will not be compromised. The extent of the impact is site-specific, as it is limited to the habitats of affected species present in the planned right-of-way. Impact duration is long term, because the alterations will be permanent. The significance of the project impact on amphibian and reptile species as a whole is thus deemed minor.

6.4.1.9.6 Bats

Anticipated construction-phase impacts and mitigation measures

Of the eight bat species present in Québec, five are likely to be found in the study area—big brown bat, little brown bat, northern long-eared bat, hoary bat and red bat. The latter four species are considered special-status species in Québec or Canada (see Table 4-13, Section 4.2.6.5).

The main source of impacts on bats during the construction phase is clearing of the right-of-way, which will affect 17.0 ha of woodland attractive to bats. The clearing may reduce the number of daytime rest areas available. However, according to the preliminary work schedule, the clearing is scheduled for mid-August, which is not during the bat birthing or nursing period.

To limit the impact of clearing on bats, Hydro-Québec will implement the general mitigation measures in Section 4 of the Standard Environmental Clauses (Appendix B on CD-ROM).

Anticipated operation-phase impacts and mitigation measures

Operation phase impacts on bats are associated with vegetation control of the planned right-of-way and presence of the right-of-way. Maintaining open environments in the right-of-way will most likely be beneficial for bats, since their activities are generally more intense in riparian habitats and forest fringes than in intact woodland environments (Grindal, 1999; Hogberg et al., 2002; Owen et al., 2003; Menzel et al., 2005; Loeb and O'Keefe, 2006). In fact, bats use road or line rights-of-way in forest environments as hunting areas and the forest fringes as resting areas (Grindal 1998; Zimmerman and Glanz, 2000; Brack, 2006).

Residual impact assessment

Given that the right-of-way clearing operations will not take place during the bat birthing or nursing period, that measures are to be taken to limit the impact of the clearing and that the new right-of-way will be favorable for bats once the construction has ended, the significance of the residual project impact on bats will be minor.

6.4.1.10 Special-status wildlife species

Mammals

Seven special-status mammal species are liable to be found in the study area: woodland caribou, rock vole, southern bog lemming, hoary bat, northern long-eared bat, red bat and little brown bat.

Project impacts on **woodland caribou** and **bats** are discussed in sections 6.4.1.9.1 and 6.4.1.9.6. The significance of the impact on these species is considered minor, mainly for the following reasons:

- Woodland caribou: The MFFP telemetry monitoring activities have not demonstrated presence of woodland caribou in the study area. The species' avoidance of the study area will not be accentuated by construction of the planned line segment because there are already anthropogenic elements present.
- Bats: The right-of-way will not be cleared during the bat birthing or nursing period. Maintaining open environments in the planned right-of-way will be beneficial for bats.

Rock vole likes environments close to water with rock substrates—riparian environments, for example (Kirkland and Jannet, 1982; Orrock and Pagels, 2003). Rock vole habitat potential in the study area is mainly in a few mossy spruce forest fringes along streams. Hydro-Québec will apply the follow specific mitigation measure to protect rock vole:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.

Studies conducted in riparian buffer strips preserved along streams crossed by line rights-of-ways confirm that this type of habitat is used by rock vole (Bélisle et al., 2002). Thus, the significance of the residual impact on rock vole is considered minor. In addition, it is noteworthy that not a single rock vole was found in the small mammal inventories conducted for the Rose Lithium-Tantalum Mine project and that the potential for presence of this species in the study area is considered low (WSP Canada, 2017).

Southern bog lemming likes grassy wetlands—swamps and bogs, for example (Getz, 1961; Linzey, 1984; Krupa and Haskins, 1996). Habitat potential for this species in the study area is mainly in open bogs. The construction-phase traffic strategy is thus to avoid bogs as much as possible. If temporary roads must be built in bogs, Hydro-Québec will take measures to reduce their impact and will restore the bogs after the construction has ended (see Section 26 of the Standard Environmental

Clauses, Appendix B on CD-ROM). Among other things, the following specific measures will be applied:

- Determine and mark off the boundaries of wetlands in the right-of-way to keep construction machinery off wetlands as much as possible.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

In sum, the significance of the impact on southern bog lemming is considered minor. Hydro-Québec studies show that environments associated with line rights-of-ways are favorable for this species. Southern bog lemmings have in fact been found repeatedly in cleared line rights-of-way in mixed and deciduous boreal forests (Fortin and Doucet, 2003 and 2008). Lastly, no southern bog lemmings were found in the small mammal inventories conducted for the mining project. Potential for presence in the study area is low (WSP Canada, 2017).

Birds

Given their ranges, nine special-status bird species may possibly be found in the study area: golden eagle, harlequin duck, common nighthawk, peregrine falcon, short-eared owl, olive-sided flycatcher, Canada warbler, bald eagle and rusty blackbird.

No impact on golden eagle, harlequin duck, peregrine falcon or bald eagle is anticipated, as the planned right-of-way does not cross environments used by these species for nesting.

In addition, the project will not impact nesting of common nighthawk, short-eared owl, olive-sided flycatcher, Canada warbler or rusty blackbird, as the land clearing and construction will not take place during their nesting or brood-rearing periods, generally from early May to mid-August.

In fact, the cleared right-of-way may constitute a new nesting habitat for common nighthawk and short-eared owl, since these two species nest in the ground in open environments (Brigham et al., 2011; Cadman and Page, 1994).

Clearing the right-of-way may mean a loss of nesting habitats for olive-sided flycatcher and Canada warbler, but the loss is deemed minor given the small area affected and the many alternative habitats in the study area. In addition, neither of these species was observed in the bird inventories conducted for the mine project (WSP Canada, 2017).

Lastly, clearing the right-of-way should have little impact on rusty blackbird. This species' preferred habitat is generally along the fringes of wetlands and it rarely uses the centre part of woodlands.

To reduce project impacts on olive-sided flycatcher, Canada warbler and rusty blackbird, Hydro-Québec will apply the general measures in sections 4 and 26 of the Standard Environmental Clauses (Appendix B) as well as the following specific measures:

- Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.
- Use clearing method B, B2, APS or C in wetlands where trees must be felled.

6.4.2 Impacts on the human environment

6.4.2.1 Cree land use

The planned line segment will be located within trapline RE1 of the Cree community of Eastmain.

There are no Cree camps in the planned right-of-way. The permanent camp at Km 42 of the Nemiscau–Eastmain-1 road is about 100 m from the right-of-way. This camp was used by the tallyman of trapline RE1 and his family as their main camp until 2011, when a new main camp was built near a lake farther north, outside the study area. There are in fact two camps at Km 42 that are still used by the tallyman and members of his family—to hunt moose in winter and geese in spring, among other things. According to information obtained from the tallyman, he has not yet signed an agreement with the mining company (Corporation Éléments Critiques) about relocation or compensation for loss of the camp.[2] Negotiations should be under way. The tallyman of trapline RE1 mentioned that he will no longer be using this camp if he comes to an agreement with the mining company. In addition, if the mine is operated, he will continue his moose and goose hunting activities in the study area.

The area crossed by the planned line segment is used by the Crees for hunting moose, particularly along the Nemiscau–Eastmain-1 road. Travel is by snowmobile.

Anticipated construction-phase impacts and mitigation measures

The members of the Cree community of Eastmain who use the study area will see their environment altered. Because the construction work will take place from mid-August through the fall, it will not hinder the pursuit of traditional activities—in particular, goose hunting (in spring) and moose hunting (generally in winter). The planned communication mechanisms for keeping Cree users up-to-date on the work schedule and project progress should enable them to adapt and continue their activities, taking into account the land clearing and construction work, and to travel in

[2] Based on the interview of trapline RE1 tallyman Ernie Moses conducted by Kathia Lavoie of Hydro-Québec on December 1, 2017.

complete safety in the project area. Hydro-Québec will install appropriate road safety signs along the Nemiscau–Eastmain-1 road during the work.

In addition, it is unlikely that workers will hunt and fish in the project area, given their heavy work schedules and the fact that the workcamp (Hydro-Québec's Eastmain workcamp) is more than 20 km from the planned line segment. Hydro-Québec will inform workers of applicable regulations and of Cree activities in areas affected by the work, to minimize their disturbance. The following specific mitigation measures will help to minimize disturbance of Cree users during the construction phase:

- Inform Cree users of the work schedule and discuss with them measures to minimize disturbance of their activities
- Agree on measures to promote participation of Cree businesses and Cree workers in executing the project, in accordance with applicable agreements.
- When clearing the planned right-of-way, make sure trappers will be able to find equipment moved outside the right-of-way.
- Inform workers of hunting, fishing and trapping regulations and of Cree activities in areas affected by the work.

Anticipated operation-phase impacts and mitigation measures

No impacts on the pursuit of traditional activities by the Crees during operation of the planned line segment are anticipated. The right-of-way of the relocated line segment will give Crees already active in this area and their families another access option.

Residual impact assessment

On the whole, the significance of the impact on traditional Cree activities is deemed minor, given that the magnitude of the disturbance is low, its extent is site-specific and the construction work will be of short duration (about four months, from mid-August to November 2019).

6.4.2.2 Mining

More than 65% of the planned line route runs through land reserved for the State for work associated with Eastmain 1 reservoir, and mining activities are prohibited on this land. Apart from this land, the line segment will run for 1,751 m over mining claims currently held by the mining company (Corporation Éléments Critiques).

Presence of a transmission line is not incompatible with mining exploration. It must not be forgotten that a mining claim is not a property title and only confers limited rights for a specific period of time. The claim holder has the exclusive right to prospect, on the site to which the claim applies, for all mineral substances in the domain of the State except sand, gravel, clay and other loose deposits. Surface

deposits remain accessible for infrastructure projects provided the holder of the mining claim retains access to mineral resources.

Anticipated construction-phase impacts and mitigation measures

No impact on mining is anticipated during construction of the planned line segment.

Anticipated operation-phase impacts and mitigation measures

This line segment project is required for operation of the planned Rose Lithium-Tantalum Mine, deemed a positive impact on mining activities in the region. The presence of the line segment and its right-of-way will reduce the area available for mining operations by 9.7 ha. However, most of this area is close to Eastmain-1 reservoir dike LE-22, where there are already restrictions on mining activities. The line route meets the mine operation requirements stipulated by Corporation Éléments Critiques with regard to its Rose Lithium-Tantalum Mine project. No mitigation measures are planned by Hydro-Québec.

Residual impact assessment

The execution of this project will have a net positive impact on mining. Indeed, the purpose of the project is to make it possible to open and operate the Rose Lithium-Tantalum Mine belonging to Corporation Éléments Critiques. Hydro-Québec and Corporation Éléments Critiques together selected the route for relocating the Eastmain-1–Nemiscau line segment to maximize mining operation potential in this area.

6.4.2.3 Recreation, tourism and vacationing by Jamesians and visitors

The planned line segment runs through two special hunting and fishing sectors, the Eastmain sector west of the Nemiscau–Eastmain-1 road, and the Weh-Sees Indohoun sector to the east (see Map 4-3). Under the Weh-Sees Indohoun Corporation management plan, sport moose hunting is prohibited in the Eastmain sector. Although sport moose hunting is permitted in the Weh-Sees Indohoun sector, the hunting season there is shorter than in the rest of hunting area 22. Hunting small game and migratory birds is permitted in both sectors, but caribou hunting is prohibited, under regulations applicable to hunting area 22 and migratory bird hunting District A. Anglers must obtain a daily pass from the Weh-Sees Indohoun Corporation for sport fishing. According to the tallyman of trapline RE1, the study area is not used by Jamesians or visitors.[3]

[3] Based on the interview of trapline RE1 tallyman Ernie Moses conducted by Kathia Lavoie of Hydro-Québec on December 1, 2017.

Anticipated construction-phase impacts and mitigation measures

The work carried out in September and October may disturb moose hunting, permitted east of the Nemiscau–Eastmain-1 road, as well as small game and migratory bird hunting. Regarding the moose hunt, current available data indicate that only four moose were killed in 2013 by sport hunters in the Weh-Sees Indohoun sector, but it cannot be determined if these moose were harvested in the study area (Hydro-Québec Production, 2014*a*). Note that most of the study area lies in the Eastmain sector, where sport moose hunting is prohibited. No impact on sport hunting during the construction period is anticipated.

Hydro-Québec has no plans for measures to mitigate project impacts on recreation, tourism and vacationing activities by Jamesians and visitors.

Anticipated operation-phase impacts and mitigation measures

No impacts on recreation, tourism and vacationing activities by Jamesians and visitors are anticipated during the operation phase.

Residual impact assessment

The significance of the impact on recreation, tourism and vacationing activities by Jamesians and visitors will be minor, as only a small group of people over a short period of time will be affected.

6.4.2.4 Road network

The Nemiscau–Eastmain-1 road will be the main artery during construction of the line segment. This road, which connects the Nemiscau and Eastmain workcamps, is managed and maintained by the Société de développement de la Baie-James (SDBJ).

Anticipated construction-phase impacts and mitigation measures

Heavy vehicles will be required to transport wood, granular material, machinery and equipment for the clearing and line construction activities. These vehicles will travel along the Nemiscau–Eastmain-1 road, causing a slight increase in traffic along this road and perhaps increasing the safety risk for users.

These temporary disturbances will be limited by applying general measures for road maintenance and protection (see Section 15.5 of the Standard Environmental Clauses, Appendix B on CD-ROM) and the following specific measures:

- Inform the Société de développement de la Baie-James (SDBJ) of the work schedule.
- Put up signs needed to ensure road safety.
- During the work, repair any damage to the road network.

The planned line segment will cross the Nemiscau–Eastmain-1 road twice. When stringing the cables (conductors and overhead ground wires), Hydro-Québec will install temporary gantries spanning the road so as not to interfere with traffic.

Anticipated operation-phase impacts and mitigation measures

No operation-phase impacts on the road network are anticipated.

Residual impact assessment

The work will cause an increase in traffic along the Nemiscau–Eastmain-1 road and disturbances for users. Thanks to the mitigation measures that will be implemented, the magnitude of the impact on the road will be low. The extent of the impact is local and its duration is short, as only a small number of people will be affected during the clearing and construction activities. The significance of the impact on the road network is considered minor.

6.4.2.5 Development projects

This project will have a positive impact on development projects, as it is being executed to make it possible to open and operate the planned Rose Lithium-Tantalum Mine.

6.4.2.6 Archaeology

The planned line segment runs for a total distance of 66 m over a single area with archaeological potential east of a lake between planned towers 44A and 45A. This area may contain remains of human activity in the past.

Anticipated construction-phase impacts and mitigation measures

The potential impacts on archaeological heritage are associated with clearing, building/upgrading access roads, excavation and earthwork as well as installation of the line segment. These activities could irreparably destroy archaeological remains.

Hydro-Québec will apply the following specific measures in the area with archaeological potential crossed by the line segment:

- Before starting the work, conduct a field inventory of the area with archaeological potential affected by building the line segment. If remains are discovered, take measures to protect their integrity and conduct a dig at the site.
- Inform the Council of the Cree Nation of Eastmain of the results of the inventories and any digs.

These measures will also be taken if archaeological remains are uncovered during the work (see Section 19 of the Standard Environmental Clauses, Appendix B on CD-ROM).

Anticipated operation-phase impacts and mitigation measures

No impacts on archaeological remains are anticipated during the line operation phase.

Residual impact assessment

Given the mitigation measures planned, particularly the digs in areas where remains are uncovered, the magnitude of the impact is considered low. The extent of the impact is site-specific, since only a small part of the planned right-of-way cuts through an area with archaeological potential. Duration of the impact is short, since the inventory will be conducted before the work starts, rendering the area accessible for clearing and construction. The significance of the residual impact on the area with archaeological potential is minor.

6.4.2.7 Soundscape

Anticipated construction-phase impacts and mitigation measures

The clearing and construction activities as well as the transport and traffic of heavy vehicles and personnel will temporarily increase noise levels near work areas.

Land users, especially those who use the permanent Cree camp at Km 42 along the Nemiscau–Eastmain-1 road, may be affected by the noise of the work. To mitigate this impact, Hydro-Québec will ensure application of Section 2 of the Standard Environmental Clauses (Appendix B on CD-ROM).

The clearing operations are the main source of noise that might temporarily disturb the environment. Fellers are generally used for this work, except in sensitive areas (riparian buffer strips, for example), or the clearing is performed manually with chain saws and brushcutters. The clearing operations will take about 20 days.

Installing foundations when building the line segment will not cause much noise. Other construction work, such as tower assembly and conductor stringing, is not very noisy either. Note that the jobsite will move rapidly along the line route, as average distance between towers is 360 m. The sound nuisances associated with the construction work will thus be site-specific and of short duration. It will take about 60 days to build the line.

Anticipated operation-phase impacts and mitigation measures

No major impact on the soundscape during the operation phase is anticipated.

Residual impact assessment

The significance of the impact on land user soundscapes is considered minor. Impact magnitude is low given the measures that will be taken. In addition, only a limited number of activities are noise sources and the jobsite will be rapidly relocated along the line route. The extent of the impact is site-specific, as the disturbance will be experienced by only a small number of people. Impact duration is short, given that the noise nuisances will not be perceived on a continuous basis during the construction work.

6.4.2.8 Landscape

The presence of the line segment and the vegetation control operations in its right-of-way may alter the landscape and the visual fields of observers in the study area.

The new 315-kV line segment will require installation of 13 lattice towers up to 74.53 m high with cables in a natural landscape. These components will be very similar in make-up and scale to the components of the existing Eastmain-1–Nemiscau 315-kV line. The appearance of the new line segment will, however, contrast with that of the natural landscape. The planned line will be composed of linear segments that cross a wide curve in the Nemiscau–Eastmain-1 road in two spots more than a kilometre apart. One segment of the line will be located between the road and Eastmain 1 reservoir, less than 300 m east of the road and less than 500 m from dike LE-22 on the edge of the reservoir.

In controlling the vegetation in the right-of-way of the new line segment (width = 54 m), Hydro-Québec will comply with the maintenance program already established for the Eastmain-1–Nemiscau 315-kV line.

Alteration of landscape appearance

The project components will alter the natural appearance of the landscape along a narrow linear strip of land.

Alteration of observers' visual fields

Project components will alter the visual fields of users of the Nemiscau–Eastmain-1 road and land users pursuing activities near the line. Though views tend to be limited, by the study area's forests, certain observation points may offer deep or open views of the structures (towers and wires) and the cleared right-of-way of the new line segment. As with the existing line, the visibility of the project components will depend mainly on the study area's forest vegetation (terrestrial coniferous, deciduous and mixed forest as well as treed swamps and treed bogs) (see Pocket Insert Map A).

From the Nemiscau–Eastmain-1 road, the visibility of components of the planned line segment will depend on the speed at which the observer is travelling, the spatial features of the observation point and how the land between the observer and the structures is used. Along the linear segments of the Nemiscau–Eastmain-1 road, views are typically deep, and the openness of the visual field is filtered or restricted by coniferous forest. Open foregrounds (lakes, clearings and low vegetation), however, could offer deep views of the planned components. In the winding road segments, forest vegetation generally limits deep views. The wires of the planned line segment, which twice intersect a wide curve in the road, will alter the foreground of the visual field and the immediate surroundings of road users at two particular spots.

As for the navigable sectors of Eastmain 1 reservoir, most offer observation points with deep, open, panoramic views. Depending on the proximity of the planned line segment, these views are in the middle ground and the background of the visual field of observers looking west. The hills of the Mistassini Highlands (landscape units CO-1 and CO-2) serve as observation points at spots along the Nemiscau–Eastmain-1 road, with bird's eye views of parts of the study area. In particular, the portions of the structures (towers and wires) that are above the treetops will alter the visual field of observers on the hills.

The density and proximity of forest vegetation make it hard to read the landscape, which is often diffuse and without definitive landmarks. The towers and wires of the new line segment could, as a result, serve as landmarks facilitating spatial orientation. According to the tallyman of trapline RE1, the planned right-of-way could constitute an excellent landmark that would be helpful in bad weather.[4] The tallyman was also not critical of the aesthetics of transmission lines, saying their presence did not bother him.

Residual impact assessment

Overall, the forest vegetation will reduce the visibility of the planned structures (towers and wires), and the similarity of these components to those of the existing Eastmain-1–Nemiscau line will promote their visual integration. The magnitude of

[4] Based on the interview of trapline RE1 tallyman Ernie Moses conducted by Kathia Lavoie of Hydro-Québec on December 1, 2017.

the project impact on the landscape is thus low. The extent of the visual impact is site-specific, as impacts on the configuration of visual fields of observers in the study area are few and only a small number of people will experience them. Duration of the impact is long term, since the impact will last for the life of the line segment.

In sum, the significance of the project's impact on the landscape and on observer perception is deemed minor.

6.5 Dismantling a segment of the existing 315-kV line

After relocating a 4.1-km segment of the Eastmain-1–Nemiscau 315-kV line to make room for the Rose Lithium-Tantalum Mine project facilities, Hydro-Québec will dismantle the decommissioned line segment between existing towers 43 and 47. The dismantling will take about 10 days and will be performed in late November and early December 2019.

The dismantling sequence is generally as follows:

- Remove wires (conductors and ground wire), disassemble towers and hardware (insulators, etc.)
- Remove or level tower foundations
- Backfill and grade at the foot of the dismantled towers

The work will take place in the line right-of-way and existing access roads used for line maintenance will be used—limiting impacts on the biophysical environment, on wetlands, streams and the lake between existing towers 45 and 46 in particular (see Pocket Insert Map A). An environmental compliance guide will be provided for the dismantling activities, specifying which access roads are to be used and any sensitive elements that must be protected.

During the dismantling, the contractor will be required to apply the general mitigation measures in sections 6, 7, 10, 12, 15, 16, 17, 21, 24 and 26 of the Standard Environmental Clauses (Appendix B on CD-ROM) as well as the following specific mitigation measures:

- Recover recyclable materials (e.g., steel) and bring waste to sites authorized by the MDDELCC.
- Avoid disturbing vegetation fringing the right-of-way.
- Determine and mark off the boundaries of wetlands in the right-of-way to keep construction machinery off wetlands as much as possible.
- Backfill the lower part of foundations of dismantled towers with granular material and fill the upper part (30 cm thick) with high quality soil.
- As needed, seed bare soil at dismantled tower sites with a seed mix that will promote vegetation regrowth.

Lastly, Hydro-Québec will apply the specific measures described in Section 6.4.1.7 to prevent propagation or introduction of non-native invasive plant species.

In general, the impact of the dismantling activities will be limited because of the nature of the work and its short duration. Furthermore, of the 2,125 m of line to be dismantled, 1,384 m are within the boundaries of the planned mining facilities, that is, the open pit mine and the waste rock stack (see Pocket Insert Map A). A residual right-of-way segment to the north about 1 km long will not be affected by the mining facilities. Hence an increase in the area covered by forest vegetation is anticipated in this sector in the long term (an additional 7.6 ha), since Hydro-Québec will no longer control the vegetation there.

6.6 Connecting the substation for the planned mine to the Eastmain 1–Nemiscau line

For electricity supply, Hydro-Québec plans to connect the mine to the Eastmain 1–Nemiscau 315-kV line. The customer will determine the exact location of the 315/25-kV transformer substation to be installed west of the connection point. No new ground structures will be required for the connection, since the substation will be built along the existing 315-kV line. There will thus be no impacts on the biophysical and human environment.

6.7 Recommissioning a borrow pit and opening a new quarry

Granular material will be required to build/upgrade access roads and install tower foundations. This material will be taken from a recommissioned borrow pit (159,000 m^2) and a new quarry, both in the study area (see Pocket Insert Map A). Neither of these two extraction areas is located in wetlands or close to an aquatic environment, and no sensitive biophysical or human environment components have been identified in their vicinity. Asked about the siting of the borrow pit and the quarry in the study area, the tallyman of trapline RE1 expressed no objections to operation of the two sites. On the contrary, he would like Hydro-Québec to check if the sites can be revegetated after they are closed to promote goose hunting.[5] Furthermore, the vegetation on the borrow pit was restored about ten years ago and is thus a recent plantation, and the quarry is located in a coniferous stand, the dominant vegetation in the study area (see Map A).

In addition to encroachment on the biophysical environment as a result of clearing and excavation activities, possible impacts of operating the extraction areas include local alteration of air quality and soundscape (e.g., dust and noise generated by the crusher). However, the contractor will be required to apply the general mitigation

[5] Based on the interview of trapline RE1 tallyman Ernie Moses conducted by Kathia Lavoie of Hydro-Québec on December 1, 2017.

measures in sections 2, 3 and 20 of the Standard Environmental Clauses (Appendix B on CD-ROM).

With the application of the general measures, operation of the borrow pit and the quarry should not have an appreciable environmental impact. Both of these extraction areas are located close to sites that have already been disturbed (access road to a recommissioned borrow pit in one case and a road close to dike LA-22 in the other). In addition, the contractor will be required to take all necessary measure to comply with the *Regulation respecting pits and quarries* and, where applicable, the *Règlement sur l'aménagement durable des forêts du domaine de l'État*. To operate a quarry or sand pit, the prime contractor must obtain authorization from the MDDELCC. The prime contractor will also be responsible for site restoration, including soil restoration, when operations end.

6.8 Adding equipment at Eastmain-1 substation

Connecting the planned mine to the Eastmain-1–Nemiscau 315-kV line will require adding three 315-kV current transformers at Eastmain-1 substation. To make room for the new transformers, existing equipment must be removed and associated equipment upgraded.

This work will take place entirely within the confines of the existing Eastmain-1 substation yard. The new foundations will be of poured concrete or composed of prefabricated modules. Laboratory analysis shows that material excavated within the substation can be reused to backfill the foundations. The site selected for the new equipment is not close to equipment containing insulating oil. Thus adding the transformers in the Eastmain-1 substation yard should not have any impact on biophysical environment components.

6.9 Summary of residual project impacts

Overall, the project to connect the Rose Lithium-Tantalum mine and relocate a 315-kV line segment will only have impacts of minor significance on components of the biophysical and human environment.

Building and operating the 315-kV line segment

Table 6-6, at the end of this chapter, summarizes the residual impacts of building and operating the 315-kV line segment as well as the general and specific mitigation measures that will be applied.

With respect to the biophysical environment, the main residual impacts are associated with the disappearance of the tree cover on approximately 17.0 ha in the planned line segment right-of-way and the concomitant loss of habitat for forest wildlife species. The clearing will mean cutting 12.3 ha of coniferous forest, 1.0 ha of mixed forest and 3.7 ha of trees in wetlands. In addition, the presence four tower foundations in peatland will mean a loss of 720 m^2 of wetland, that is, 0.06% of the wetlands in the study area or 1% of the wetlands in the right-of-way. The impacts on wildlife will be limited, because the right-of-way clearing operations will not take place during the period when birds nest or mammals, bats in particular, birth their young.

As for the human environment, the greatest residual impact will relate to disturbance of land users during the construction phase. However, this disturbance will be of short duration, about four months. In addition, the work should not hinder the pursuit of traditional activities by the Cree community. In terms of landscape, the presence of new structures near the Nemiscau–Eastmain-1 road and Eastmain 1 reservoir will alter observers' visual fields. Views of the line will, however, be sporadic and sometimes screened by forest vegetation.

Dismantling a segment of the existing 350-kV line

Dismantling a segment of the Eastmain-1–Nemiscau line will have no residual impact, mainly because mining facilities will occupy most of the right-of-way of the dismantled segment. On the remainder of the right-of-way (about 1 km at the north end), natural vegetation conditions will gradually return.

Connecting the substation for the planned mine to the Eastmain 1–Nemiscau line

Connecting the substation to the Eastmain-1–Nemiscau 315-kV line will have no residual impact because no new ground structures will be installed. The substation will be built along the existing line and the work will be the responsibility of the mining company.

Recommissioning a borrow pit and opening a new quarry

Operating the borrow pit and the new quarry will have no residual impact. These extraction areas will be restored when the work is completed.

Adding equipment at Eastmain 1 substation

Adding equipment in the Eastmain-1 substation yard will have no residual impact, since no environment components will be affected by the work.

Table 6-6: Summary of Residual Project Impacts

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Biophysical environment				
Soil (surface, profile and quality)	Building/upgrading access roads Clearing Line construction Transport and traffic Line maintenance Vegetation control	Construction phase Alteration of soil surface in the right-of-way due to compaction and rutting caused by traffic of heavy vehicles and construction machinery. Alteration of slope and soil profile in the right-of-way, increasing erodibility. Risk of soil contamination due to accidental spilling of contaminants or petroleum products.	General measures Standard Environmental Clauses: sections 4, 6, 10, 15, 16, 17, 21 and 24. Specific measures None.	Minor
Water (quality of surface water and groundwater, stream crossings and drainage)	Building/upgrading access roads Clearing Line construction Transport and traffic Line maintenance Vegetation control	Construction phase Crossing of a lake and seven streams. Risk of fine particle suspension (increased turbidity) when installing and removing temporary bridges. Possible disturbance of natural drainage during construction work. Risk of water contamination due to accidental spilling of contaminants or petroleum products.	General measures Standard Environmental Clauses: sections 6, 7, 9, 12, 15, 16, 17, 21 and 24. Specific measures • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.	Minor
Air	Transport and traffic Clearing	Construction phase Burning of wood debris from clearing. Generation of dust and emission of air pollutants during transport and traffic of construction vehicles and machinery.	General measures Standard Environmental Clauses: sections 4, 15 and 20. Specific measures None.	Minor

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Forest vegetation	Clearing Vegetation control	Construction phase Loss of 13.3 ha of woody vegetation in the right-of-way. Possible temporary loss of vegetation due to building access roads outside the right-of-way. Operation phase Vegetation kept in the shrub and grass stages in the right-of-way.	General measures Standard Environmental Clauses: Section 4. Specific measures • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.	Minor
Wetlands	Building/upgrading access roads Clearing Transport and traffic Vegetation control	Construction phase The right-of-way crosses through 34 wetlands covering a total of 6.9 ha. Loss of tree layer on 3.7 ha of treed wetlands (treed swamp and treed bogs) crossed by the right-of-way. Traffic in certain wetlands in the right-of-way. Operation phase Loss of 720 m^2 of wetlands (treed bogs and open bogs) as a result of laying four tower foundations. Vegetation kept in the shrub and grass stages in the right-of-way.	General measures Standard Environmental Clauses: Section 26. Specific measures • Determine and mark off the boundaries of wetlands in the right-of-way to keep construction machinery off wetlands as much as possible. • Use clearing method B, B2, APS or C in wetlands where trees must be felled.	Minor
Special-status plant species	—	No impact because of absence of special-status plant species.	—	—

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Non-native invasive plant species (NNIS)	Transport and traffic	Construction phase Risk of propagation of reed canary grass in the right-of-way during the work.	General measures None. Specific measures • Require that the contractor wash all vehicles and machinery before bringing them to the jobsite. • Mark off areas affected by reed canary grass to prevent vehicles and machinery from going there. • Require that the contractor wash all vehicles and machinery before leaving work areas where NNIS are found, removing all dirt and plant fragments. If pressurized water cannot be used, machinery tracks/tires and shovels must be carefully rubbed clean.	Nil
Plant species traditionally valued by the Crees	Clearing Vegetation control	Construction phase Possible loss of certain plants traditionally valued by the Crees due to clearing the right-of-way and access roads. Operation phase During line maintenance activities, no anticipated impact on plant species traditionally valued by the Crees, apart from tree species present in the right-of-way.	General measures None. Specific measures None.	Minor

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Terrestrial wildlife (moose, caribou, black bear, small wildlife, fur-bearing animals and micromammals)	Clearing Line construction Transport and traffic Vegetation control	Construction phase Loss of habitat for forest species due to clearing the right-of-way. Disturbance of animals whose home range includes work areas. Operation phase Temporary disturbance of animals during vegetation control activities in the right-of-way. Permanent right-of-way favorable for some species, particularly for feeding and travel.	General measures Standard Environmental Clauses: sections 2, 4 and 26. Specific measures • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses. • Use clearing method B, B2, APS or C in wetlands where trees must be felled. • Encourage workers to store food properly and to refrain from feeding animals, so they won't be attracted to work areas. • Relocate bears that approach work areas if they pose a threat to worker safety.	Minor
Birds	Clearing Line construction Transport and traffic Vegetation control	Construction phase Reduced nesting habitat for forest birds due to clearing the right-of-way. Disturbance of birds whose home range includes work areas. Operation phase Disturbance during vegetation control activities of birds that use the shrub or low tree layer in the right-of-way. Permanent right-of-way favorable for open-environment species and but not very favorable for forest species.	General measures Standard Environmental Clauses: sections 2, 4 and 26. Specific measures • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses. • Use clearing method B, B2, APS or C in wetlands where trees must be felled.	Minor

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Fish	Building/upgrading access roads Clearing	Construction phase Possible alteration of fish habitat when temporary bridges are installed or removed. Possible alteration of water quality due to increase in suspended solids or accidental contaminant spills.	General measures Standard Environmental Clauses: sections 4, 6, 7, 9, 12 and 21. Specific measures • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.	Nil
Reptiles	Building/upgrading access roads Clearing Transport and traffic Vegetation control	Construction phase Loss of habitat for forest species. Operation phase Foundations of four towers in wetlands. Maintenance of vegetation in the shrub and grass stages in the right-of-way, creating an environment that is generally not favorable for woodland salamanders.	General measures Standard Environmental Clauses: sections 4, 12, 21 and 26. Specific measures • Determine and mark off the boundaries of wetlands in the right-of-way to keep construction machinery off wetlands as much as possible. • Use clearing method B, B2, APS or C in wetlands where trees must be felled. • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.	Minor
Bats	Clearing Vegetation control	Construction phase Loss of daytime rest areas for bats due to clearing the right-of-way. Operation phase Maintenance of open environments in the right-of-way bordering the forest fringe could be favorable for bats.	General measures Standard Environmental Clauses: Section 4. Specific measures None.	Minor

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Special-status wildlife species	Building/upgrading access roads Clearing Line construction Transport and traffic Vegetation control	Construction phase Loss of feeding habitat because of clearing of coniferous forest in the right-of-way (woodland caribou). No impact on nesting and brood rearing (birds) or on birthing and nursing (bats) as the clearing and construction will not take place during sensitive periods. Temporary disturbance of all species due to construction activities, transport, traffic and even just the presence of workers. Operation phase Temporary disturbance of animals in the right-of-way during vegetation control activities. Maintenance of a habitat that is not very favorable for woodland caribou in winter but could be suitable for southern bog lemming. Maintenance of open environments in the right-of-way bordering forest fringes that could favor aerial hunting by certain bird and bat species (little brown bat, red bat, northern long-eared bat, common nighthawk, short-eared owl, olive-sided flycatcher and Canada warbler).	General measures Standard Environmental Clauses: sections 4 and 26. Specific measures • Determine and mark off the boundaries of wetlands in the right-of-way to keep construction machinery off wetlands as much as possible. • Use clearing method B, B2, APS or C in wetlands where trees must be felled. • Use clearing method B over a strip 20 m wide along both shores of the lake and the permanent streams crossed by the planned line segment and 6 m wide along both shores of the intermittent streams the line segment crosses.	Minor

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Human environment				
Cree land use	Building/upgrading access roads Clearing Line construction Transport and traffic	Construction phase Disturbance of pursuit of traditional activities (e.g., moose and small game hunting). Operation phase Right-of-way will provide land access for Crees already active in the area. Landmark (right-of-way and towers) that could be helpful in bad weather.	General measures None. Specific measures • Inform Cree users of the work schedule and discuss with them measures to minimize disturbance of their activities. • Agree on measures to promote participation of Cree businesses and Cree workers in executing the project, in accordance with applicable agreements. • When clearing the planned right-of-way, make sure trappers will be able to find equipment moved outside the right-of-way. • Inform workers of hunting, fishing and trapping regulations and of Cree activities in areas affected by the work.	Minor
Mining	Line presence	Operation phase Enables execution of the Rose Lithium-Tantalum Mine project.	General measures None. Specific measures None.	Positive impact
Recreation, tourism and vacationing – Jamesians and visitors	Line construction Transport and traffic	Construction phase Temporary disturbance of sport hunting and fishing activities.	General measures None. Specific measures None.	Minor
Road network	Transport and traffic	Construction phase Temporary increase in traffic on the Nemiscau–Eastmain-1 road. Increased risk for users because of heavy vehicles on the Nemiscau–Eastmain-1 road.	General measures Standard Environmental Clauses: Section 15.5. Specific measures • Inform the Société de développement de la Baie-James (SDBJ) of the work schedule. • Put up signs needed to ensure road safety. • During the work, repair any damage to the road network.	Minor

Table 6-6: Summary of Residual Project Impacts (cont.)

Environment component	Main sources of impact	Impact description	General and specific mitigation measures[a]	Significance of residual impact
Development project	—	Operation phase Enables execution of the Rose Lithium-Tantalum Mine project.	—	Positive impact
Archaeology	Building/upgrading access roads Clearing Line construction	Construction phase Possible alteration of archaeological remains during the work.	General measures Standard Environmental Clauses: Section 19. Specific measures • Before starting the work, conduct a field inventory of the area with archaeological potential affected by building the line segment. If remains are discovered, take measures to protect their integrity and conduct a dig at the site. • Inform the Council of the Cree Nation of Eastmain of the results of the inventories and any digs.	Minor
Soundscape	Building/upgrading access roads Clearing Line construction Transport and traffic	Construction phase Increase in noise level near work areas.	General measures Standard Environmental Clauses: Section 2. Specific measures None.	Minor
Landscape	Line presence Vegetation control	Operation phase Alteration of the natural appearance of the landscape along a narrow linear strip of land. Alteration of visual fields of users of the Nemiscau–Eastmain-1 road and land users pursuing activities near the relocated line segment.	General measures None. Specific measures None.	Minor

a. The general mitigation measures are described in Appendix B (on CD-ROM).

7 Environmental compliance monitoring and follow-up

Hydro-Québec monitors environmental compliance at all stages of its line construction projects, adapting its environmental compliance monitoring program to project specifics and the host environment and overseeing the application of mitigation measures in the field.

Furthermore, Hydro-Québec conducts an environmental follow-up when assessment of the effectiveness of the mitigation measures and measurement of the project's actual residual impacts is deemed necessary.

7.1 Environmental compliance monitoring program

Description

In its tender documents, Hydro-Québec describes all specific measures the contractor must take to protect the environment as well as the traffic rules applicable within and outside the jobsite. When bids are opened, Hydro-Québec checks that the construction methods and equipment proposed by bidders suit the nature of the work and meet the requirements set out in the standard environmental clauses. These clauses are also included in all tender documents. Incorporating environmental considerations into all project processes is ensured by the ISO 14001 environmental management system, under the responsibility of the Senior Director – Transmission Projects and Construction.

As part of its environmental compliance monitoring program, Hydro-Québec ensures that information about its environmental commitments, specific environmental protection measures and jobsite traffic strategy are compiled in a compliance guide given to the contract administrator and the jobsite environmental compliance officer. This guide is an internal tool that includes all mitigation measures (standard environmental clauses and specific mitigation measures) and specifies locations where they must be applied. It also has a section on application, modification or non-application of the recommended measures. The guide is given to the jobsite manager and his or her supervisor(s), but it is also frequently requested by jobsite contractors, who see to compliance with Hydro-Québec requirements throughout the work. During the work, the environmental compliance officer completes the section of the guide on fulfilment of environmental commitments.

Implementation

For Hydro-Québec line projects, the construction manager is in charge of environmental protection at the jobsite. As such, he or she ensures that the contractor assigned to the work complies with environment-related contract provisions and is well informed of the general environmental clauses and project-specific measures. The contractor is responsible for conveying environmental protection directives to employees and subcontractors, and verifying compliance. The contractor must name, for the term of the contract, a liaison officer responsible in the field for all environmental matters.

Before work begins, the on-site Hydro-Québec environmental compliance officer organizes a kickoff meeting with the contractor and everyone the compliance officer considers must be present. He or she presents the environmental compliance guide, the specific environmental protection measures that must be applied during the work and the procedure for requesting an exemption.

The Hydro-Québec environmental compliance officer is on the jobsite for the duration of the construction. Before work begins, he or she marks off areas where the contractor must take specific measures to protect the environment and the roads to be used to reach the jobsite or travel in the right-of-way. He or she tours the site with the contractor to check conditions in the field and confirm where travel is possible.

Before work begins, Hydro-Québec implements an information program to explain to concerned Aboriginal organizations and land users how the work will proceed and the possible project impacts.

7.2 Environmental follow-up program

Hydro-Québec is not planning any environmental follow-up activities after the new segment of the Eastmain-1–Nemiscau 315-kV line is built and the de-energized segment (between existing towers 43 and 47) is dismantled.

8 Bibliography

ARKÉOS. 2016. *Projet minier Rose – Tantale et lithium. Étude du potentiel archéologique*. Montréal, Arkéos. 40 p.

ATLAS DES AMPHIBIENS ET DES REPTILES DU QUÉBEC (AARQ). 2017. *Atlas des amphibiens et des reptiles du Québec.* Online: [www.atlasamphibiensreptiles.qc.ca] (September 2017).

BAZOGE, A., D. LACHANCE and C. VILLENEUVE. 2015. *Identification et délimitation des wetlands du Québec méridional*. Québec, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec, Direction de l'expertise en biodiversité et Direction de l'aménagement des eaux souterraines. 64 p. and app.

BÉLISLE, F., G.J. DOUCET and Y. GARANT. 2002. "Wildlife use of riparian vegetation buffer zones in high voltage powerline rights-of-way in the Quebec boreal forest." *In* J.W. Goodrich-Mahoney, D.F. Mutrie and C.A. Guild (eds.). *The Seventh International Symposium on Environmental Concerns in Rights-of-way Management*. Oxford, Elsevier, p. 393-397.

BIBBY, C.J., N.D. BURGESS and D.A. HILL. 1992. *Bird Census Techniques. British Trust for Ornithology and Royal Society for the Protection of Birds*. London, Academic Press. 257 p.

BOSTOCK, N.S. 1970. "Physiographic suddivisions of Canada." *In* R.J.W. Douglas (ed.). *Geology and Economic Minerals of Canada*. Geological Survey of Canada, Economic Geology Report 1. Ottawa, Geological Survey of Canada, p. 9-30.

BOUTHILLIER, L, S. PELLETIER and N. TESSIER. 2015. *Méthode d'inventaire des anoures du Québec*. Longueuil, Ministère des Forêts, de la Faune et des Parcs du Québec, Direction de la gestion de la faune de l'Estrie, de Montréal, de la Montérégie et de Laval. 12 p.

BRACK, V. Jr. 2006. "Autumn activity of *Myotis sodalis* (Indiana bat) in Bland County, Virginia." *Northeastern Naturalist*, vol. 13, p. 421-434.

BRIGHAM, R.M., J.N. MARK, R.G. POULIN and S.D. GRINDAL. 2011. "Common Nighthawk (*Chordeiles minor*)." *In* A. Poole (ed.). *The Birds of North America Online*. Ithaca, Cornell Lab of Ornithology. Online: [http://bna.birds.cornell.edu/bna/species/213doi:10.2173/bna.213].

BROUILLET, L., F. COURSOL, S.J. MEADES, M. FAVREAU, M. ANIONS, P. BÉLISLE and P. DESMET. 2010. *Vascan, la base de données des plantes vasculaires du Canada*. Online: [http://data.cadensys.net/vascan] (September 2017).

CADMAN, M.D., and A.M. PAGE. 1994. COSEWIC status report on the Short-eared Owl *Asio flammeus* in Canada. Ottawa, Committee on the Status of Endangered Wildlife in Canada. 53 p.

CANADA. 2017. *Species at Risk Public Registry*. Online: [http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1] (September 2017).

CENTRE DE DONNÉES SUR LE PATRIMOINE NATUREL DU QUÉBEC (CDPNQ). 2017. Response to a request for information about rare or endangered species in the Rose Lithium project areas. Email received August 9, 2017 from Benoît Larouche. Rouyn-Noranda, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec, Direction régionale de l'analyse et de l'expertise de l'Abitibi-Témiscamingue et du Nord-du-Québec.

CENTRE DE DONNÉES SUR LE PATRIMOINE NATUREL DU QUÉBEC (CDPNQ). 2016. Response to a request for special-status plan species occurrence data within a 15-km radius of the study site. Email received November 9, 2016 from Benoît Larouche. Rouyn-Noranda, Direction régionale de l'analyse et de l'expertise de l'Abitibi-Témiscamingue et du Nord-du-Québec.

CHEKCHAK, T., R. COURTOIS, J.-P. OUELLET, L. BRETON and S. ST-ONGE. 1997. *Caractéristiques des sites de mise bas de l'orignal* (*Alces alces).* Québec, Ministère de l'Environnement et de la Faune du Québec, Direction de la faune et des habitats, Service de la faune terrestre. 38 p.

COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA (COSEPAC). 2013. *COSEWIC assessment and status report on the Harlequin Duck, Histrionicus histrionicus, Eastern population in Canada.* Ottawa, COSEPAC. 42 p and app.

COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA A (COSEPAC). 2002. *COSEWIC assessment and update status report on the woodland caribou, Rangifer tarandus caribou, in Canada*. Ottawa, COSEPAC. 112 p.

CONFÉRENCE RÉGIONALE DES ÉLUS DE LA BAIE-JAMES (CREBJ). Undated. *Plan quinquennal de développement 2004-2009*. (September 2017).

COURBIN, N., D. FORTIN, C. DUSSAULT and R. COURTOIS. 2009. "Habitat management for woodland caribou: the protection of forest blocks influences wolf-caribou interactions." *Landscape Ecology*, vol. 24, p. 1375-1388.

COURTOIS, R., J.-P. OUELLET, L. BRETON, A. GINGRAS and C. DUSSAULT. 2007. "Effects of forest disturbance on density, space use, and mortality of woodland caribou." *Ecoscience*, vol. 14, p. 491-498.

COUTURIER, S., J. DONALD, R. OTTO and S. RIVARD. 2004. *Démographie des troupeaux de caribous migrateurs-toundriques* (Rangifer tarandus) *au nord du Québec et au Labrador*. Québec, Ministère des Ressources naturelles et de la Faune du Québec. 71 p.

CREE HUNTERS AND TRAPPERS INCOME SECURITY BOARD 2017. *The Program*. Online: [http://www.chtisb.ca/program/] (November 3, 2017).

CREE HUNTERS AND TRAPPERS INCOME SECURITY BOARD. 2015. *Annual Report 2014-2015*. Québec, 93 p.

CREE NATION OF EASTMAIN. 2011. *Rapport annuel 2009-2010*. Online: [www.eastmain.ca/Book/CNEAR2009-2010.swf] (September 2017).

CREE TRAPPERS' ASSOCIATION. 2017. *Harvesting database.* Cree geoportal. Online: [www.creegeoportal.ca/CTA] (September 2017).

DEL DEGAN, MASSÉ ET ASSOCIÉS. 2008. *Aménagement hydroélectrique de l'Eastmain-1. Inventaire de la grande faune – hiver 2008*. Prepared for the Société d'énergie de la Baie James. 58 p and app.

DESROCHES, J.-F., and D. RODRIGUE. 2004. *Amphibiens et reptiles du Québec et des Maritimes*. Waterloo, Éditions Michel Quintin. 288 p.

DESROSIERS, N., R. MORIN and J. JUTRAS. 2002. *Atlas des micromammifères du Québec*. Québec, Société de la faune et des parcs du Québec, Direction du développement de la faune. 92 p.

DOUCET, G.J., and D.T. BROWN. 1997. "Snowshoe hare, red squirrel and gray squirrel winter activity in a 120 kV powerline right-of-way and in adjacent forests." *In* J.R. Williams, J.W. Goodrich-Mahoney, J.R. Wisniewski and J. Wisniewski (ed.). *The Sixth International Symposium on Environmental Concerns in Rights-of-Way Management.* Oxford, Elsevier, p. 295-297.

DUHAMEL, R., and J.A. TREMBLAY 2013. *Rapport sur la situation du campagnol des rochers (Microtus chrotorrhinus) au Québec.* Québec, Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs du Québec, Direction générale de l'expertise sur la faune et ses habitats. 22 p.

EEYOU ISTCHEE JAMES BAY REGIONAL GOVERNMENT. 2017. Online: [www.greibj.ca/en/territory/communities] (September 9, 2017).

ENVIRONMENT AND CLIMATE CHANGE CANADA (ECCC). 2017. *Canadian Climate Normals 1971-2000 Station Data*. Online: [http://climat.meteo.gc.ca/climate_normals/results_f.html] (November 2017).

ENVIRONMENT AND CLIMATE CHANGE CANADA (ECCC). 2017. *Migratory Birds Hunting Regulations, 2017-2018*. Online: [https://www.ec.gc.ca/rcom-mbhr/default.asp?lang=En&n=A6FB935C-1&pedisable=true] (September 13, 2017).

ENVIRONMENT CANADA. 2015. *Recovery Strategy for Little Brown Myotis (Myotis lucifugus), Northern Myotis (Myotis septentrionalis), and Tri-colored Bat (Perimyotis subflavus) in Canada* [Proposed]. Species at Risk Act Recovery Strategy Series. Ottawa, Environment Canada. 121 p.

ÉQUIPE DE RÉTABLISSEMENT DU CARIBOU FORESTIER DU QUÉBEC. 2008. *Plan de rétablissement du woodland caribou* (*Rangifer tarandus) au Québec — 2005-2012*. Québec, Ministère des Ressources naturelles et de la Faune du Québec. 78 p.

FÉDÉRATION QUÉBÉCOISE DU CANOT ET DU KAYAK (FQCK). 2005. *Guide des parcours canotables du Québec*. Montréal, FQCK. 455 p.

FORTIN, C., and G.J. DOUCET. 2003. "Communautés de micromammifères le long d'une d'une emprise de lignes de transport d'énergie électrique située en forêt boréale." *Le Naturaliste canadien*, vol. 127, p. 47-53.

FORTIN, C., and G.J. DOUCET. 2008. "Micromammifères et emprises de lignes de transport d'énergie électrique situées en milieu forestier." *Le Naturaliste canadien*, vol. 132, p. 32-40.

GAUDREAU, R., P. JACOBS and G. LALONDE. 1986. *Méthode d'analyse visuelle pour l'intégration des infrastructures de transport (Montréal)*. Québec, Ministère des Transports, Service de l'Environnement. 124 p.

GETZ, L.L. 1961. "Factors influencing the local distribution of *Microtus* and *Synaptomys* in southern Michigan." *Ecology*, vol. 42, p. 110-119.

GRINDAL, S.D. 1998. "Habitat use by bats, *Myotis spp*., in Western Newfoundland."*Le Naturaliste canadien*, vol. 113, p. 258-263.

GRINDAL, S.D., J.L. MORISSETTE AND R.M. BRIGHAM. 1999. "Concentration of bat activity in riparian habitats over an elevational gradient." *Canadian Journal of Zoology*, vol. 77, p. 972-977.

HINS, C., J.-P. OUELLET, C. DUSSAULT and M.-H. ST-LAURENT. 2009. "Habitat selection by forest-dwelling caribou in a managed boreal forest of eastern Canada. Evidence of a landscape configuration effect." *Forest Ecology and Management*, vol. 257, p. 636-643.

HOGBERG, L.K., K.J. PATRIQUIN AND R.M.R. BARCLAY. 2002. "Use by bats of patches of residual trees in logged areas of the boreal forest." *The American Midland Naturalist*, vol. 148, no. 2, p. 282-288.

HYDRO-QUÉBEC. 1992. *Méthode d'étude du paysage pour les projets de lignes et de postes de transport et de répartition*. In collaboration with Groupe Viau and Groupe-conseil Entraco. Montréal, Hydro-Québec. 325 p.

HYDRO-QUÉBEC. 2012. *Profil régional des activités d'Hydro-Québec 2011*. 110 p. Online: ftp://ftp.mrn.gouv.qc.ca/Public/Bibliointer/Perio/0918568/2011.pdf] (September 14, 2017).

HYDRO-QUÉBEC. 2017. *Centrales hydroélectriques*. Online: [www.hydroquebec.com/production/centrale-hydroelectrique.html] (November 3, 2017, up-to-date as at January 1, 2017).

HYDRO-QUÉBEC ÉQUIPEMENT ET SERVICES PARTAGÉS and SOCIÉTÉ D'ÉNERGIE DE LA BAIE JAMES (SEBJ). 2016. Standard Environmental Clauses. Montréal, Hydro-Québec Équipement et services partagés et SEBJ. 40 p.

HYDRO-QUÉBEC ÉQUIPEMENT ET SERVICES PARTAGÉS. 2014. *Cahier des bonnes pratiques en environnement. Construction de ligne de transport d'énergie*. Montréal, Hydro-Québec Équipement et services partagés. 79 p. and app.

HYDRO-QUÉBEC PRODUCTION. 2004. *Eastmain-1-A powerhouse and Rupert diversion – Environmental Impact Statement.* Montréal, Hydro-Québec Production. Vol. 1: chap. 1 to 9, 259 p; vol. 4: chap. 16 to 25, 580 p.

HYDRO-QUÉBEC PRODUCTION. 2014*a*. *Eastmain-1 Hydroelectric Development. Environmental Activities, 2002–2013 – Highlights.* Montréal, Hydro-Québec Production. 28 p.

HYDRO-QUÉBEC PRODUCTION. 2014*b*. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Bilan des activités environnementales 2013*. Montréal, Hydro-Québec Production. 149 p.

HYDRO-QUÉBEC TRANSÉNERGIE. 2004. *Ligne biterne à 315 kV Eastmain-1-Nemiscau, poste de l'Eastmain-1 et travaux au poste de la Nemiscau. Évaluation environnementale*. Montréal, Hydro-Québec TransÉnergie. 143 p.

INSTITUT DE LA STATISTIQUE DU QUÉBEC (ISQ). 2016*a*. *Bulletin statistique régional. Édition 2016. Nord-du-Québec.* Online: [www.stat.gouv.qc.ca/statistiques/profils/bulletin-statistique-regional_an.html] (September 12, 2017). 42 p.

INSTITUT DE LA STATISTIQUE DU QUÉBEC (ISQ). 2016*b*. *Average employment income aged 25-64 years, by age group, RCMs of the Nord-du-Québec region, 2011-2015* Table. Online: [www.stat.gouv.qc.ca/statistiques/profils/profil10/societe/marche_trav/indicat/remun_age_mrc10_an.htm] (September 14, 2017].

INSTITUT DE LA STATISTIQUE DU QUÉBEC (ISQ). 2017*a*. *Panorama des régions du Québec. Édition 2017.* Online: [www.stat.gouv.qc.ca/statistiques/profils/panorama-regions-2017.pdf] (September 12, 2017). 193 p.

INSTITUT DE LA STATISTIQUE DU QUÉBEC (ISQ). 2017*b*. *Estimation de la population des municipalités du Québec au 1er July des années 1996 à 2016, selon le découpage géographique au 1er July 2016*. Excel file. Online: [www.stat.gouv.qc.ca/statistiques/population-demographie/structure/index.html] (September 12, 2017).

INSTITUT DE LA STATISTIQUE DU QUÉBEC (ISQ). 2017*c*. *Statistical profiles by region and geographical RCM*. Online: [www.stat.gouv.qc.ca/statistiques/profils/region_00/region_00_an.htm] (September 12, 2017).

INSTITUT DE LA STATISTIQUE DU QUÉBEC (ISQ). 2017*d*. *Bulletin statistique régional. Édition 2017. Nord-du-Québec. October 2017*. Online: [www.stat.gouv.qc.ca/statistiques/profils/bulletins/2017/10-Nord-du-Quebec.pdf] (November 3, 2017).

JOLY, M., S. PRIMEAU, M. SAGER and A. BAZOGE. 2008. *Guide d'élaboration d'un plan de conservation des wetlands*. 1st edition. Québec, Ministère du Développement durable, de l'Environnement et des Parcs du Québec. ISBN 978-2-550-53636-9. 68 p.

JOURNAL OF ETHNOBIOLOGY AND ETHNOMEDICINE. 2012. *Traditional use of medicinal plants in the boreal forest of Canada: review and perspectives*. Document no. 10.1186/1746-4269-8-7. Online: [https://ethnobiomed.biomedcentral.com/articles/10.1186/1746-4269-8-7] (September 2017).

JUTRAS, J., and C. VASSEUR. 2011. *Bilan de la saison 2009*. *CHIROPS*, No. 10. Bulletin de liaison du Réseau québécois d'inventaires acoustiques de chauves-souris. 32 p.

JUTRAS, J., M. DELORME, J. MC DUFF and C. VASSEUR. 2012. "Le suivi des chauves-souris du Québec." *Le Naturaliste canadien*, vol. 136, n° 1, p. 48-52.

KIRKLAND, G.L., and F.J. JANNETT JR. 1982. "Microtus chrotorrhinus." *Mammalian Species*, vol. 180, p. 1-5.

KRUPA, J.J., and K.E. HASKINS. 1996. "Invasion of the meadow vole *(Microtus pennsylvanicus)* in Southeastern Kentucky and its possible impact on the southern bog lemming (*Synaptomys cooperi*)." *American Midland Naturalist*, vol. 135, p. 14-22.

LABRECQUE, J., N. DIGNARD, P. PETITCLERC, L. COUILLARD, A. O. DIA and D. BASTIEN. 2014. *Guide de reconnaissance des habitats forestiers des plantes menacées ou vulnérables. Abitibi-Témiscamingue et du Nord-du-Québec (secteur sud-ouest)*. Québec, Ministère des Forêts, de la Faune et des Parcs du Québec et Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec. 148 p.

LANTIN, E. 2003. "Évaluation de la qualité des habitats d'alimentation pour le woodland caribou en forêt boréale du nord-ouest du Québec." M.A. thesis. Montréal, Université du Québec à Montréal. 112 p.

LAROCHELLE, M., N. TESSIER, S. PELLETIER and L. BOUTHILLIER. 2015. *Protocole pour les inventaires de couleuvres associées aux habitats de début de succession au Québec*. Québec, Ministère des Forêts, de la Faune et des Parcs du Québec, secteur Faune. 11 p.

LINZEY, A.V. 1984. "Patterns of coexistence in *Synaptomys cooperi* and *Microtus pennsylvanicus.*" *Ecology*, vol. 65, p. 382-393.

LOEB, S.C., and J.M. O'KEEFE. 2006. "Habitat use by forest bats in South Carolina in relation to local, stand, and landscape characteristics." *Journal of Wildlife Management*, vol. 70, p. 1210-1218.

MCDUFF, J., S. ROULEAU, M. GAUTHIER and R. BRUNET. 1999. *Inventaire acoustique des chauves-souris dans la région de Sept-Îles, Côte-Nord. Été 1999*. Sherbrooke, Envirotel. 42 p.

MENZEL, J. M., M. A. MENZEL JR., J. C. KILGO, W. M. FORD, J. W. EDWARDS and G. F. MCCRACKEN. 2005. "Effect of habitat and foraging height on bat activity in the coastal plain of South Carolina." *Journal of Wildlife Management*. vol. 69, no. 1, p. 235-245.

MOREAU, G., D. FORTIN, S. COUTURIER and T. DUCHESNE. 2012. "Multi-level fonctional responses for wildlife conservation: the case of threatened caribou in managed boreal forests." *Journal of Applied Ecology*, vol. 49, p. 611-620.

MORIN, M. 2015. "Plan de gestion de l'orignal dans la zone 22." *In* S. Lefort and S. Massé. *Plan de gestion de l'orignal au Québec – 2012-2019*. Québec, Ministère des Forêts, de la Faune et des Parcs du Québec, p. 356-367.

MORNEAU, F., M. SIGOUIN, S. GAGNON and V. CLÉMENT. 2010. *Aménagement hydroélectrique de l'Eastmain-1. Milieux terrestres et humides. Suivi environnemental 2009. Utilisation des baies endiguées par la sauvagine et des plates-formes de nidification par le balbuzard pêcheur*. Prepared for Hydro-Québec Production. Labelle, Biofilia. 57 p and app.

NEMASKA LITHIUM. 2013. *Projet Whabouchi. Développement et exploitation d'un gisement de spodumène sur le territoire de la Baie-James. Étude des impacts sur l'environnement et le milieu social*. Shawinigan, Nemaska Lithium. 627 p.

NICKERSON, N.H., R.A. DOBBERTEEN and N.M. JARMAN. 1989. "Effects of power-line construction on wetland vegetation in Massachusetts." *Environmental Management*, vol. 13, no. 4, p. 477-483.

ORROCK, J.L., and J.F. PAGELS. 2003. "Tree communities, microhabitat characteristics, and micromammals associated with the endangered rock vole, Microtus chrotorrhinus, in Virginia." *Southeastern Naturalist*, vol. 2, p. 547-558.

OUELLET, M.C. FORTIN and M.-J. GRIMARD. 2009. "Distribution and habitat use of the boreal chorus frog *(Pseudacris maculata)* at its extreme northeastern range limit." *Herpetological Conservation and Biology*, vol. 4, p. 277-284.

OWEN, S., M.A. MENZEL, M.W. FORD, B.R. CHAPMAN, K.V. MILLER, J. EDWARDS AND P. WOOD. 2003. "Homerange size and habitat use by northern Myotis (*Myotis septentrionalis*)." *American Midland Naturalist*, vol. 150, p. 352-359.

PRESCOTT, J., and P. RICHARD. 1996. *Mammifères du Québec et de l'Est du Canada*. 2nd edition. Waterloo, Éditions Michel Quintin. 399 p.

PRÉVOST, M., A. PLAMONDON and V. ROY. 2001. "La production forestière." *In* S. Payette and L. Rochefort (dir.). *Écologie des tourbières du Québec-Labrador*. Québec, Presses de l'Université Laval, p. 556-581.

PUBLICATIONS DU QUÉBEC. 2005. *Décret n^{o} 75-2005*. *Gazette officielle du Québec*, 137th year, No. 7, February 16, 2005. Québec, Publications du Québec.

QUÉBEC BREEDING BIRD ATLAS. 2017. *Atlas results*. Online: [http://www.atlas-oiseaux.qc.ca/donneesqc/datasummaries.jsp?lang=en] (November 2017).

QUÉBEC, MINISTÈRE DE L'ÉNERGIE ET DES RESSOURCES NATURELLES (MERN). 2017. *GestimPlus. Gestion des titres miniers*. Online: [https://gestim.mines.gouv.qc.ca/MRN_GestimP_Presentation/ODM02201_menu_base.aspx] (September 13, 2017).

QUÉBEC, MINISTÈRE DE L'ÉNERGIE ET DES RESSOURCES NATURELLES (MERN). 2016. *Main-d'œuvre dans les activités d'extraction minière par région*. Online: [http://mern.gouv.qc.ca/mines/statistiques/regionales-maindoeuvre.jsp] (September 2017).

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2017*a*. Response to a request for wildlife information for an environmental study of electric supply for the Rose-Lithium mine in Northern Québec (received July 20, 2017). Chibougamau, MFFP, Direction de la gestion de la faune du Nord-du-Québec.

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2017*b*. *Liste des espèces désignées comme menacées ou vulnérables au Québec*. Online: [www3.mffp.gouv.qc.ca/faune/especes/menacees/liste.asp#vulnerables] (September 2017).

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2017*c*. Response to a request for information addressed to InfoFaune – Nord-du-Québec. Email received February 20, 2017.

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2016*a*. *Zones de végétation et domaines bioclimatiques du Québec*. Online: [www.mffp.gouv.qc.ca/forets/inventaire/inventaire-zones-carte.jsp] (September 2017).

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2016*b*. *Statistiques de chasse et de piégeage*. Online: [https://www.mffp.gouv.qc.ca/faune/statistiques/chasse-piegeage.jsp) (September 2017).

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2016*c*. "Caribous de la rivière aux feuilles. Résultats de l'inventaire aérien." Press release, Québec, December 9, 2016. Online. [http://mffp.gouv.qc.ca/2016-12-09-inventaire-caribous-riviere-aux-feuilles].

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2016*d*. "Fermeture de la chasse sportive au caribou migrateur." Press release, Québec, December 21, 2016. Online: [https://mffp.gouv.qc.ca/fermeture-de-la-chasse-sportive-au-caribou-migrateur/].

QUÉBEC, MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (MFFP). 2016*e*. *Limite territoriale des forêts attribuables*. Online: [http://mffp.gouv.qc.ca/forets/connaissances/connaissances-limite-nordique-forets.jsp] (September 11, 2017).

QUÉBEC, MINISTÈRE DES RESSOURCES NATURELLES ET DE LA FAUNE (RNF). 2011. *Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures*. Tome I: *Acquisition de données*. Québec, MRNF, secteur Faune. 137 p.

QUÉBEC, MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES (MDDELCC). 2017*a*. *Espèces menacées ou vulnérables au Québec*. Online: [www.mddelcc.gouv.qc.ca/biodiversite/especes] (September 2017).

QUÉBEC, MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES (MDDELCC). 2017*b*. *Réserves de biodiversité projetées*. Online: [www.mddelcc.gouv.qc.ca/biodiversite/reserves-bio/index.htm#biop] (September 2017).

QUÉBEC, MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES (MDDELCC). 2014. *Cadre écologique de référence du Québec*. Online: [www.mddelcc.gouv.qc.ca/biodiversite/cadre-ecologique/rapports/Provinces_Internet_ 16-12-2014.pdf] (August 2017).

QUÉBEC, MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES (MDDELCC). 2012. *Les wetlands et l'autorisation gouvernementale*. Québec, MDDELCC, Direction du patrimoine écologique et des parcs, Direction des politiques de l'eau et Pôle d'expertise hydrique et naturel. 41 p. and app.

QUÉBEC, MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS (MDDEP). 2006. *Identification et délimitation des écosystèmes aquatiques, humides et riverains*. Québec, MDDEP. 10 p. and app.

QUÉBEC. 2017*a*. *Québec. Regional Portraits. Nord-du-Québec*. Online: [www.gouv.qc.ca/EN/LeQuebec/Pages/NordDuQuebec.aspx] (September 11, 2017).

QUÉBEC. 2017*b*. *Québec Portal. Services Québec. Geography. Climate and seasons*. Online: [www.gouv.qc.ca/EN/LeQuebec/Pages/Geographie.aspx#climat] (November 2017).

RALPH, C.J., J.R. SAUER and S. DROEGE. 1995. *Monitoring Bird Populations by Point Counts*. Gen. Tech. Rep. PSW-GTR-149. Albany (CA), US. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 187 p.

RUDOLPH, T.D., P. DRAPEAU, M.-H. ST-LAURENT and L. IMBEAU. 2012. *Situation du caribou forestier (Rangifer tarandus caribou) sur le territoire de la Baie-James dans la région Nord-du-Québec*. Scientific report submitted to the Ministère des Ressources naturelles et de la Faune du Québec and the Grand Council of the Crees. 77 p.

SAMSON, C. 1996. "Modèle d'indice de qualité de l'habitat pour l'ours noir (*Ursus americanus*) au Québec." Québec, Ministère de l'Environnement et de la Faune du Québec. 57 p.

SOCIÉTÉ WEH-SEES INDOHOUN. Undated. *Zone spéciale de chasse et de pêche Weh-Sees Indohoun*. Dépliant. Online: [www.weh-sees-indohoun.ca/images/Depliant_francais.pdf] (September 12, 2017).

VISTNES, I., and C. NELLEMANN. 2008. "The matter of spatial and temporal scales: a review of reindeer and caribou response to human activity." *Polar Biology*, vol. 31, p. 399-407.

WSP CANADA. 2017. *Projet minier Rose lithium-tantale. Étude d'impact sur l'environnement.* Project No. 111-17853-01. Prepared for the Corporation Éléments Critiques. Montréal, WSP Canada.

ZIMMERMAN, G.S., and W.E. GLANZ. 2000. "Habitat use by bats in eastern Maine." *Journal of Wildlife Management*, vol. 64, p. 1032-1040

Printed on paper made in Québec
from 100% postconsumer recycled fibre.

2017E3056-A

Hydro Québec